United States
Department of
Agriculture

United States
Department of
Interior

Forest
Service

Bureau of Land
Management

Pacific
Southwest Region

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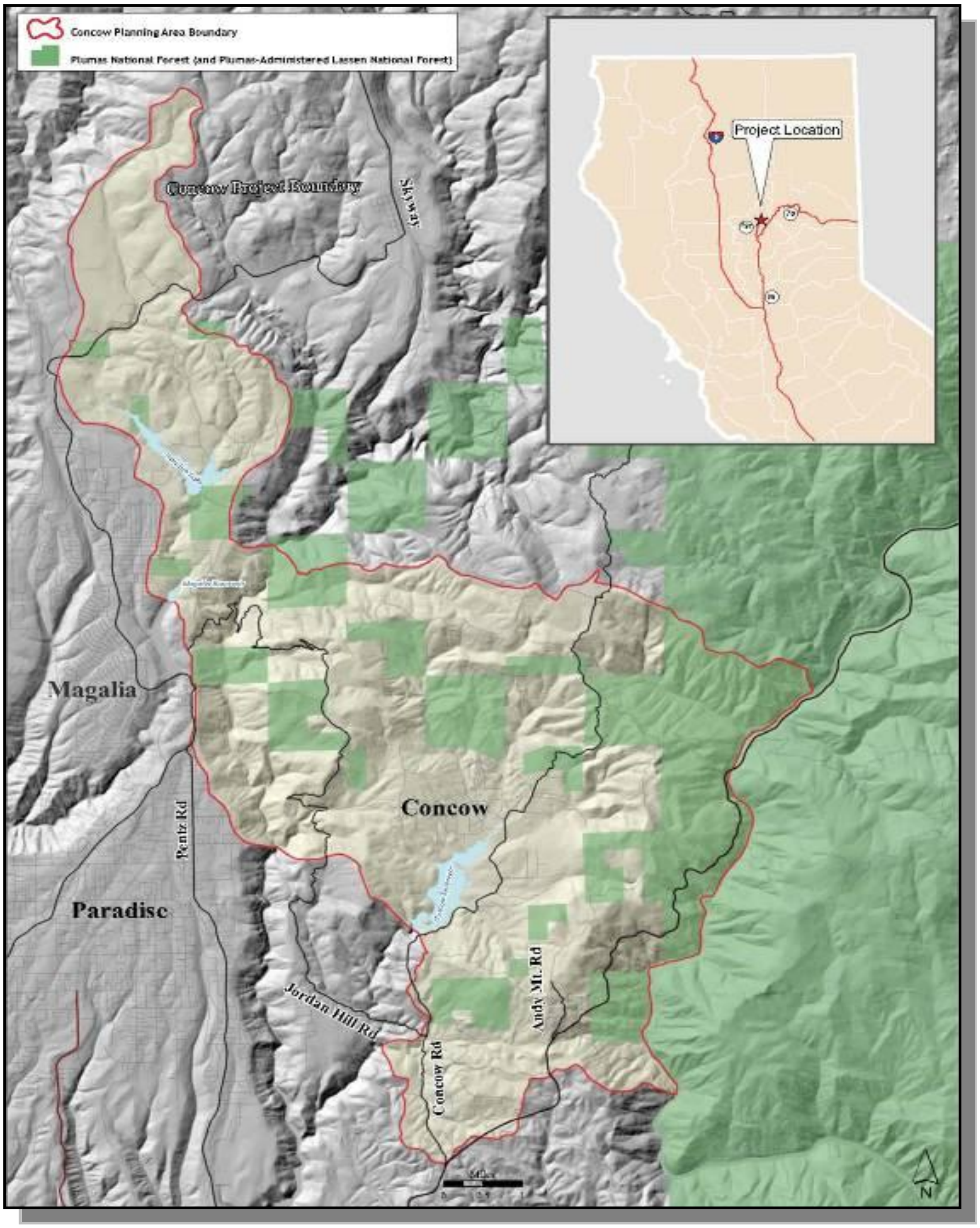
Final Environmental Impact Statement

Concow Hazardous Fuels Reduction Project

USDA Forest Service, Plumas National Forest, Feather River Ranger District
USDI Bureau of Land Management, Northern California District, Redding Field Office; Butte County, California


Concow Planning Area Boundary
Plumas National Forest (and Plumas-Administered Lassen National Forest)
Project Location
Concow Project Boundary
Skyway
Magalia
Concow
Pentz Rd
Paradise
Jordan Hill Rd
Concow Rd
Andy Mt. Rd
N

Concow Hazardous Fuels Reduction Project

Final Environmental Impact Statement

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Cooperating Agency:	USDI Bureau of Land Management
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Abstract: The USDA Forest Service and the USDI Bureau of Land Management propose to reduce hazardous forest fuels on approximately 1,500 acres of public land, in part by establishing and maintaining spaces, called Defensible Fuel Profile Zones (DFPZs), for suppressing fire in locations around the towns of Paradise, Magalia, Concow and Yankee Hill in Butte County, California.

The Concow Hazardous Fuels Reduction Final Environmental Impact Statement (FEIS) describes the environmental effects of three alternatives, including:

1. **Alternative A** – The No-action Alternative provides a baseline against which to compare the the action Alternatives B and C.

2. **Alternative B** – The Agencies' preferred Proposed Action is designed to establish and maintain Defensible Fuel Profile Zones (DFPZs) on a maximum 1,510 federally managed acres (32 acres administered by the Bureau of Land Management, with remaining area administered by the Forest Service). Alternative B would apply a variety of treatment methods to land in the wildland urban-interface, integrating forest health promotion with hazardous fuels reduction, estimated to generate commercial forest by-products of up to 2 million board feet of timber volume and 3,750 tons of biomass. This alternative would contribute an estimated 30 forestry-related jobs in Butte County, California. Forest health treatments would allow for the removal of conifer trees ranging from 9.0" to 29.9" dbh. Treatments such as radial release around oaks and pines are designed to have long term beneficial outcomes via enhanced habitat diversity and resiliency to wildfire disturbance.

3. **Alternative C** – The alternative to the Proposed Action is designed to establish Defensible Fuel Profile Zones (DFPZs) on a maximum 1,363 acres on Forest Service administered land, through solely non-commercial funding sources in a single treatment entry; contributing potentially 15 forestry-related jobs in Butte County, California. Small live trees less than 9" at dbh in the unburned areas and small dead trees less than 11" dbh in the burned areas would be felled and surface fuels treated on location.

The Concow Hazardous Fuels Reduction Project is a cooperative effort between the U.S. Department of Agriculture, Forest Service (FS) and the U.S. Department of Interior, Bureau of Land Management (BLM), in collaboration with local Fire Safe Councils, residents and other interested parties. The project design conforms to the stipulations of the 1998 *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act), and associated legislation, including the *Healthy Forest Restoration Act* (HFRA) of 2003, Sections 104-106, and is consistent with the Butte Unit's Community Wildfire Protection Plan (CWPP) (For relevant laws, regulations and other direction that influence the scope of this FEIS, and development of the alternatives, please see Concow FEIS; (Chapter 1, section 1.5, and Chapter 2, section 2.1.1).

Predecisional Administrative Review (Objection process): The Concow Hazardous Fuels Reduction FEIS is available online at the Plumas National Forest website: http://fs.usda.gov/plumas. The 1988 Plumas National Forest Land and Resource Management Plan, as amended by the 1999 HFQLG final EIS ROD, and as amended by the 2004 SNFPA final supplemental EIS ROD, guides the Proposed Action and alternatives for lands administered by the Plumas National Forest, Feather River Ranger District. In December 2007, the 2008 Consolidated Appropriations Act extended the HFQLG Pilot Project to September 30, 2012. It also applied some portions of the Healthy Forest Restoration Act (HFRA: Sections 104–106) to HFQLG projects. These sections relate to environmental analysis, public notice, comment and objection processes.

To make decisions on hazardous fuel projects more timely, projects authorized under the 2003 Healthy Forest Restoration Act (HFRA) are exempt from the more lengthy appeals process (36 CFR Part 215) applied to other projects. Hazardous fuel reduction projects conducted under the provisions of the HFRA are not subject to administrative appeal. As far as judicial challenges, the HFRA says that civil action challenging an authorized hazardous fuel reduction project in Federal district court may only be brought if the person has exhausted their administrative remedies by using the objection process.

If you submitted specific written comments related to the proposed authorized hazardous fuel reduction project during the opportunity for public comment provided during preparation of the Concow Hazardous Fuels Reduction Draft Environmental Impact Statement (DEIS), as characterized in section 104(g) of the Healthy Forest Restoration Act (HFRA), you are eligible to file an objection (pursuant to 36 CFR Part 218; Subpart A). The objection process is an opportunity to resolve issues during the analysis phase, before a project decision is made. For more information on how this objection process works and the requirements, refer to the regulations under 36 CFR Part 218, Subpart A on the National Forest Service web site at http://www.fs.fed.us/emc/applit/36cfr218a.htm

Written objections, including any attachments, must be filed with the reviewing officer within 30 days following the publication date of the legal notice of the final EIS (FEIS) in the newspaper of record (§218.5(c)). The first day of the objection-filing period is the day after publication of the legal notice for the Concow Hazardous Fuels Reduction final EIS (FEIS) in the newspaper of record (§218.5(c)). The publication date of the legal notice of the FEIS in the newspaper of record is the exclusive means for calculating the time to file an objection. Objectors may not rely on dates or timeframe information provided by any other source. It is the responsibility of objectors to ensure that their objection is received in a timely manner. The deadline for objections cannot be extended for extenuating circumstances.

Objections must be filed in writing with the reviewing officer. All objections must be open to public inspection during the objection process. At a minimum, an objection must include the following: (1) Objector's name and address (§218.2), with a telephone number, if available; (2) Signature or other verification of authorship upon request (a scanned signature for electronic mail may be filed with the objection); (3) Identification of the lead objector, when multiple names are listed on an objection (§218.2); Verification of the identity of the lead objector, provided upon request; (4) The name of the proposed authorized hazardous fuel reduction project, the name and title of the responsible official, and the name(s) of the national forest(s) and/or ranger district(s) on which the proposed authorized hazardous fuel reduction project will be implemented, and; (5) Sufficient narrative description of those aspects of the proposed authorized hazardous fuel reduction project addressed by the objection, specific issues related to the proposed authorized hazardous fuel reduction project, and suggested remedies that would resolve the objection.

Incorporation of documents by reference is not allowed; all documents must be included with the objection except for the following items which may be provided by including date, page, and section of the cited document: (1) All or any part of a Federal law or regulation; (2) Forest Service directives and land management plans; (3) Documents referenced by the Forest Service in the proposed HFRA project subject to objection, or; (4) Comments previously provided to the Forest Service by the objector during the proposed HFRA project comment period.

Either the reviewing officer or the objector may request a meeting to discuss the objection's issues and potentially resolve them. Meetings are open to the public. Any objection issues not resolved through such meetings within 30 days following the end of the objection-filing period will be addressed in a written response from the reviewing officer. The reviewing officer is required to respond to all objections, although she may consolidate multiple objections into a single response. Objections must be resolved within a 30-day period.

The project decision must be consistent with the reviewing officer's response to objections. Upon review of an objection, one of the following outcomes could occur: (1) An objector may withdraw the objection; (2) Some or all of the issues may be resolved through discussion or meetings, and the reviewing officer writes a response documenting the resolution; (3) The responsible official may determine that more analysis needs to be done, or; (4) There may be no meetings, or resolution may be unreachable during meetings, and the reviewing officer completes the review and provides a written response.

The responsible official may not issue a Record of Decision on an authorized hazardous fuel reduction project until the reviewing officer has provided written response to all pending objection issues. When no objection is filed within the 30-day filing period, the reviewing officer notifies the responsible official that approval of the Record of Decision may occur on, but not before, the fifth business day following the end of the objection filing period.

Send objections to Alice B. Carlton, Forest Supervisor, Plumas National Forest, Supervisors Office, 159 Lawrence Street, PO Box 11500, Quincy, CA 95971-6025. Comments may be hand delivered Monday through Friday, 8:00 am to 4:30 pm, excluding holidays. Comments may also be faxed to (530) 283-7746 or emailed to comments_pacificsouthwest_plumas @fs.fed.us. The acceptable format(s) for electronic objections is: Microsoft Word or Rich Text Format.

Summary of the Final Environmental Impact Statement (FEIS)

The National Environmental Policy Act (NEPA) is our country's basic charter for environmental responsibility. The NEPA applies when a federal agency has discretion to choose amongst one or more alternative means of accomplishing a particular goal (Council on Environmental Quality [CEQ] NEPA Regulations, 40 CFR § 1508.23). In compliance with the NEPA, this FEIS discloses potential environmental effects associated with Alternative A (No-action), the responsible officials' preferred Proposed Action (Alternative B), and one additional action alternative developed in response to issues raised by the public (Alternative C).

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

Following publication of the Concow Hazardous Fuels Reduction Project Draft Environmental Impact Statement (DEIS), there have been minor corrections and modifications to the surface level of the document, as well as restructuring of supplemental information in the appendices. A summary of the changes made between the Draft Environmental Impact Statement (DEIS) and the FEIS are described according to chapter, below.

Introduction (Abstract, Reader's Guide, etc.)- Minor grammatical changes and spelling corrections, clarification of document structure including removal of inadvertently repeated paragraphs containing entirely identical information , clarification of comment and objection processes as well as the Scoping process's role in developing Significant Issues, and clarification of frequently used acronym definitions.

Chapter 1-Minor grammatical changes.

Chapter 2- Minor grammatical and sentence structure changes.

Chapter 3-Minor grammatical and syntactical changes to clarify meaning, removal of irrelevant or repetitious information to reduce redundancy across reports.

Chapter 4-Removal of analysis for a noxious weed that does not grow in the Project Area, minor grammatical and sentence structure changes, removal of irrelevant or repetitious information to reduce redundancy across reports.

Chapter 5-Additional information about contributors to the EIS.

Glossary-Clarification of meaning via minor grammatical and syntactical changes.

Appendices- Re-ordering of supplemental information reports, additional information on Aquatic Management Indicator Species, addition of the Agriculture Secretary's administrative review process (36 CFR 218), the Response to Comments, the Butte Unit Community Wildfire Protection Plan, and the *Healthy Forest Restoration Act*.

Purpose and Need for Action

The four elements comprising the Purpose of and Need for this proposed federal action include:

1. FIRE AND FUELS IN THE WUI. There is a need for thinning of overcrowded unburned forests, selectively removing burned dead trees to establish Defensible Fuel Profile Zone (DFPZ) conditions within the wildland urban-interface (WUI). In meeting this need, the Proposed Action would also achieve the following purpose of reducing risks to rural communities from wildfires.

2. FIRE SUPPRESSION IN THE WUI. There is a need for safer and more effective locations for firefighters to initiate fire suppression. In meeting this need, the Proposed Action would also achieve the following purpose of establishing and maintaining Defensible Fuel Profile Zones (DFPZs) to control and contain wildfire.

3. ECOSYSTEM MANAGEMENT. There is a need for reestablishment and sustainment of healthy forests, habitats, watersheds and aquatic resources on public land within the Concow Planning Area. In meeting this need, the Proposed Action would also achieve the following purpose of restoring recently fire-damaged forests to promote forest health and habitat diversity.

4. SOCIOECONOMICS. There is a need for encouragement of local labor involvement, while offering forest by-products resulting from ecologically appropriate vegetative fuels reduction treatments. In meeting this need, the Proposed Action would also achieve the following purpose of contributing to the stability and economic health of local communities.

Proposed Action

The Plumas National Forest (PNF) proposes to establish and maintain a Defensible Fuel Profile Zone (DFPZ) network to further complete the Herger-Feinstein Quincy Library Group (HFQLG) Pilot Project's larger DFPZ network, and fill in gaps linking shaded fuelbreak networks on private land in the wildland urban-interface (WUI). The Proposed Action would be accomplished by altering fuels and vegetative conditions over a maximum 1,510 acres of public land, in three spatially overlapping treatment phases. These treatments would occur at points in time roughly five years apart, beginning with the initial treatments, followed by two maintenance treatments.

Significant Issues

Scoping, a process of information collection and public collaboration in the early stages of project development, identified the following Significant Issues, as described inTable S-1, below.

Table S-1. List of Significant Issues

Issue Topic	Cause and Effect
1. Cumulative effects to municipal and other watershed resources (applicable to unburned and burned areas)	The Proposed Action may increase adverse effects to the beneficial uses[1] of water related resources, including aquatic dependent resources in municipal watersheds, already considered highly disturbed. Specifically, implementing ground-disturbing activities in watersheds that are already over the threshold of concern,[2] may increase the risk of adverse cumulative watershed resource effects.
2. Cumulative effects to terrestrial wildlife – snag habitat (applicable to the burned area only)	The Proposed Action may increase adverse cumulative loss of snag (fire killed tree) habitat, already depleted in surrounding areas, along with the species that are dependent on them for nesting and roosting. The combination of past, present and foreseeable future government and non-government dead tree removal activities may potentially reduce, fragment and/or incrementally degrade habitat.
3. Social debate over forest management of public land –economic recovery (applicable to the unburned and burned areas)	Public comments received during the Scoping period indicate public concern that federal forest land management is unreasonably biased towards cost recovery or economic rewards, particularly in context of harvesting fire killed trees from highly disturbed, post-fire environments.

[1] **Beneficial Uses** —A use of the waters including, but not limited to domestic, municipal, agricultural, and industrial supply, power generation, recreation, aesthetics, navigation, and protection and enhancement of fish, wildlife, and other aquatic resources or preserves (USDA Forest Service 1990). The Forest Service and Bureau of Land Management are required to protect and enhance existing and potential beneficial uses during water quality planning (California Regional Water Quality Control Board [CRWQCB], 1998, revised 2007).

[2.] **Threshold of Concern—**a measure of watershed health based on comparative analysis of existing and estimated project-related disturbance thresholds, as defined in the 1999 HFQLG Final EIS. The analysis includes an assessment of the likelihood and probable duration of increased risk of off-site and downstream cumulative watershed effects in context of stream channel, riparian, and aquatic conditions.

Alternatives Considered In Detail

The Forest Service, in collaboration with the Bureau of Land Management, developed three alternatives: the No-Action, the Proposed Action and one other action alternative generated in response to the Significant Issues. The three alternatives considered in detail for this analysis are listed in Table S-2. Complete details of the alternatives, including project design criteria, are found in Chapter 2 of the Concow Hazardous Fuels Reduction Project FEIS.

Table S-2. Description of Alternatives Considered in Detail

Alternative	Description
Alternative A: No-action Alternative	The No-action Alternative provides a baseline against which to compare the other alternatives. The No-action Alternative would not establish Defensible Fuel Profile Zones (DFPZs) on public land, nor implement the recommendations in the Butte Unit's Community Wildland Protection Plan (CWPP). This Alternative allows for on-going administrative, federal land management within the Planning Area, such as reforestation, oak woodland stand tending, road maintenance and Roadside Danger Tree felling, fire suppression, and dispersed recreation. Under the No-action Alternative, current management plans would continue to guide management of the Concow Project Area.
Alternative B: Proposed Action	The Proposed Action is designed to further the completion of the Herger-Feinstein Quincy Library Group (HFQLG) Pilot Project's larger Defensible Fuel Profile Zone (DFPZ) network, and to fill in gaps linking shaded fuelbreak networks on private land in the wildland urban-interface (WUI). The Proposed Action would establish a DFPZ network over a maximum of 1,510 acres on lands administered by the Forest Service and Bureau of Land Management. Forest health treatments would allow for the removal of conifer trees ranging from 9.0" to 29.9" at dbh. Treatments such as radial release around oaks and pines are designed to have long term beneficial outcomes for enhanced habitat diversity and resiliency to wildfire disturbance. Follow up DFPZ maintenance treatments would occur over a 10 year period, once DFPZs have been established. The Forest Service would perform three sets of treatments: an initial entry, then the first follow up maintenance entry 5-7 years later, followed by the final maintenance entry 8-10 years later. This Alternative would generate commercial forest by-products of up to 2 million board feet of timber volume and 3,750 tons of biomass; contributing potentially 30 forestry-related jobs in Butte County, California. **Proposed DFPZ Initial Entry Treatments:** Handcut Pile and Burn 666 acres; Lop and Scatter 118 acres; Masticate 671 acres; Remove Dead (Burned) Trees 320 acres; Radial Release and Thin 217 acres; Underburn 127 acres; Plantation and Spot Planting 96 acres; Chip 385 acres; Oak Release (Prune) 213 acres; Construct up to 2 miles of temporary road;

Alternative	Description
	Implement heavy road maintenance on up to 4 miles; Bridge Improvement. **Follow up DFPZ Maintenance Entry Treatments:** Handcut Pile and Burn 666 acres; Lop and Scatter 118 acres; Masticate 671 acres; Underburn 468 acres; Oak Release (Prune) 213 acres.
Alternative C: (Non-commercial funding alternative)	Alternative C is designed to further the completion of the HFQLG Pilot Project's larger DFPZ network, and to fill in gaps linking shaded fuelbreak networks on private land in the wildland urban-interface (WUI). Alternative C would establish a DFPZ network on Forest Service (FS) administered lands over a maximum of 1,363 acres, consistent with Butte Unit's Community Wildfire Protection Plan (CWPP) endorsing shaded fuel break treatments being implemented on private land. For this reason, small live trees less than 9" dbh in the unburned areas and small dead trees less than 11" at dbh in the burned areas would be felled and surface fuels treated on location. While Alternative C would create DFPZs, it does not propose to maintain them; the necessity and scope of follow up treatments would be developed and assessed in a separate environmental analysis. Alternative C would alter multiple aspects of fuels conditions simultaneously in a single entry phase (1-4 years to allow operations to be implemented during optimal environmental conditions). This Alternative would contribute potentially 15 forestry-related jobs in Butte County, California. **Proposed DFPZ Treatments:** Handcut Pile and Burn 586 acres; Lop and Scatter 102 acres; Masticate 626 acres; Underburn127 acres; Roadside Chip 142 acres; Roadside Prune 142 acres.

Summary of Environmental Consequences

Summarized below are the environmental consequences associated with Significant Issues analyzed for the three alternatives considered in detail: Alternative A - No Action, Alternative B - Proposed Action, and Alternative C - Non-commerial funding alternative to the Proposed Action.

1. **Cumulative effects to municipal and other watershed resources:**

Table S-3 includes the summary of watershed conditions by percent of Threshold of Concern (TOC) by alternative, including for proposed maintenance treatments considered under Alternative B. The predicted increase in percent of TOC from existing condition to conditions under treatment in Alternative A in Subwatersheds 1 and 2 is a result of reasonably foreseeable future actions on private timber land, within the Concow Planning Area.

There would be a slight increase in TOC under Alternative B due to Forest Service proposed activities (max 11% of the total ERA score in Subwatershed 2). Predicted TOC under Alternative C would be slightly lower than under Alternative B due to a reduction in Forest Service timber harvesting activities.

Table S-3 Summary of Cumulative Effects to Water Resources across Alternatives within the Planning Area.

Subwatershed Number	Existing Condition: Percent of TOC		Alternative A, No Action: Percent of TOC		Alternative B, Proposed Action: Percent of TOC		Alternative C: Percent of TOC	
	Near-Stream	Total	Near-Stream	Total	Near-Stream	Total	Near-Stream	Total
1	118%	76%	160%	103%	166%	107%	164%	105%
2	91%	82%	93%	83%	98%	98%	97%	92%
3	21%	24%	21%	24%	20%	26%	20%	25%
4	55%	54%	55%	54%	55%	60%	55%	60%
5	200%	87%	200%	87%	140%	94%	140%	94%
6	358%	167%	358%	167%	269%	167%	269%	167%
7	292%	143%	292%	143%	237%	147%	233%	145%
8	234%	169%	234%	169%	228%	169%	228%	169%
9	310%	144%	310%	144%	259%	151%	257%	149%
10	181%	78%	181%	78%	148%	78%	148%	78%
11	295%	112%	295%	112%	233%	122%	226%	117%
12	378%	164%	378%	164%	322%	173%	320%	167%
13	332%	162%	332%	162%	308%	180%	308%	172%
14	240%	97%	240%	97%	167%	101%	167%	100%
15	172%	80%	172%	80%	149%	80%	149%	80%

Wildlife – Aquatic Species

Table S-4 Summary of Potential Effects of Proposed Action Implementation on Threatened, Endangered, Proposed, and Sensitive Animal Species.

SPECIES	ALTERNATIVES		
	A	B	C
FISH			
Hardhead minnow (*Mylopharodon conocephalus*)	WNA	WNA	WNA
AMPHIBIANS			
California red-legged frog (*Rana aurora draytonii*)	WNA	WNA	WNA
Foothill yellow-legged frog (*Rana boylii*)	WNA	MAI	WNA
REPTILES			
Western pond turtle (*Clemmys marmorata marmorata*)	WNA	MAI	MAI

WNA = Will Not Affect, MAI = May Affect Individuals, but is not likely to result in a trend toward Federal listing or loss of viability

2. Cumulative effects to terrestrial wildlife:

Wildlife – Terrestrial Species

Table S-5 Summary of Effects of Proposed Action Implementation on Threatened, Endangered, Proposed, and Sensitive Animal Species that potentially occur within the Concow Project Analysis Area.

SPECIES	**ALTERNATIVES**		
	A	**B**	**C**
BIRDS			
Bald Eagle (*Haliaeetus leucocephalus)*	WNA	WNA	WNA
Northern goshawk (*Accipiter gentilis*)	WNA	WNA	WNA
California spotted owl (*Strix occidentalis occidentalis*)	WNA	WNA	WNA
MAMMALS			
Pallid bat (*Antrozous pallidus*)	WNA	MAI	WNA
Western red bat (*Lasiurus blossevillii*)	WNA	MAI	WNA

WNA = Will Not Affect, MAI = May Affect Individuals, but in not likely to result in a trend toward Federal listing or loss of viability

3. Social debate over forest management of public land –economic recovery:

The No-action Alternative would forego the opportunity to generate forest by-products and forestry related job opportunities. The preferred Proposed Action (Alternative B) would provide an estimated 2.0 mmbf as timber (sawlog) volume, approximately 3,750 tons of biomass (green) and up to 30 forestry related jobs, twice as many as under Alternative C. As the non-commercial funding alternative, Alternative C's forest by-products would not be made available for commercial sale, but rather limited to personal firewood cutting alongside public roads.

Decision Framework

The District Ranger for the Feather River Ranger District of the Plumas National Forest will be the deciding official for land administered by the USDA Forest Service (FS). "District Rangers are responsible for reviewing and approving ecological restoration projects to ensure they are consistent with national, regional, and forest policies," (FSM 2000, chapter 2020). As responsible official for the lead agency, the Feather River District Ranger has led the EIS analysis, and guided the interdisciplinary team and public involvement process.

The District Manager of the Northern California District will be the deciding official for land administered by the USDI Bureau of Land Management (BLM). The Northern California District Manager, as responsible official for the cooperating agency, has participated in the EIS analysis and public involvement and provided resource data and expertise.

This FEIS is not a decision document. Its main purpose is to publicly disclose the environmental analysis conducted, as well as the Proposed Action and the alternatives' potential consequences on the human environment. This FEIS analysis provides a disclosure of the relationship between wildfire, fuels, and vegetative conditions in the Concow Project Area, providing an important context for subsequent federal decision-making. Accordingly, the FEIS focuses on providing analysis sufficient to facilitate the following federal decisions:

- Should hazardous fuels reduction and Defensible Fuel Profile Zone (DFPZ) construction be authorized at this time?
- If it is decided action is warranted now, to what extent and under what conditions should the Forest Service and BLM authorize activities?
- What mitigation and monitoring measures should be required, if an action alternative is selected?

Timing

The Concow Hazardous Fuels Reduction Project, as presented in detail in Chapter 2 of the FEIS, is scheduled for implementation beginning in 2011.

Reader's Guide

The Forest Service as lead agency[3] prepared this Final Environmental Impact Statement (FEIS) in accordance with the National Environmental Policy Act (NEPA)[4], first enacted by Congress in December, 1969, and with other applicable Federal and State laws and regulations. NEPA was the first major environmental law in the United States, establishing national environmental policies. To implement these policies, NEPA requires agencies to assess environmental effects of their Proposed Actions prior to making decisions. The environmental review process encourages collaboration to better inform both citizens and decision makers (USDA 2007). The purpose of this Final Environmental Impact Statement is to disclose the potential direct, indirect, and cumulative environmental effects[5] of the Proposed Action and alternatives. As described below, this FEIS is organized into five chapters to aid the reader's understanding of the analysis process and results.

Chapter 1. Purpose and Need for Action: This chapter briefly describes the Proposed Action, the need for that action, and other purposes to be achieved by the proposal. This section also details how the Forest Service informed the public of the Proposed Action and how the public responded.

Chapter 2. Alternatives, including the Proposed Action. This chapter provides a detailed description of the agency's Proposed Action, as well as alternatives considered in detail, developed in response to comments raised by the public during scoping and other collaborative forums. The end of the chapter presents a summary table comparing environmental effects of the Proposed Action and alternatives.

Chapter 3. Affected Environment: This chapter describes the current environmental and social conditions within the area of influence potentially affected by the alternatives considered in detail.

Chapter 4. Environmental Consequences: This chapter describes the environmental effects of the Proposed Action and alternatives.

Chapter 5. Consultation and Coordination: This chapter provides a list of preparers and agencies consulted during the development of the Environmental Impact Statement.

Glossary: The glossary provides definitions of key or technical terms referred to in this FEIS.

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

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[3] **Lead Agency**—the organization supervising the preparation of the FEIS; lead agency prepares environmental analysis and incorporates cooperating agencies' analysis, with jurisdiction by law and special expertise, to the maximum extent possible consistent with its responsibilities. A Memorandum of Understanding (a formal agreement defining the roles of and mutual benefit to lead and cooperating agencies) signed in 2010 established the Forest Service as lead agency and the Bureau of Land Management as cooperating agency.
[4] **NEPA**—the policy of the Federal Government 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.
[5] **Environmental Effects—Direct effects** are environmental consequences caused by the activities or events themselves, occurring concurrently and in the same location. **Indirect effects** include environmental consequences, occurring later in time or at greater distance from the point of contact, but still reasonably foreseeable. **Cumulative effects** address incremental environmental consequences resultant of multiple, past, present, and reasonably foreseeable future actions, regardless of land ownership, or which agency, or person initiated the action (40 Code of Federal Regulations [CFR}1508.7).

Guide to Frequently Used Acronyms

HFQLG—Herger Feinstein Quincy Library Group (Pilot Project): a project designed to 1) implement and demonstrate the effectiveness of fuels and vegetation management activities proposed by the Quincy Library Group to promote local economic stability; 2) create healthy, fire-resilient forests that maintain ecological integrity, and; 3) construct a strategic network of fuelbreaks (Defensible Fuel Profile Zones or DFPZs) that provides for safe and effective fire suppression.

DFPZ—Defensible Fuel Profile Zone: an area where fuel has been treated to reduce surface fuel loads, increase the canopy base height, or decrease canopy bulk density. A *Defensible Fuel Profile Zone* (DFPZ) is another phrase for a fuelbreak but is applicable usually to forest fuelbreaks (as contrasted with fuelbreaks in shrublands). The term originates from the Quincy Library Group's proposal for fragmenting fuels on the Lassen and Plumas national forests and north portion of the Tahoe National Forest in California.

SNFPA ROD—Sierra Nevada Forest Plan Amendment Record of Decision: a decision that adopts an integrated strategy for vegetation management that is aggressive enough to reduce the risk of wildfire to communities in the wildland urban-interface, while modifying fire behavior over the broader landscape. It combines overall strategy addressing the fire situation in the Sierra with key components of the conservation strategy for old forest dependent species. The integrated strategy includes methods of thinning trees and removing brush, thereby reducing the amount of burnable material. These reduction methods are known as "fuels treatments."

HFRA—*Healthy Forest Restoration Act*: an Act to improve the capacity of the Secretary of Agriculture and the Secretary of the Interior to conduct hazardous fuels reduction projects on National Forest System lands and Bureau of Land Management lands. These projects are to be aimed at protecting communities, watersheds, and certain other at-risk lands from catastrophic wildfire and other threats to forest and rangeland health.

When the HFQLG Act was extended to 2012, the decision to extend it also stipulated that it be linked to HFRA sections 104-106, related to Environmental Analysis, Special Administrative Review Process, and Judicial Review in United States District Courts.

WUI—Wildland Urban-Interface: the area, or zone, where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. It generally extends 1.5 miles from the edge of developed private land into the wildland.

ESA—Endangered Species Act: 1973 Legislation providing a program to conserve, to the extent practicable, the various species of fish or wildlife and plants facing extinction.

DBH—Diameter at Breast Height: diameter of a tree stem at a height 4.5 ft above ground level. Diameter at breast height (DBH), unless otherwise noted, is measured outside the bark (DBHOB). On sloping terrain, DBH is measured 4.5 feet above the highest ground around the tree. DBH can be measured by ocular estimate or using tools such as a Biltmore stick, calipers, or diameter tape (d-tape). DBH of very large trees is estimated by dividing the circumference (outside bark) by pi (3.14159).

CWHR—California Wildlife Habitat Relationship: a wildlife habitat classification and information system, and predictive model for occurrence of California's regularly occurring birds, mammals, reptiles, and amphibians.

ERA—Equivalent Roaded Acres: a measure of soil disturbance (such as compaction, erosion, and removal) derived by applying a site disturbance coefficient to an area of proposed activities. Development of the coefficient is done by comparing the effect on soil of land use activity to the effect on soil of a forest road, in terms of altering a watershed's surface runoff patterns and timing. For example, one acre of tractor clear-cut may count as 0.30 to 0.35 equivalent roaded acres because the effect of the equipment used causes 0.30 to 0.35 times the effect of a road. One acre of land occupied by road typically counts as 1.0 equivalent roaded acre.

EIS—Environmental Impact Statement: a federal government document describing the beneficial, neutral, and adverse environmental effects of federal government actions significantly affecting the quality of the human environment.

CWPP—Community Wildfire Protection Plan: a locally maintained strategy designed by a community to reduce the risk of wildfire. The plan identifies strategic sites and methods for fuel reduction projects across the landscape and jurisdictional boundaries.

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Chapter 1. Purpose and Need for Action

1.1 Background

In June, 2008, in numerous locations around the towns of Paradise, Magalia, Concow and Yankee Hill in Butte County, California, lightning struck repeatedly, igniting distinct forest fires. Due to local topography, weather and forest fuels conditions, these separate fires expanded until they joined, scorching forestlands and consuming homes in the central and eastern portions of the Concow Planning Area (see map 1-1). The photographs below of Concow Reservoir were taken shortly before and just after the fires were controlled, recording the drastic, visually-evident changes to forest conditions.

Figure 1-1 Concow Reservoir before the fires

Figure 1-2 Concow Reservoir after the fires

In fighting to control what is now referred to as the Butte Lightning Complex, over three thousand fire suppression personnel encountered three extremely dangerous conditions: 1) unusually tall flames (excessive flame lengths); 2) rapid rates of spread (active tree crown fires), and; 3) long range spread of flames (spotting) caused by torching and wind-carried embers igniting new fires. Circumstances that encourage these three dangerous conditions include the presence of hazardous forest fuels – such as excessive dead scorched wood and dry brush – and extremely hot, dry, windy weather, characteristic of summer in this region's steep topography.

Fuels are vegetative matter, considered in terms of their combustibility. In this FEIS the terms "fuels" and "vegetation" are often used interchangeably.

Suppressing the 2008 Butte Lightning Complex cost taxpayers roughly $95 million. Many residents were evacuated during the fire, some left devastated by the loss of their homes and much of what they owned. One civilian fatality and 69 injuries can be attributed to the fires. These financial, property and personal losses are all associated with such large, quick-moving, dangerous fires.

According to California Fire Alliance, historical records indicate that from 1920 to 2000, multiple fires greater than 50 acres in extent were recorded within the Concow Planning Area. Although low to moderate intensity fire is a naturally occurring, frequent disturbance in this region, such large high intensity fire has affected more local areas in recent years than before. Local fire history indicates that this trend is likely to continue, making it likely that the Concow Planning Area, if left untreated, would burn soon, and at high intensity.

"Making fire suppression tactics more effective will not solve the wildfire crisis alone, without also addressing the root cause—overcrowded forests and aging shrubfields" (Aplet and Wilmer 2003; USDA Forest Service 2000, 2004). Post fire, it is expected the burned areas will have a flush of brush growth and that a vast number of dead standing trees will fall over time, further increasing fuel loading while the remaining dead trees will pose a threat to public and firefighter safety for many years to come.

1.1.1 Quincy Library Group

In 1993, the Quincy Library Group (QLG), a grassroots citizen group interested in collaborative management of public lands, developed the "Community Stability Proposal," eventually lobbying for passage of the 1998 *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act). The HFQLG Pilot Project Area covers a large landscape, including the Lassen and Plumas National Forests, and the Sierraville District of the Tahoe National Forest. Since the Concow Project Area is administered by the Plumas National Forest and overlaps the HFQLG Pilot Project Area, legislative policies linked to the HFQLG Act serve as the basis for the Purpose and Need for the Proposed Action.

Defensible Fuel Profile Zone (DFPZ) – strategically located strips of land where vegetation has been managed to reduce hazardous fuels.

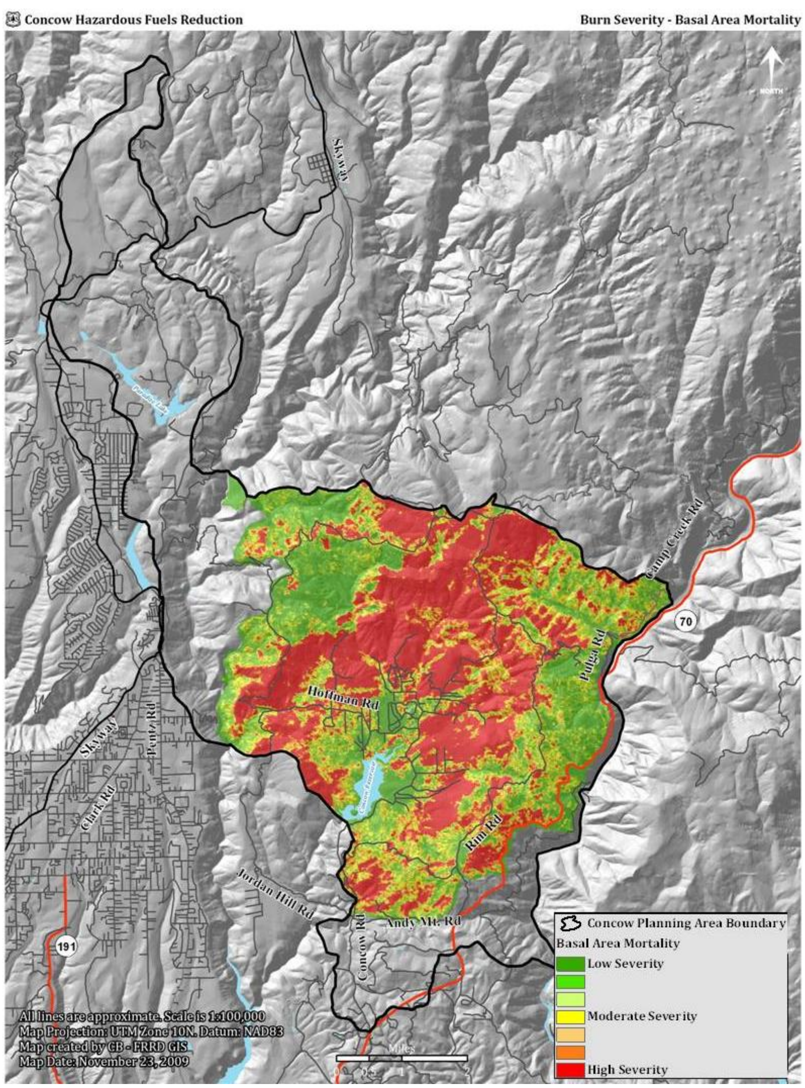
With this comprehensive solution strategy for the wildfire crisis in mind, the Concow Hazardous Fuels Reduction Project is a cooperative effort between the U.S. Department of Agriculture, Forest Service (FS) and the U.S. Department of Interior, Bureau of Land Management (BLM), in collaboration with local Fire Safe Councils, residents and other interested parties.

One of the major aspects of the HFQLG Act is the establishment of a landscape scale Defensible Fuel Profile Zone (DFPZ) network, a series of corridors and clearings up to ½ mile in width, in which vegetation has been reduced methodically to allow firefighters and workers access to the surrounding forest. As the Concow Hazardous Fuels Reduction Project lies within this larger HFQLG Pilot Project Area, the Proposed Action would add to the HFQLG Pilot's partially completed landscape DFPZ network.

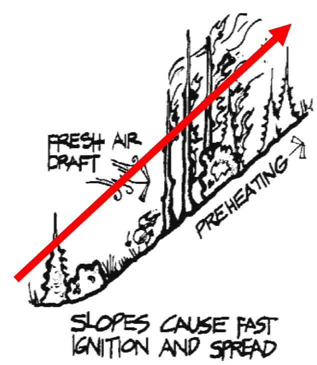
1.1.2 National Wildfire Planning

Beginning in the 1990s, nationally televised news reports about the destructive effects of high intensity wildfire, particularly in the western United States, increased the public's awareness that millions of Federal forests and rangelands were considered at high risk of large-scale fire. Such an event would not only threaten citizens' wellbeing, but would also alter the forest landscape and species composition. "While the increased risk of catastrophic wildland fire is often blamed on long-term drought or expansion of the wildland urban-interface (WUI) in the Western United States, the underlying cause is the buildup of forest fuel and changes in vegetation composition over the last century" (USDA and USDI 2004). Excessive amounts of fuels increase the risk of large-scale wildland fire; the effects of such a fire on ecosystem properties are typically defined by the degree of loss of vegetation. Greater fire intensity typically correlates with greater vegetative mortality, and thus greater fire severity, a measure of how much a site has been disrupted by fire. Map 1-1 depicts the Butte Lightning Complex's fire severities.

Wildland urban-interface (WUI) - Refers to the 1.5 mile area surrounding a community at-risk to wildfire, where structures and other human development meet or intermingle with wildland or forest vegetative fuels.



Map 1-1 Concow Planning Area: Fire Severities



Of the total acreage burned within the Concow Planning Area, approximately 42 percent was high severity burn. Within these high severity areas, greater than 75 percent of the trees were killed; most trees lost all foliage, and bark char was extensive. Downed fuels and ground cover were largely consumed by the fire.

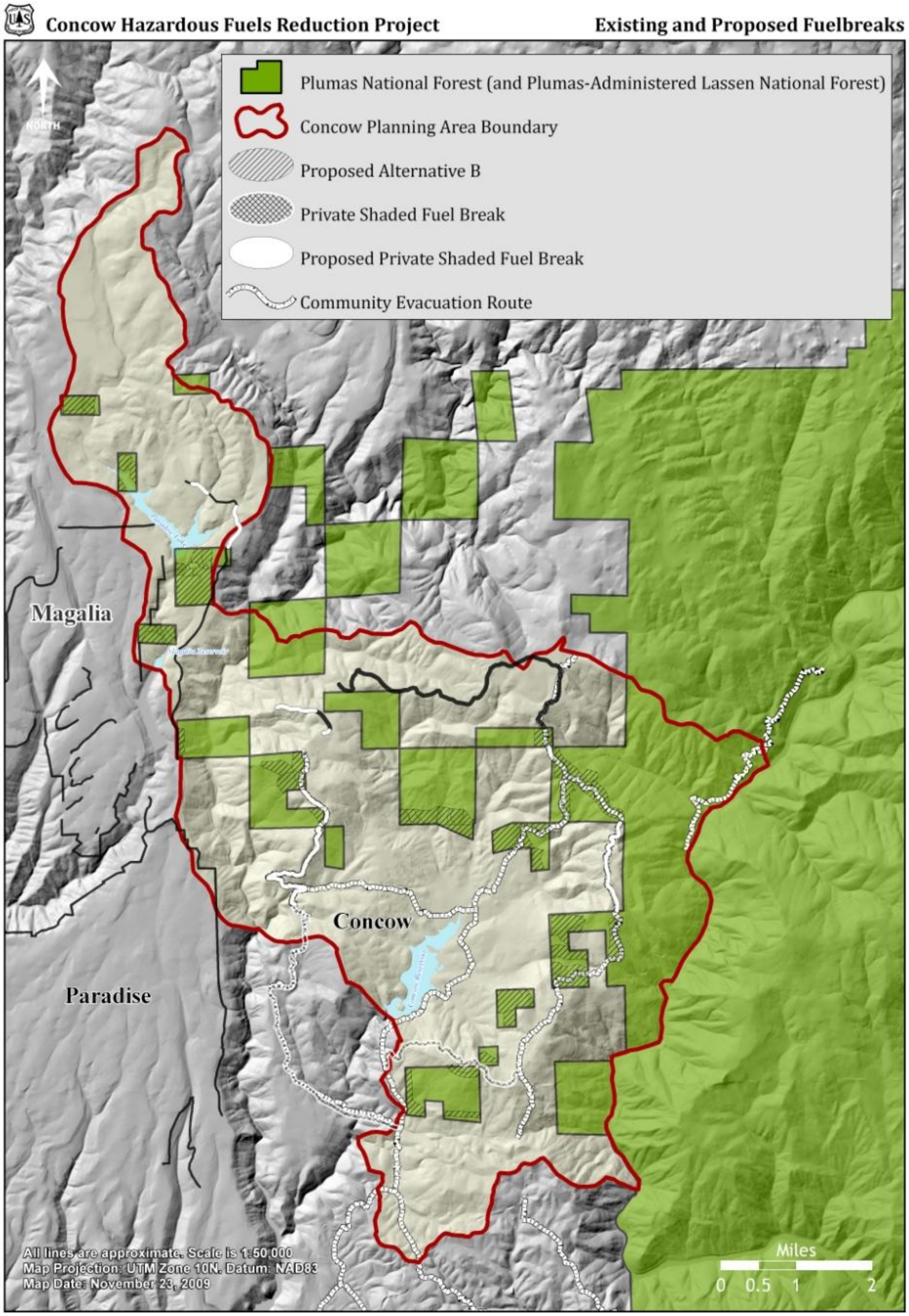
Since the 1990s, there have been many policy changes to expedite national and regional administrative procedures governing the preparation of fuels reduction projects on public land. For instance, the Secretaries of Agriculture and the Interior, along with the Western Governors and other interested parties responded by developing “A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Strategy Implementation Plan” to expedite hazardous fuels reduction projects (USDA and USDI 2001).

The most recent national direction central to the Concow Hazardous Fuels Reduction Final Environmental Impact Statement (FEIS) is the 2003 *Healthy Forest Restoration Act* (HFRA). The HFRA emphasizes public collaboration processes for developing and implementing hazardous fuels reduction projects on public land. HFRA also provides other authorities and direction to help restore healthy forests. Several key laws and regulations, including HFRA, are discussed in further detail later in chapter 1.

1.1.3 Community Wildfire Planning

The Concow Hazardous Fuels Reduction Project is designed to compliment other important, on-going community wildfire planning. An example of community wildfire planning used to mitigate future destruction and associated costs is the development of Community Wildfire Protection Plans (CWPP). A CWPP enables a community to plan how it will reduce the risk of wildfire to mitigate future destruction and associated costs through focused, pre-fire management treatments at the landscape level in the wildland urban-interface (WUI). The plan identifies strategic sites and methods for fuels reduction projects across the landscape and jurisdictional boundaries. Benefits of having a CWPP include National Fire Plan funding priority for projects identified in the CWPP. The United States Forest Service and the Bureau of Land Management can expedite the implementation of such fuels treatments through alternative environmental compliance options offered under the Healthy Forest Restoration Act (HFRA). The Concow Project is one example of a fuels treatment project formed in collaboration with CWPP.

Since their formation, local Fire Safe Councils such as those of Butte, Yankee Hill and Upper Ridge have united their diverse memberships to speak with one voice about fire prevention. The Councils have distributed fire prevention education materials to industry leaders and their constituents, evaluated legislation pertaining to fire safety, and empowered grassroots organizations to spearhead fire reduction and safety programs.



Map 1-2 Concow Planning Area: Existing and Proposed Fuelbreak Networks

Map 1-2 illustrates the cooperative defensible space efforts, specifically shaded fuelbreak networks, made and planned by local Fire Safe Councils, residents, timber industrial companies and watershed conservation groups within the Concow Planning Area. Federally proposed hazardous fuels reduction and vegetative forest health treatments described in this FEIS are consistent with the Butte County's Community Wildfire Protection Plan (CWPP).

1.2 Purpose and Need

Agencies draft a "Purpose and Need" statement to describe what they aim to achieve with the action they are proposing.

The Purpose and Need explains why an agency action is necessary and is the basis for identifying reasonable alternatives. The information summarized in this chapter is described in detail in the FEIS chapter 3: Affected Environment, chapter 4: Environmental Consequences, the FEIS appendices and associated resource assessments. The four elements of the Purpose and Need for this proposed federal action are:

1. FIRE AND FUELS IN THE WUI. There is a need for thinning of overcrowded unburned forests, selectively removing burned dead trees to establish DFPZ conditions within the wildland urban-interface (WUI). In meeting this need, the Proposed Action would also achieve the following purpose of reducing risks to rural communities from wildfires.

DESIRED CONDITION – The openness of crown fuels correlates with open conditions around large trees, allowing only slow-moving, low intensity fires. The absence of most small diameter trees and the small amount of surface fuels would produce a very low probability of sustained crown fire.

> ***Measurement indicators (Unburned area only)**:* (1) Flame length in feet (under existing [pre treatment] conditions and immediately post treatment), and; (2) Rate of spread in chain(s) per hour (existing and immediately post treatment).
>
> ***Measurement indicators (Burned area only)**:* (1) Flame length in feet (existing [pre treatment] and post treatment projected into the future).

2. FIRE SUPPRESSION IN THE WUI. There is a need for safer and more effective locations for firefighters to initiate fire suppression. In meeting this need, the Proposed Action would also achieve the following purpose of establishing and maintaining Defensible Fuel Profile Zones (DFPZs) to control and contain wildfire.

DESIRED CONDITION – Even under high fire weather conditions, surface and ladder fuels within DFPZs are such that crown fire ignition is highly unlikely.

> ***Measurement indicators (Unburned area only)**:* (1) Fuel loading measured by tons per acre (existing [pre treatment] and post treatment projected into the future), and; (2) Canopy base height in feet (existing [pre treatment] and immediately post treatment).
>
> ***Measurement indicators (Burned area only)**:* (1) Fuel loading measured by tons per acre (existing [pre treatment] and post treatment projected into the future), and: (2) Average snags per acre (pre treatment and post treatment projected into the future).

3. ECOSYSTEM MANAGEMENT. There is a need for reestablishment and sustainment of healthy forests, habitats, watershed and aquatic resources on public land within the Concow Planning Area. In meeting this need, the Proposed Action would also achieve the following purpose of restoring recently fire-damaged forests to promote forest health and habitat diversity.

DESIRED CONDITION – Tree densities have been reduced to a level consistent with the site's ability to sustain healthy forests and habitats during drought conditions.

> ***Measurement indicators (Unburned area only)****:* (1) Change in tree species composition (shifts from shade tolerant to shade intolerant tree species; black oak trees per acre by size classes [existing and post treatment]), and; (2) Percent changes in acres of California Wildlife Habitat Relationship (CWHR) size classes and stand density characteristics measured by canopy closure, basal area in square feet per acre; and trees per acre (pre and post treatments).

> ***Measurement indicators (Burned area only)****:* (1) Tree species composition (shifts in shade intolerant and shaded tolerant tree species, and; (2) Snag fall and average number of snags per acre.

4. SOCIOECONOMICS. There is a need for encouragement of local labor involvement, while offering forest by-products resulting from ecologically appropriate vegetative fuels reduction treatments. In meeting this need, the Proposed Action would also achieve the following purpose of contributing to the stability and economic health of local communities.

DESIRED CONDITION – A community incorporating forestry-related jobs into its economy to a degree appropriate for the number of jobs available at any given time, based on fluctuations in federal timber supplies.

> ***Measurement indicators (Unburned and Burned Areas):*** (1) Forestry related employment opportunities measured by total number of potential full-time jobs created; and (2) Biomass commercial volume (tons).

> ***Measurement indicators (Unburned area only)****:* (1) Live tree commercial sawlog volume (per million board feet [mmbf]).

1.2.1 Fire and Fuels in the Wildland Urban-Interface

There is a *need* for thinning of overcrowded, unburned forests, selectively selectively removing burned dead trees to establish DFPZ conditions within the wildland urban-interface (WUI).

Outside the Butte Lightning Complex perimeter, the lack of periodic fire disturbance has created ideal environmental conditions to support unnaturally high tree densities, with various conifer and hardwood species predominant. Today, saplings and pole size trees have grown in amongst dense manzanita, ceanothus, and other shrub species. Forests once stocked with more fire-resistant species are now overcrowded with increasingly fire-vulnerable trees, shrubs and other understory vegetation: a vertical and horizontal continuum of fuels capable of supporting large-scale fire.

Within the Butte Lightning Complex perimeter, fire left a landscape of dead and dying trees within the WUI, where fire suppression resources are expected to protect life and property. In these areas affected by high severity fire in 2008, although ground fuels were mostly consumed, standing charred dead trees and brush the remaining landscape. Over time this burnt vegetation will deposit large amounts of hazardous fuels onto the ground, as the number of dead trees falling leads to a buildup of fuels. More specifically, the *need* is to:

- In both unburned and burned areas, promote flame lengths less than 4 feet to encourage only slow moving surface fire, by decreasing horizontally distributed surface fuels and further interrupting both horizontal and vertical continuity of fuels from the surface to the forest canopy.

- In the burned area, reduce hazardous fuels by either removing or recycling surface (horizontally distributed) and ladder (vertically distributed) fuels on-site to accelerate wood decomposition.

In meeting this need, the Proposed Action would also achieve the following *purpose* of reducing risk to rural communities from wildfires

History shows a dozen large fires between 1917 and 2009 within the Concow Planning Area. The outcome of the most recent large-scale Butte Lightning Complex on immediate surroundings suggests wildfire will continue to influence both forest conditions and the safety of those residing within the Concow Planning Area. The density of houses and other private structures in formerly "wildland" landscapes of the West is increasing rapidly (USDI Safford H.D. et al. 2009; Fields and Jensen 2005). In California's established WUIs, residential development grew almost 9 percent from 1990 to 2000. In contrast, the number of houses in the new expanding boundaries of the WUI grew by almost 700 percent over the same period (Hammer et al. 2007).

Residential development in the wildland urban-interface (WUI), illustrated by figure 1-3, is “Leading both to increasing fire ignitions and to increasing losses of property and life” (Radeloff et al. 2005). These alarming changes in development and human settlement patterns have led community groups such as the Quincy Library Group (QLG), the Forest Service (FS), the Bureau of Land Management (BLM), Cal Fire, and local Fire Safe Councils, along with a multitude of collaborators, to embark on a large-scale effort to reduce hazardous fuels buildup adjacent to communities. For this reason, the Concow Hazardous Fuels Reduction Project is designed to compliment local efforts aimed at decreasing future wildfire intensities around rural communities, as well as establishing defensible space.

As illustrated in figure 1-3, the Forest Service administers the dark (green) shaded parcels in the central and upper right corner, bordering dense checkerboard pattern residential development in the WUI, north of Magalia. Although independently federally proposed treatment would be limited to scattered public land parcels, the Proposed Action, combined with other adjacent private land projects, would contribute incrementally to achieving the broader landscape fuelbreak goals.

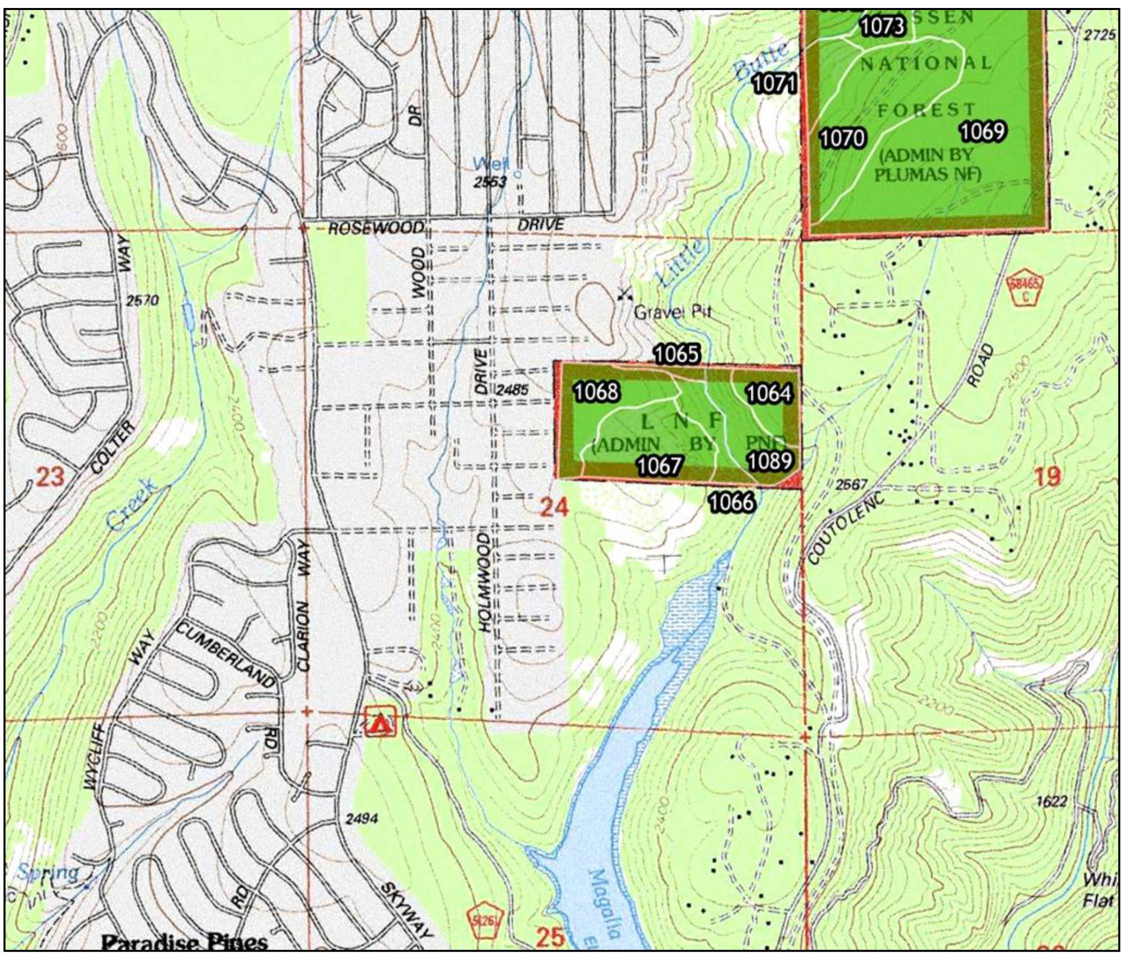


Figure 1-3 Residential Development Patterns in the WUI

1.2.2 Fire Suppression in the Wildland Urban-Interface

There is a *need* for safer and more effective locations for firefighters to initiate fire suppression.

Citizens rely on effective wildfire suppression to save them and their assets during a fire. Since the 1940s, wildfire suppression activities in the wildland urban-interface (WUI), intended to protect urban growth, prevented these isolated forested areas on public land from undergoing the regenerative processes that follow fire, including the removal of surface fuel concentrations (i.e. brush, trees, down logs and debris). This has led to concentrations of surface and ladder fuels that increase potential flame lengths and the potential for torching of a single tree or a small group of trees, from the bottom up. As demonstrated during the Butte Lightning Complex, overcrowded forest conditions contribute to rapid fire spread and high intensity fire behavior.

The desired flame length for public land in the Concow Planning Area is less than 4 feet at the head of a fire.

Vegetative conditions such as those depicted in figure 1-4 influence fire behavior through continuous fuel loading, and therefore affect an area's fire vulnerability. Currently overcrowded forests located on public lands, near the town of Paradise, exhibit horizontal continuity of surface fuels and vertical continuity of ladder fuels, ideal to promote the rapid spread of high intensity fire and flame lengths over 4 feet.

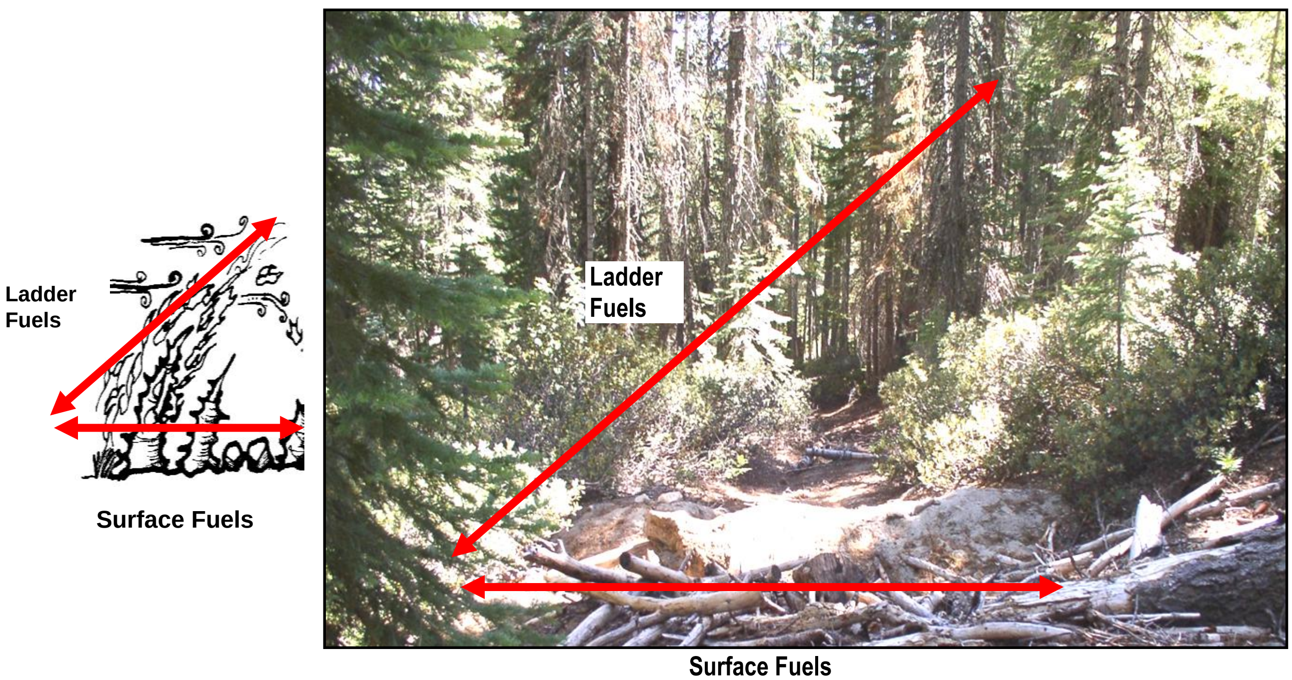


Figure 1-4 Horizontal and Vertical Fuels Continuity

In contrast, the burned area in the Planning Area no longer has high concentrations of surface fuels, since the Butte Complex consumed them. Flame lengths over the next 10 years are predicted to be less than 4 feet. After the 2008 fires, however, thousands of standing, charred dead trees remain; this is depicted in figure 1-5 below. Over time, dead trees decay and become brittle, succumbing to wind throw, breakage and root decay. Falling debris can harm or kill firefighters. The focus of treatments here is to provide fire suppression crews safe access and defensible space, for effective suppression.

Recent field surveys indicate between 60 and 1,000 snags per acre still stand in the burned area, with an average 400 snags per acre. Although it is recognized that standing, dead trees provide unique wildlife snag habitat after a fire, the number of smaller dead trees in proximity to residents, and within the proposed DFPZs, is of concern to fire managers.

Figure 1-5 Standing Fire-killed Trees

The buildup of falling debris and surface fuels within the next decade will also slow the creation of fire lines and dozer lines, while potentially increasing fire intensity and elevating risks to firefighters. For these reasons, strategically selected danger trees need to be hand felled or mechanically cut.

More specifically, the *need* is to:

- In both unburned and burned areas, remove both standing live and dead danger trees within DFPZs, and along fire suppression and public ingress and egress routes;
- In the unburned area, decrease horizontal fuels, both at surface and crown levels, and vertical ladder fuels, while increasing crown spacing, thereby reducing the potential rate of fire spread and torching, and aiding aerial suppression by allowing retardant and water to penetrate the tree canopy to reach the forest floor, and;
- In the burned area, reduce dead fuel concentrations and break up the horizontal continuity of surface and ladder fuels due to post fire regrowth, thereby reducing fire's rate of spread.

In meeting this need, the Proposed Action would also achieve the following *purpose* of establishing and maintaining DFPZs to improve fire suppression capacity to control and contain wildfire.

The Concow Hazardous Fuels Reduction Project is designed to implement the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG) Pilot DFPZ network in the WUI to aid in fire suppression (SNFPA 2004; HFQLG 1999). The desired condition for DFPZ construction for unburned, mixed conifer and ponderosa pine west side types would be achieved as follows:

- Reduce canopy cover to approximately 40 percent;
- Decrease surface fuel loads (small diameter material less than 3 inches) to 5 tons per acre or less;
- Maintain, where available, 10-15 tons per acre of the largest logs ≥20 inches DBH, 10 feet or greater in length (approximately 8-12 logs);
- Leave 4 of the largest snags, preferably greater than 15 inches DBH within proposed DFPZs, except in strategic locations adjacent to private land and alongside roads;
- Achieve conditions producing flame lengths less than 4 feet at the head of a fire burning under high fire danger weather conditions, and;
- Increase canopy base heights by removing ladder fuels.

The desired condition for DFPZ construction for burned mixed conifer and ponderosa pine west side types would be achieved as follows:

- Decrease small diameter material, less than 3 inches, to 5 tons per acre or less;
- Maintain, where available, 10-15 tons per acre of the largest logs ≥20 inches DBH, 10 feet or greater in length (approximately 8-12 logs);
- Leave 4 of the largest snags greater than 15 inches DBH, where available in treatment areas, and all snags within Snag Retention Areas (including Riparian Habitat Conservation Areas [RHCAs]);
- Accelerate the dispersal of coarse woody debris, and;
- Increase canopy base height to protect remnant old forest structure from high intensity re-burns or other severe disturbance events in the future.

1.2.3 Ecosystem Management

There is a *need* for reestablishment and sustainment of healthy forests, habitats, watersheds and aquatic resources on public land within the Concow Planning Area.

Since the early 1900s, forests, habitats, watershed and aquatic resources have been altered by land development such as gold mining, cattle and sheep grazing, timber harvesting, urbanization along with introduction of invasive plants, and road building. Following the National Forest proclamation in the early 1900s, periods of hydrologic and habitat recovery ensued. In the 1970s, modernization of the Forest Practices Act reflected the public's growing interest in fish and wildlife conservation, water quality protection, and the general sustainability of the state's forest industry.

Despite these shifts in land management policies, recurring human caused land disturbances, along with other natural disturbances such as wildfire, soil erosion and sedimentation in streams, have, over time, culminated in an unhealthy ecosystem. Excessive channeling of water moves fine soil particles and woody debris, ultimately impacting water quality and habitat downstream.

Unburned Areas

For most of the Concow Project Area's recorded history, fires in the Lower-Montane ecological zone of the Project Area burned with low to moderate intensity, reducing fuel accumulations and vegetation density. Fire return intervals were shorter (5-15 years) on drier, southern aspects, and longer (5-25 years) on moist, northern aspects (Sugihara et al, 2006). Fire suppression practices initiated in the 1940s erroneously reduced the frequency of low severity fire disturbances, allowing many trees to survive in unnaturally close-growing conditions, resulting in high tree stem densities, proliferation of shade tolerant trees and understory plants, and closed forest canopy cover habitats.

Figure 1-6 Illustration of desired Defensible Fuel Profile Zone (DFPZ) condition

Forest Health and Resiliency are terms used to describe the capacity of forest trees and plants for recovering or adapting to disturbances. Vegetative treatments aim to increase Forest Health and Resiliency.

Each habitat type develops under a certain balance of sunlight, moisture, air temperature, soil temperature, and nutrients; a change in any one of these environmental factors can cause a chain reaction affecting wildlife species' survival. Although the Concow Planning Area once supported a high percentage of open forest and healthy riparian habitats, which historically housed a multitude of California's aquatic, aviary and mammalian wildlife species, there is now a need to restore formerly diverse, fire-adapted ecosystems.

"Healthy, resilient landscapes will have greater capacity to survive natural disturbances and large scale threats to sustainability, especially under changing and uncertain future environmental conditions, such as those driven by climate change and increasing human uses," (FSM 2020.2). Lacking periodic, low severity disturbances that would normally remove high conifer seedling populations and stimulate black oak regeneration and different age classes through sprouting, few oaks survive to reach larger tree sizes to contribute to wildlife mast (i.e., acorns used as food and unique habitat). More specifically in unburned areas, there is a *need* to:

- Implement radial release or thinning treatments around large black oak and pine trees, as a first step, to enhance tree health and promote habitat diversity;

- Break up continuity of fuels from surface to forest canopy to enhance tree vigor, thereby improving resiliency to wildfire, sustaining habitats and watershed resources, and;

- Introduce periodic prescribed fire to promote ecological diversity, and enhance special McNabb Cypress and serpentine fire-dependent ecosystems.

Burned Area

In the burned area, the Proposed Action responds to the need to actively manage post-fire vegetative regrowth to ensure establishment of healthy, structurally diverse, more fire resilient oak and mixed-conifer habitats, while accelerating wood decay and good distribution of woody soil cover. Prior to the 2008 fires, Douglas-fir, Sierran Mixed Conifer and Ponderosa Pine mixed-conifer vegetation types were close to equally represented within the Concow Planning Area. Before being burned, many of these conifer types were characterized by a closed canopy forest overstory of mostly conifer trees like Douglas-fir, ponderosa and sugar pines, with hardwoods such as black oak and tan oak growing in the understory. After the 2008 Butte Lightning Complex, many of these well established, mixed conifer forests were reduced to thousands of woody skeletons, as illustrated in figure 1-7. In some areas, these former mixed conifer dominated forests are now typified by newly sprouting hardwoods, shifting vegetation species composition toward a hardwood dominated condition.

Figure 1-7 Burned Area Condition in 2008

Presently, types of vegetation including tender basal oak sprouts are in the early stages of growth, providing important habitat and high-quality forage for many wildlife species. However, over time, these young sprouts will grow into numerous, woody intertwining stems. If left untreated, eventually vegetation becomes overgrown and highly flammable placing animal health, survival and habitats at excessive risk during a wildfire. Walls of dense shrubs can also block animal migratory travel corridors used by large animals, such as the long time resident Bucks Deer Herd. For these reasons, after such a severe event, lack of response or inaction can be as destructive as the fire itself.

Hence, federal land managers have decided human intervention is warranted to aid in the recovery of these formerly diverse mixed conifer and oak woodland habitats. More specifically in the burned area, there is a *need* to:

- Masticate (cut, shred and/or chip) post-fire new growth in existing Defensible Fuel Profile Zones (DFPZs) to promote opportunities for wildlife travel corridors, as well as high quality forage habitat for the Bucks Deer Herd and other native species;

- Maintain charred, decaying dead trees as cavity nesting snag habitat refuge away from adjacent private property, travel routes and homes, and DFPZs;

- Masticate (cut, shred and/or chip) standing dead fuels on-site to cover damaged soils and stabilize sparsely vegetated slopes in disturbed municipal watersheds, particularly alongside Riparian Habitat Conservation Areas (RHCAs);

- Masticate (cut, shred and/or chip) surface fuels and remove excess ladder fuels to reduce the likelihood of potential future, excessive degradation of recovering riparian and upland wildlife habitats from wildfire, and;

- Maintain former tree plantations damaged by wildfire, recently reforested with mixed conifer tree species (i.e., Douglas-fir, ponderosa and sugar pine), and spot plant alongside private residential properties and areas devoid of natural conifer tree seed sources.

In meeting this need, the Proposed Action would also achieve the following *purpose* of restoring recently fire-damaged forests to promote forest health and habitat diversity.

The destructive 2008 wildfire drastically altered ecosystems in the Concow Planning Area for the long term. New oak woodlands will take time to develop. Oak seedlings in particular are vulnerable to competition and require management to enhance individual stem, height and diameter growth. Strategically managing both this rapidly growing basal sprouting and snag habitat is key to achieving desired structural diversity and woodland wildlife habitats.

Additionally, in areas unaffected by the 2008 wildfires, the Concow Project affords an opportunity to proactively promote desired forest health and habitat diversity, concurrent with reducing the threat of wildfire in and around local communities and municipal watersheds, before the next forest wildfire incident.

1.2.4 Socioeconomics

There is a *need* for encouragement of local labor involvement, while offering forest by-products, resulting from ecologically appropriate vegetative fuels reduction treatments.

Historically, the area's economy has depended on timber, mining, ranching and a major trans-Sierra railroad. More recently, an influx of retired citizens has accompanied a transition to an economy that is increasingly based on recreation, retail sales and services. Job growth in the tourism sector throughout the Sierras has outpaced the growth in the forest products industry sector. Typical wages associated with tourism jobs tend to be lower than those in forestry, thus forestry jobs stimulate the local economy by providing superior wages to residents. (USDA Forest Service, Pacific Southwest Region; Status Report to Congress Fiscal Year 2007; HFQLG 2008)

Timber production from national forests peaked from the 1960s through the 1980s, and plummeted in the last several decades. Because the Forest Service dominates timberland ownership in the HFQLG Pilot area, and privately owned timber cannot fill the gap created by the decline of harvesting in the area, there has been a sharp decline in forestry-related economic activity and employment.

Although revenues from the sale of commercial forest by-products may be obtained from some of the Defensible Fuel Profile Zone (DFPZ) related fuels reduction and vegetation treatments, the likelihood of generating revenues is significantly constrained by several factors, including: 1) rapid post-fire wood decay; 2) declining market values; 3) limited mill utilization capacity, and: 4) increasing forest extraction operational costs. These constraining factors make it potentially unlikely that generated revenues would be ample to offset proposed treatment costs. The Concow Project addresses the need to optimize local forestry employment opportunities and make available commercial wood by-products when feasible. Therefore, the need is to:

- Stimulate local forestry employment through service contracting, stewardship contracting and small business timber and woodlot sales when establishing desired DFPZ conditions, and;

- Stimulate local forest-dependent markets by providing opportunities for lumber grade salvage timber harvest as well as small log and biomass woody material as a by-product of DFPZ hazardous fuels reduction and forest health vegetative treatments.

In meeting this need, the Proposed Action would also achieve the *purpose* of contributing to the economic health of local communities.

One of the more common means of treating hazardous fuels conditions and vegetation to prevent severe wildfire is through selective mechanized timber harvesting. While this practice was once common locally, controversy surrounding its potential environmental impacts on habitat has caused its decline, upsetting the socioeconomic balance of local community employment, in tandem with the health of the forest ecosystem. Due to fire suppression practices and decline of forestland density reduction treatments, overcrowded forest conditions have increased, California's wildfires have gotten larger, and firefighting costs have soared. "Expenditures to prevent, control, and suppress wildfire in the United States have been expanding rapidly" (Mutch 2002). The cost of Forest Service fire suppression rose from $160 million in 1977 to $760 million in 2005, when adjusted to 2003 dollars (Mercer et al. 2007).

In response to rising suppression costs, the Proposed Action is designed to pro-actively reduce overcrowded forest conditions and post-fire hazardous fuels concentrations that lead to severe wildfire and expensive suppression costs. When biomass by-products result from DFPZ land management treatments, every effort will be made to optimize commercial ventures using various stewardship and traditional contract methods, in support of local economies.

1.3 Proposed Action

The federal government develops a Proposed Action when an agency agrees to move forward with an existing proposal to authorize, recommend, or implement an action (CFR 1508.23).

The Concow Hazardous Fuels Reduction Project is a cooperative environmental planning effort between the USDA Forest Service and USDI Bureau of Land Management. The Proposed Action is designed to contribute towards completing the *Herger-Feinstein Quincy Library Group* (HFQLG) Pilot Project's larger Defensible Fuel Profile Zone (DFPZ) network, while complimenting local community fuels reduction and shaded fuelbreak efforts occurring in the wildland urban-interface (WUI). The Proposed Action would treat a maximum of 1,510 acres on lands administered by the Forest Service and Bureau of Land Management within the Concow Planning Area. Follow up DFPZ maintenance treatments would occur over 10 years, once DFPZs have been established.

The proposed DFPZs would establish defensible space on strips of land up to ½ mile in width, designed to link to natural fire barriers such as mountain ridges and rocky areas, as depicted below in figure 1-8. When feasible, DFPZs would also be placed alongside residential properties, evacuation routes and primary fire suppression access routes. The type and intensity of treatment(s) proposed would be dictated by how divergent forest conditions are from desired DFPZ conditions in a particular location. The Proposed Action would also promote forest health and habitat diversity, when favorable to achieving desired DFPZ conditions.

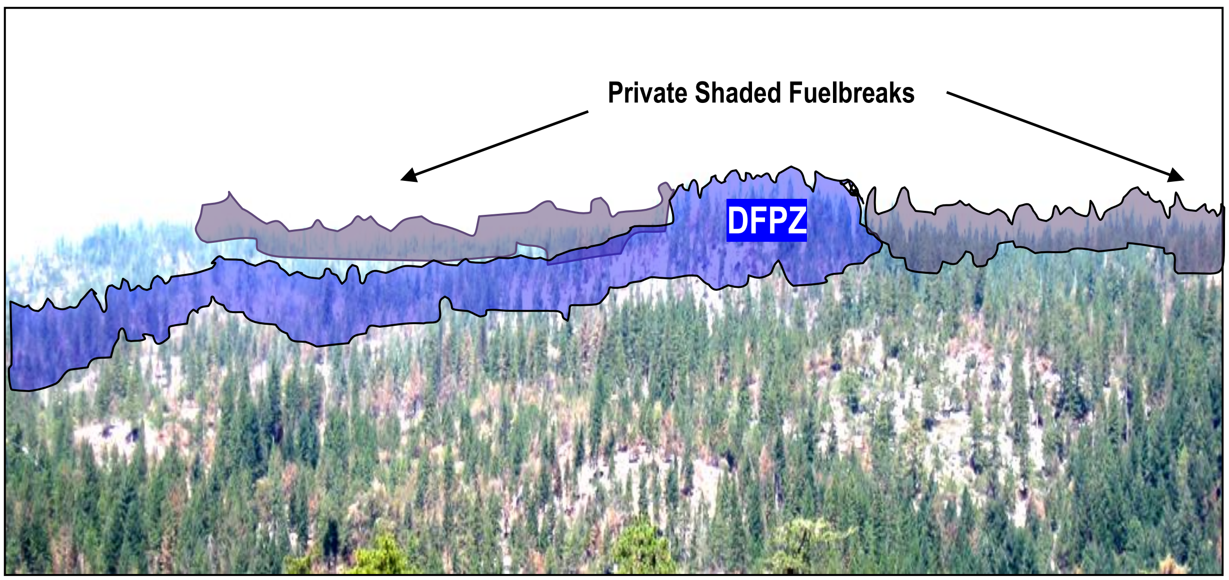


Figure 1-8 Illustration of Defensible Fuel Profile Zone (DFPZ) and Shaded Fuelbreak Networks

1.3.1 Burned Area Treatments

Although flame lengths in the next 4 to 5 years are predicted to be less than 4 feet during a wildfire event (well within safety standards for fire fighter crews), the presence of numerous, dangerously unstable, dead trees would prevent fire fighters from using direct attack suppression tactics.

For this reason, the Proposed Action includes strategically removing danger trees[6], particularly alongside evacuation routes, as the first step towards establishing safe conditions within DFPZs for fire fighters to initiate direct or indirect attack suppression tactics.

Select fire-killed trees greater than 20 inches at diameter at breast height (DBH) with commercial value (in excess of wildlife needs), would be felled and removed intact (whole tree), skidded by ground-based systems to landing sites. An alternate helicopter transport option may be employed to move forest by-products from proposed treatment areas located in Township 23 North, Range 4 East, Section 34 to landing sites, if right-of-way permission to use proposed private roads is not secured.

Select dead non-merchantable trees 12 to 19.9 inches at DBH would be removed and processed in one of the following ways; chipped, incinerated or made into firewood. In areas with limited accessibility, dead trees up to 19.9 inches at DBH may be masticated.

All dead trees would be retained to provide snag habitat for wildlife over 82 percent of the Project Area; referred to as Snag Retention Areas, and within treatment areas at a minimum of two snags per acre and maximum four snags per acre (except alongside the Rim Road, where either all snags would be removed or up to two stable snags per acre would be retained).

Shrubs and black oak basal sprouts would be left untreated at an approximate spacing of 18–25 feet, with mastication occurring in between. Remaining oak sprouts would be periodically hand pruned, retaining up to 3 main stems per aggregation, to encourage the development of tree characteristics.

Approximately 56 acres of fire-damaged plantations reforested in 2010 may require stand tending (i.e., grubbing and pre-commercial thinning), while another 40 acres would undergo “spot planting” with a mixture of native tree species (i.e., Douglas-fir, ponderosa and sugar pine), with varied spacing to emulate natural variation of former, mixed conifer forests. Finally, burned area treatments would include manual cutting of shrubs and trees 1 to 9 inches at DBH, and/or thinning aggregations of conifers or plantation trees 1 to 9 inches at DBH.

Shrubs and black oak basal sprouts would be left untreated at an approximate spacing of 18–25 feet, with mastication occurring in between. Remaining oak sprouts would be periodically hand pruned, retaining up to 3 main stems per aggregation, to encourage the development of tree characteristics.

[6] **Safety Provisions on National Forest System Roads** (FSH 7709.59 (40.3); FSM 7733.02)—This provision stipulates: 1. Safety is the predominant consideration in road operation and maintenance and takes priority over biological or other considerations, and 2. Roadways must be managed for safe passage by road users. This includes management of hazards or dangers associated with roadside vegetation, including identification and mitigation of danger trees.

1.3.2 Unburned Area Treatments

Within the unburned area, forest canopy cover would be lowered via radial release or thinning, and thinning from below methods to achieve desired DFPZ canopy coverage, ranging from 40 to 50 percent within the Size Class 4 trees (11–24 inches at DBH) and Size Class 5 trees (greater than 24 inches at DBH), as defined by the California Wildlife Habitat Relationship (CWHR) classification system[7]. The intent of the release is to promote the health and retention of specific tree species by removing competition while retaining highly desirable conifer specimens.

Radial thinning and thinning from below not only achieves DFPZ desired conditions; these treatments also help to maintain the vigor of the older, larger trees, particularly hardwoods and pines.

Radial thinning or release would occur around large diameter pine species. Radial release of conifers would be conducted around one to three of the largest healthiest growing sugar pine, or ponderosa pine > 24 inches in diameter on a per acre basis. Radial thinning would correlate to tree DBH. For example a 24 inch diameter tree would have a radius thinning of 24 feet. Radial thinning or release would not exceed a 30 foot radius. Undesirable pines less than 24 inches in diameter and all other conifers less than 28 inches in diameter would be removed in the radial release. Black oak trees greater than 6 inches in diameter would be retained during radial thinning.

Radial release would be conducted around all living black oak trees 6 inches in diameter or greater, on up to 5 trees per acre (See black oak below). The intent of the release is to promote the health and retention of black oak, which will encourage a more fire resilient forest structure.

Treatments are expected to encourage acorn production for the benefit of a variety of wildlife species and promote the more vigorous growth of individual oak trees. In the inner zone surrounding the edge of the black oak tree crown, from 0-20 feet, all ponderosa pine less than 24 inches in diameter and all other conifers less than 30 inches in diameter would be removed. In the zone extending from 20-50 feet from the black oak tree crown, healthy growing conifers would be retained at an approximate density of 50 to 100 square feet of basal area.

Harvested black oak less than 6 inches at DBH, tanoak 3.0 to 8.9 inches in dbh and conifer trees 3.0 to 8.9 inches at DBH, would be either machine piled and burned, or removed from treatment areas.

All trees 30 inches at DBH or larger would be retained, unless removal is required to ensure the safety of forestry workers or for operations. Residual spacing of conifers would establish a random mosaic pattern in DFPZs, responsive to unique forest stand and fuel conditions as illustrated in figure 1-9.

[7] **California Wildlife-Habitat Relationships System**—a vegetative classification system at a scale sufficient to classify wildlife habitats. Each habitat description provide information on forest stand structure, species composition, habitat stages, biological setting, physical setting and distribution (A Guide to Wildlife Habitats of California, 1988)

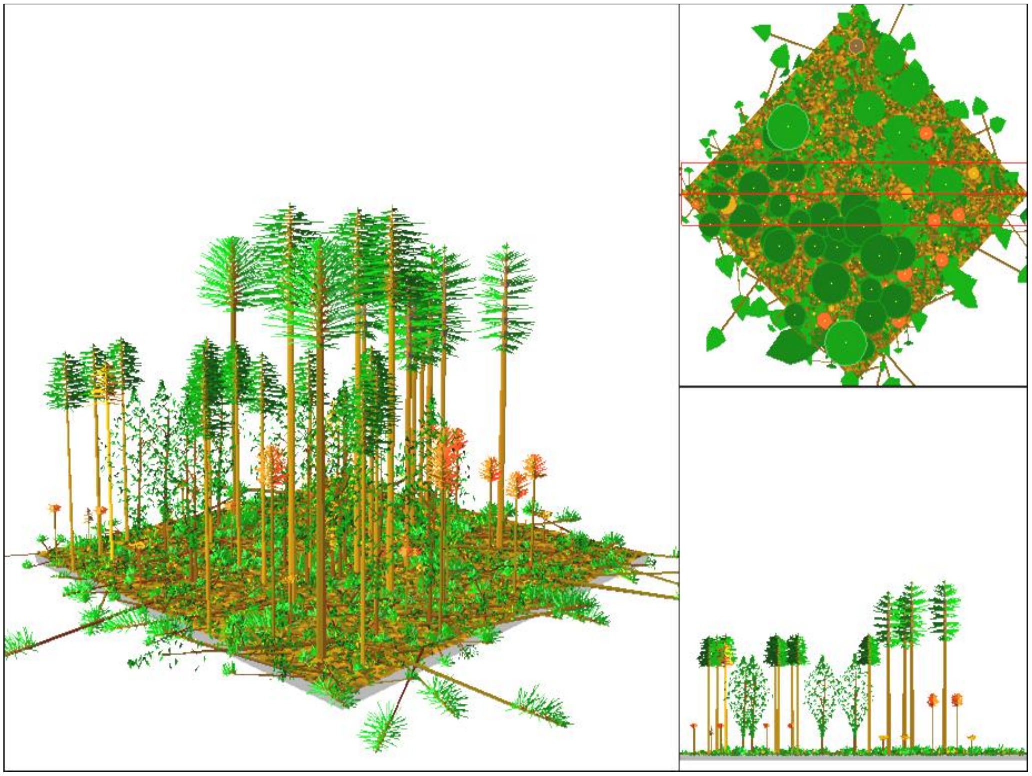


Figure 1-9 Illustration of DFPZ thinned to 40-50% Canopy Closure

Shrubs would be masticated, as would trees less than 9 inches DBH, unless needed to fulfill desired DFPZ forest canopy cover and tree (density) spacing. CWHR Size Class 3 stands (trees averaging 6–11 inches at DBH) and plantations would be thinned to residual tree spacing from approximately 18 to 22 feet (±25 percent), depending on average residual tree size. Ultimately, the goal is to retain the healthiest, largest, and tallest conifers and black oaks within DFPZs to establish conditions resilient to fire, while providing unique habitats.

1.3.3 Burned and Unburned Area Treatments

Within DFPZs, low intensity, hazardous fuels reduction treatments would occur within Riparian Habitat Conservation Areas (RHCAs), which are buffers located alongside sensitive stream channels. Hand cutting would occur immediately adjacent to stream channels. Hand cut debris would be moved upslope 25+ feet from the stream channel, then hand piled and burned. Ground based equipment restriction zones within RHCAs would be established, ranging in width from 75–150 feet, depending on slope steepness, soil type and site-specific vegetative conditions.

A maximum of 28 acres may be required for log and biomass landing activities. No new permanent system road construction would be required. However, the Proposed Action would require minor bridge improvement and an estimated 2 miles of minor road improvements through rural neighborhoods north of Concow Reservoir, in order to access public land inholding parcels. Probable road improvements would include road surface grading, curve widening, enhancing drainage and upgrading stream crossing.

An additional estimated 4 miles of road maintenance along transportation haul routes (i.e., surface grading, cleaning debris from ditches and culverts, roadside brushing and danger tree felling) would be conducted to ensure safe road use conditions. Up to 2 miles of temporary (1 time use), non-system road construction may be required to access proposed new log and biomass landings. After use, these native surface (dirt) temporary roads would be closed to vehicular traffic.

Across the 10-year treatment plan project area, the sum of all acreage treated appears to be greater than the acreage actually being treated—this is due to the overlap of the treatment phases. For example, if it is possible to treat 118 acres per phase, the sum of possibly treated acres after three phases would be 354 acres. However, in reality, only a portion of the 118 acres would be treated during each entry, as limited by the land base area.

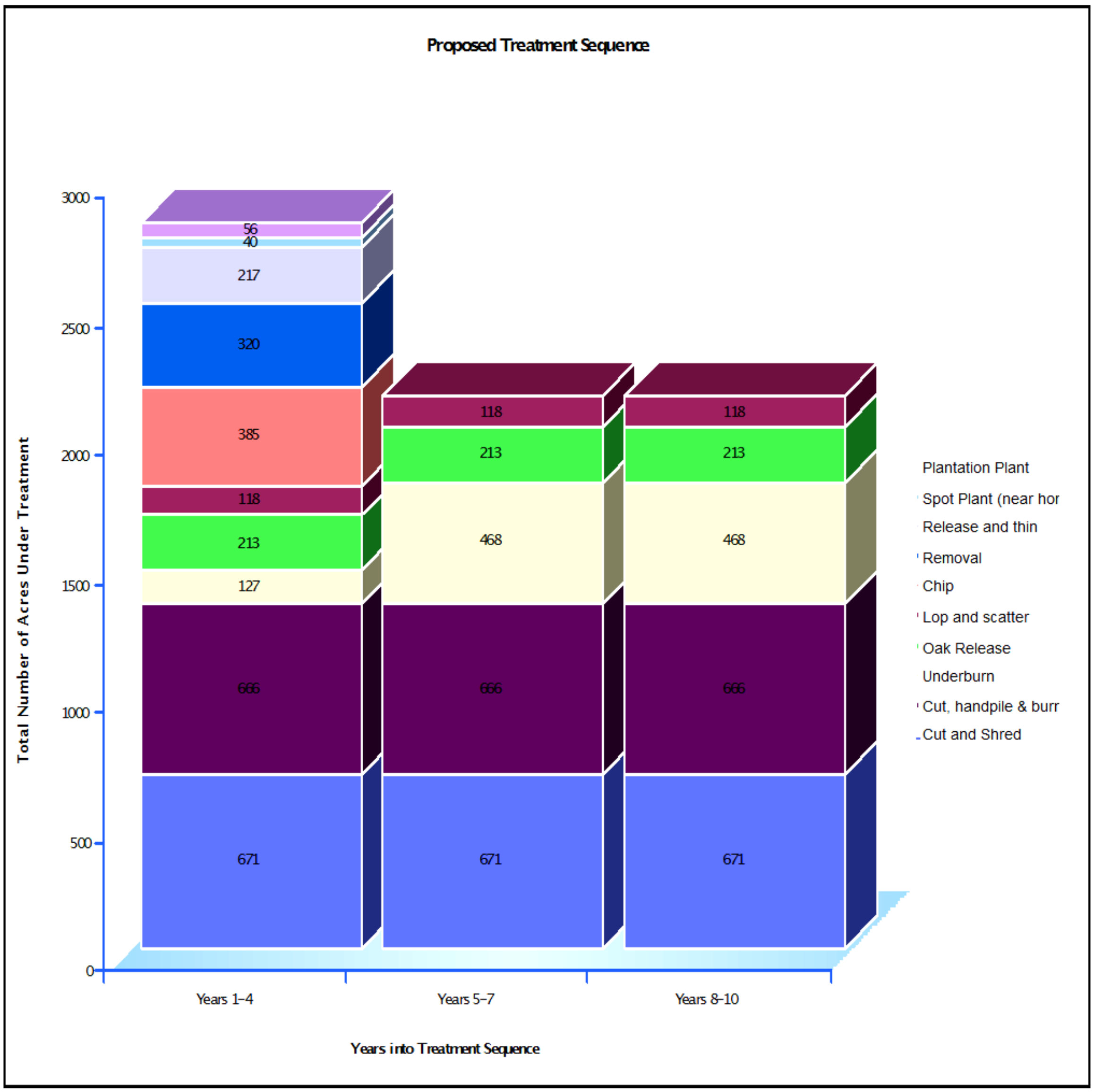


Figure 1-10 The Proposed Action (Alternative B) Treatment Sequence

The order of appearance for proposed treatments depicted in figure 1-10 above does not necessarily reflect treatment priorities. The sequencing of geographically overlapping initial and maintenance treatments would provide flexibility to treat site-specific environmental conditions in the most suitable way, as planned in advance.

For instance, if conditions deter post-fire regrowth, maintenance may not be necessary until 7 years after the initial treatment. If for some reason, there is a trend favoring rapid growth, maintenance may be warranted within 5 years. Removal, radial release and thin-from-below treatments would be the first operation conducted in order to reduce the presence of danger trees and heavy fuel concentrations. The Proposed Action is presented in detail in chapter 2 of this FEIS.

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

The authority for restoring public lands derives from many laws enacted by Congress, defining the purpose of public land forests and grasslands. Several key laws and regulations are summarized below.

1.4.1 Forest Service – *Herger-Feinstein Quincy Library Group Forest Recovery Act*

On October 21, 1998, the President of the United States signed the Department of the Interior and Related Agencies *Appropriations Act*, including Section 401—the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act). The HFQLG Act states that the Secretary of Agriculture, acting through the Forest Service, and after completing an EIS, shall conduct a pilot project for 5 years on federal lands in the Lassen and Plumas National Forests and the Sierraville District of the Tahoe National Forest.

The HFQLG Pilot Project is designed to test and demonstrate the effectiveness of certain fuels and vegetation management activities in meeting ecologic, economic, and fuel-reduction objectives, consistent with protection of ecosystems, watersheds, and other forest resources.

1.4.2 Forest Service – *Herger-Feinstein Quincy Library Group Forest Recovery Act* Environmental Impact Statement, Supplemental Environmental Impact Statement, Records of Decision (1999 and 2003) and Appropriations Acts

The HFQLG Act EIS was completed on August 17, 1999, and the Record of Decision (ROD) was signed on August 20, 1999 (USDA Forest Service 1999). The ROD amended the land and resource management plans for the three National Forests (Plumas, Lassen, and Tahoe) and gave direction to implement the resource management activities required by the HFQLG Act, including establishing DFPZs criss-crossing the Pilot Project Area to support fire suppression activities. Establishing a DFPZ network within the Concow Planning Area is consequently reflected in the Purpose and Need.

The ROD on the HFQLG final supplemental EIS addressing DFPZ maintenance was adopted on July 31, 2003 (USDA Forest Service 2003). In February 2003, the *Department of the Interior and Related Agencies Appropriations Act* was signed, and it extended the HFQLG Pilot Project legislation by another five years. In December 2007, the *2008 Consolidated Appropriations Act* extended the HFQLG Pilot Project to September 30, 2012. It also applied some portions of the *Healthy Forest Restoration Act* (Sections 104–106) to HFQLG projects. These sections relate to environmental analysis, public notice, comment and objection processes.

1.4.3 Forest Service – Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement (2004)

In January 2004, the Regional Forester signed the Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS ROD, which replaced the 2001 ROD on the SNFPA final EIS and changed management direction to allow full implementation of the HFQLG Pilot Project, consistent with the goals identified in the HFQLG Act. The 2001 SNFPA final EIS and ROD are incorporated by reference in the 2004 ROD on the SNFPA final supplemental EIS.

The 2004 ROD on the SNFPA final supplemental EIS directed the Plumas National Forest to implement the HFQLG Pilot Project, which includes creation of DFPZs for the proposed project. These treatments are needed in order to limit the potential size of, and loss of resources from large high-intensity wildfires. DFPZs are strategically located and designed strips of land where surface fuels (excess down woody material), ladder fuels, and canopy fuels are treated so that large, destructive canopy fires will lose intensity and transition to surface fires. DFPZs are wide enough to capture short-range spot fires, and are designed to provide fire suppression personnel a safe location from which to take fire-suppression actions. DFPZs are usually located along roads, ridges, meadows, or rocky areas to enhance their effectiveness and accessibility.

1.4.4 Forest Service – Forest Plan Direction

The 1988 Plumas National Forest Land and Resource Management Plan (commonly referred to as the “Forest Plan”), as amended by the 1999 HFQLG final EIS ROD, and as amended by the 2004 SNFPA final supplemental EIS ROD, guides the Proposed Action and alternatives for lands administered by the Plumas National Forest, Feather River Ranger District. The 2004 SNFPA ROD (pp. 68–69) displays the standards and guidelines applicable to the HFQLG Pilot Project Area.

1.4.5 Forest Service – Region 5 (California) Guidance on Court Order for a Non-commercial Funding Alternative

The Memorandum and Order dated 11/04/2009, for Case 2:05-cv-00205-MCE-GGH, Sierra Forest Legacy, et al., Plaintiffs, versus Mark Rey in his official capacity as Under Secretary of the Agriculture, and People of the State of California vs. United States Department of Agriculture, provided an order from Morrison C. Englund, United States District Judge, directing the Forest Service to address the NEPA violation previously identified in both these cases. The Remedy section of this Memorandum and Order (in section C) states: "At a project level, where the Court can properly make substantive recommendations, it orders the Forest Service to include a detailed consideration of project alternatives, including a non-commercial funding alternative, for all new fuel reduction projects not already evaluated and approved as of the date of this Memorandum and Order."

1.4.6 Bureau of Land Management – Resource Plan Direction

The 1993 Redding Resource Management Plan and ROD, Management Area Decisions, Ishi Management Area, Section G – Remainder of Management Area, (pp. 50 and 52) guide the Proposed Action and alternatives for lands administered by the Northern California District, Redding Field Office.

1.4.7 Bureau of Land Management – Fire Management Plan Direction

The 2004 BLM Redding Field Office Fire Management Plan, Fire Unit Descriptions, FMU I.D. No.: CA-360-05 Ishi Area includes objectives and strategies for post fire rehabilitation and restoration activities.

- Management direction states burned areas should be rehabilitated to mitigate the adverse effects of wildland fire on soil and vegetation in a cost-effective manner, and to minimize the possibility of wildland fire recurrence or invasion of weeds.

- Direction also specifies post-fire rehabilitation and/or restoration will emphasize re-establishing and perpetuating habitat diversity, and reducing annual grass establishment and proliferation. Additionally, project design emphasizes ensuring equipment and stabilization material (e.g., rice straw, hay) is weed free (p. 93).

1.5 Decision Framework

This FEIS is not a decision document. Its main purpose is to publicly disclose the environmental analysis conducted, as well as the Proposed Action or action alternatives' potential consequences on the human environment.

This FEIS analysis along with a disclosure of the relationship between wildfire, fuels, and vegetative conditions in the project area, form an important context for subsequent federal decision-making.

Accordingly, the FEIS focuses on providing analysis sufficient to facilitate the following federal decisions:

- Should hazardous fuels reduction and DFPZs be authorized at this time?
- If it is decided action is warranted now, to what extent and under what conditions should the Forest Service and Bureau of Land Management authorize activities?
- What mitigation and monitoring measures should be required, if an action alternative is selected?

1.5.1 Responsible Officials

The District Ranger for the Feather River Ranger District of the Plumas National Forest will be the deciding official for land administered by the USDA Forest Service (FS). "District Rangers are responsible for reviewing and approving ecological restoration projects to ensure they are consistent with national, regional, and forest policies" (FSM 2000, chapter 2020). As responsible official for the lead agency, the Feather River District Ranger has led the EIS analysis, guided the interdisciplinary team and coordinated the public involvement process.

The District Manager of the Northern California District will be the deciding official for land administered by the USDI Bureau of Land Management (BLM). The Northern California District Manager, as responsible official for the cooperating agency, has participated in the FEIS analysis and public involvement and provided resource data and expertise.

1.6 Public Involvement

Local involvement is critical when planning projects, setting project priorities, and allocating resources at the local level. Section 104 of the HFRA recognizes the importance of local involvement, establishing special procedures when agencies prepare EISs for hazardous fuel reduction projects. Section 104(e) of the HFRA requires agencies to provide notice of the project, and is supported by Section 104(f), which encourages meaningful public participation, such as through collaborative meetings and public field trips to project sites. Public involvement occurred during three key periods:

1. During the informal public collaboration phase beginning in 2004, which aided in the identification of the Purpose and Need and development of the Proposed Action referred to as the Flea Mountain Project. The Flea Planning Area bordered the communities of Paradise, De Sabla, Magalia, Yankee Hill, Pulga and Mayaro;

2. During the 30-day public Scoping period, commencing with the publication of the Flea EIS Notice of Intent (NOI) on August 17, 2007 for the same communities;

3. During the 45-day public Scoping period for the Revised NOI published on August 17, 2009, when the Flea Project was renamed the Concow Hazardous Fuels Reduction EIS for most of the same communities.

The area northwest of the communities of Pulga and Mayaro, originally contained within the eastern portion of the Flea Mountain Planning Area, was deferred to focus on those communities most at risk to future high severity wildfire.

As a procedural delay in publication of the Revised NOI occurred, a Corrected NOI was published on September 23, 2009, re-initiating a 45-day Scoping period to provide ample time for public comment.

1.6.1 The 2008 Butte Lightning Complex; Flea Revised and Renamed

Between 2004 and 2007, the Forest Service began public and government-oriented outreach efforts to develop hazardous fuel reduction strategies for National Forest System lands under their jurisdiction around the communities of Paradise, Magalia, Yankee Hill, and Concow, in Butte County, California. Based on the community feedback over this 3-year period, the Forest Service decided to initiate the Flea Mountain Project to: (1) address threats associated with high-intensity wildfires; (2) promote healthy all-aged, multistoried, fire-resilient forests; (3) contribute to the stability and economic health of communities; (4) promote the health of unique plant communities; (5) promote healthy aquatic and riparian ecosystems, as well as improve long-term watershed conditions; and (6) improve wildlife habitats.

On August 30, 2007, the Forest Service published a Notice of Intent indicating the Agency would be preparing an EIS. In December 2007, the 2008 Consolidated Appropriations Act applied some portions of the HFRA (Sections 104–106) to HFQLG projects, including sections relating to public notice, comment and objection processes. On April 22, 2008, an invitation to comment letter, introducing the unique procedural elements of the HFRA, was widely distributed throughout the aforementioned local communities.

The local Fire Safe Councils, in collaboration with the Forest Service and BLM, hosted briefings and small group meetings to invite comments on the proposed project's design and to ensure consistency with the general methods described in the Butte Unit's Community Wildfire Protection Plan (CWPP).

In 2008, during the preparation of the DEIS, the Butte Lightning Complex burned through the central and eastern portions of the Flea Project Area. Shortly after containing the wildfires, the Forest Service began determining the severity of the fires' environmental effects, and how best to respond to the needs of devastated communities and altered landscape. In November 2008, the Flea Project was renamed the Concow Hazardous Fuels Reduction Project with a modified planning boundary.

In January 2009, the Feather River District Ranger attended two community outreach meetings in Concow and Magalia, in collaboration with the Upper Ridge and Yankee Hill Fire Safe Councils. A presentation and discussion focused on how the effects of fire on the landscape had changed the environment and, in turn, how the Forest Service had responded. Topics discussed included the new name and modified planning boundary, the pending revision of the NOI and proposed new treatments.

In July 2009, the Forest Service contacted the BLM regarding 32 acres of adjoining BLM administered land, to discuss the opportunity to collaborate on complimentary treatments in a strategically key area. The BLM is a cooperating agency for the purposes of the Concow Project EIS. Records garnered by the Forest Service have been compiled in the Concow Analysis File, available for review at the Feather River Ranger District office.

1.6.2 45-Day Public Scoping Period – Corrected Notice of Intent (NOI)

On September 23, 2009, the Forest Service published the Corrected NOI for the Concow Hazardous Fuels Reduction EIS, indicating HFRA procedures would apply. The NOI publication initiated the 45-day Scoping Period. During this 45-day Scoping Period, the Forest Service and BLM invited the public to comment on the Proposed Action by conducting local presentations, hosting a public field trip, making phone calls, and publishing news releases, emails and website postings. Specifically, public meetings introduced the Proposed Action, provided project maps and handouts, and invited comments and requests for project updates. Both individuals as well as a variety of interest groups have expressed a diverse range of comments in letters, verbally, and in e-mails. Some comments are a request for information, some indicate full support for the Proposed Action, and others provide recommendations to consider other alternatives to the Proposed Action, or favor no action at all.

1.6.3 Notice of Availibility – Comments Recived

Official Notice of Availability (NOA) of the Concow Hazardous Fuels Reduction Project was published in the US Federal Register Vol. 76, No. 19 Friday, January 28, 2011, and made available on the Forest Service website. Agencies, local organizations and individuals responded to the notification of availability. Copies of all correspondence received are in the project administrative record, in section D-3 in the project FEIS appendices. Comments from residents indicate strong support for hazardous fuels reduction. Industry respondents expressed concern for economic viability and local labor involvement. Environmental comments focused on extraction methods, climate change, and water quality concerns.

1.6.4 Significant Issues

An issue is a point of discussion, debate or dispute concerning the Proposed Action or alternatives to it. Issues are formulated from public comments, in this case, compiled by the Forest Service since 2004. The Forest Service organized the issues into three major groups: Non-significant, Other Relevant and Significant Issues. The difference between them relates to the extent of their geographic consequence, the duration of their effects, and/or the intensity of interest or resource conflict.

An issue is a point of discussion, debate or dispute concerning the Proposed Action or alternatives.

Non-Significant Issues were identified as those outside the scope of this Proposed Action, already decided by law, regulation, Forest Plan, or other higher level decision; irrelevant to the decision to be made; or conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) explains this delineation process and rationale in Section 1501.7, instructing the agency to "…[I]dentify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review…" (Section 1506.3). For these reasons, non-Significant Issues are not discussed further in this FEIS.

Other Relevant issues, as used in this analysis, differ from Significant Issues in that they often describe minor and/or non-variable consequences, typically fully mitigated by project design features (recorded in the Project Analysis File; available upon request). The following Significant Issues were identified as those influencing the Defensible Fuel Profile Zone (DFPZ) treatment methods or design, placement or the mitigation measures incorporated, and moreover, were the basis for developing an alternative to the Proposed Action, and a context to compare the alternatives. Chapter 2 summarizes potentially Significant and Other Relevant effects in tabular format by alternative for easy comparison. Chapter 4 further discusses these Issues in narrative format.

Significant Issue 1: Cumulative effects to municipal and other watershed resources (applicable to unburned and burned areas)

Large watersheds are further subdivided into smaller size sub-watersheds for the purpose of environmental analysis.

Discussion: The Proposed Action may increase adverse effects to beneficial uses[8] of water related resources, including aquatic dependent resources in municipal watersheds, already considered highly disturbed. Specifically, implementing ground-disturbing activities in watersheds that are already over the threshold of concern,[9] may increase the risk of adverse cumulative watershed resource effects.

Watersheds and their associated stream and riparian systems can tolerate certain levels of land disturbance; however, there is a point when land disturbances begin to substantially impact downstream stream channel stability, water quality and aquatic (stream and lake associated) habitats. This upper estimate of watershed "tolerance" to ground disturbing land management activities is called the threshold of concern (TOC) (USDA Forest Service 1990).

At levels above the TOC, water quality may be degraded to the extent that other aspects of aquatic resources deteriorate and human demands for beneficial uses cannot be fulfilled. Out of the 15 delineated subwatersheds within the Concow Planning Area, 9 are currently over TOC and 3 are approaching TOC; an indication of the degree of present disturbance.

Potential project effects to aquatic resources, in combination with results of previous, existing and foreseeable land management within the Concow Planning Area, may temporarily incrementally increase degradation to highly disturbed stream and riparian conditions. As a potential indirect effect of establishing and maintaining a DFPZ network on public land, sedimentation levels could increase, and moreover, downstream water quality and aquatic ecosystems may degrade unacceptably and cumulatively.

Proposed mechanical ground-based methods, road improvements and construction of working biomass and log landings may affect water quality by increasing fine sediment input into streams, degrading aquatic and riparian breeding and transitory habitats. These habitats are of primary concern; thus, due to the intense interest and potential for resource conflicts associated with beneficial use by municipal, California state, and local agencies, the issue of increasing cumulative watershed effects is classified as Significant.

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[8] **Beneficial Uses** —A use of the waters including, but not limited to domestic, municipal, agricultural, and industrial supply, power generation, recreation, aesthetics, navigation, and protection and enhancement of fish, wildlife, and other aquatic resources or preserves (USDA Forest Service 1990). The US Forest Service and BLM are required to protect and enhance existing and potential beneficial uses during water quality planning (California Regional Water Quality Control Board [CRWQCB], 1998, revised 2007).

[9] **Threshold of Concern—**a measure of watershed health based on comparitive analysis of the existing and estimated project-related disturbance thresholds, as defined in the 1999 HFQLG Final EIS. The analysis includes an assessment of the likelihood and probable duration of increased risk of off-site and downstream cumulative watershed effects in context of stream channel, riparian, and aquatic conditions.

Measurement Indicators:

- *Determination of cumulative effects for Municipal Watershed Resources: Subwatershed at risk measured in percent Threshold of Concern (% TOC) linked to percent public land.*

- *Determination of cumulative effects for Forest Service (Region 5) Sensitive Aquatic Species and Habitat, Federally-listed Threatened Amphibians Species and Habitat, and Forest Service Management Indicator (MIS) Aquatic Species and Habitat.*

Significant Issue 2: Cumulative effects to terrestrial wildlife – snag habitat (applicable to the burned area only)

Discussion: The Proposed Action may increase adverse cumulative loss of snag (fire killed tree) habitat, already depleted in surrounding areas, along with the species that are dependent on them for nesting and roosting. The combination of past, present and foreseeable future government and non-government dead tree removal activities, may potentially reduce, fragment and/or incrementally degrade habitat. Therefore, due to the intensity of interest and potential for resource conflicts associated with quality and location of snag habitat, the issue of increasing cumulative effects is classified as Significant.

Measurement Indicators:

- *Determination of cumulative effects for Forest Service (Region 5) Sensitive and Management Indicator Species associated with snag habitat.*

Significant Issue 3: Social debate over forest management of public land - economic recovery (applicable to the unburned and burned areas)

Discussion: Public comments received during the Scoping period indicate public concern federal forest land management is unreasonably biased towards cost recovery or economic rewards, particularly in context of harvesting fire killed trees from highly disturbed, post-fire environments.

One perspective is that removing fire-killed trees may drastically or completely delay recovery, remove the elements of recovery, or accentuate the damage. This premise, opposing active federal land management, is that natural passive recovery (no action) occurs rapidly with no deleterious consequences. Therefore, according to this perspective, active land management of any kind is not needed and is generally driven by over arching economic objectives that, in turn, may be ecologically counter-productive.

In the unburned areas, the dispute is over the need to remove bigger trees (especially those 30 inches in diameter or larger) to increase crown separation in Defensible Fuel Profile Zones (DFPZs) to influence fire behavior, and the possible indirect adverse impacts to old-forest associated species, such as the Pacific fisher, California spotted owl, and northern goshawk.

Most agree some amount of surface hazardous fuels reduction is warranted in the wildland urban-interface (WUI); however, public opinion as to the extent of forest canopy reduction and upper diameter thresholds varies widely depending on individual viewpoints.

Measurement Indicators:

- *Estimated commercial timber sawlog volume (live trees) measured in million board feet (MBF) and estimated commercial biomass (dead fuels) measured in tons per acre (TBA).*

1.7 Permits

In accordance with 40 CFR 1502.25 (b), the Environmental Impact Statement is to list all Federal permits, licenses, or other entitlements that must be obtained in implementing the action alternatives. The implementation of the Proposed Action or alternatives may require entitlements in conjunction with minor bridge improvement on private land, required to safely access potential public land biomass landings and provide for equipment entry. Sorting and removing Forest by-products from the site to commercial off-Forest vendors would involve some form of permits for road use, right-of-way, or use of private lands for landings and access. Potential permits required to facilitate the action alternatives would involve the Cirby Creek Road Maintenance Association and Sierra Pacific Industries. Throughout the planning process, no additional Federal, State or County permits, licenses, or other entitlements were identified as requirements for implementation of the Proposed Action or alternatives.

Chapter 2. Alternatives

2.1 Introduction

This chapter describes and compares the management alternatives considered for the Concow Hazardous Fuels Reduction Final Environmental Impact Statement (FEIS) including:

- Alternative A - No-action.
- Alternative B - Preferred Proposed Action.
- Alternative C - Alternative to the Proposed Action.

The National Environmental Policy Act (NEPA) is our country's basic charter for environmental responsibility. The NEPA applies when a federal agency has discretion to choose amongst one or more alternative means of accomplishing a particular goal (Council on Environmental Quality [CEQ] NEPA Regulations, 40 CFR § 1508.23). In compliance with the NEPA, this chapter discloses information about the management alternatives, divided into three major sections:

- Section 2.1.1. *Alternative Development* summarizes land management direction and procedures key to the development of the Purpose and Need elements, describing how each action alternative uniquely responds.
- Section 2.2. *Description of the Alternatives Considered in Detail* (A, preferred B, and C) discusses specific treatment design methods and locations, including key mitigation and monitoring legal frameworks, discussed further in context of project specific protocols in the FEIS: appendix A.
- Section 2.3. *Alternative Comparison* at the end of this chapter includes a tabular comparative display of the alternatives' potential environmental, social and economic effects, further described in narrative later in the FEIS, chapter 4: Environmental Consequences.

2.1.1 How the Alternatives Were Developed

The provisions of the extended *Herger-Feinstein Quincy Library Group* (HFQLG) *Forest Recovery Act* provides direction to implement resource management activities, such as establishing and maintaining DFPZs within the larger Pilot Project Area, to support fire suppression.

In addition, the extended HFQLG *Forest Recovery Act* applies some portions of the *Healthy Forest Restoration Act* (HFRA; Sections 104–106), which relate to public notice, comment and objection processes, briefly described below.

Butte Unit's Community Wildfire Protection Plan (CWPP) provides recommendations and guidance regarding general fuels treatment locations and basic methods, intended to lessen the potential for future destruction, reduce associated costs of suppressing severe wildfire, and reduce risks to assets through focused pre-fire management treatments at the Butte County landscape scale.

HFRA Section 104. This section establishes special procedures for federal agencies preparing environmental impact statements for hazardous fuel reduction projects aimed at encouraging meaningful public participation during the planning process (Section 104(f)). Since 2004, local community members and interest groups, such as the local Fire Safe Councils in Butte County, have been collaborating with the Forest Service to develop the Proposed Action. Consequently, proposed land management activities incorporate public treatment method recommendations such as reintroducing prescribed underburning to mimic naturally occurring low severity fire in the wildland urban-interface (WUI), thinning small diameter trees, and promoting healthy oak woodlands.

Under the HFRA, if the community at-risk to wildfire has adopted a Community Wildfire Protection Plan (CWPP), and the agency's proposed action does not implement the recommendations in the plan regarding the general location and basic method of treatments, agencies are required to analyze the recommendations in the plan as an alternative to the Proposed Action (Sections 104(d)(2) and (3)). For the purposes of this FEIS, both action management alternatives propose treatment methods and locations that are consistent with those described in the relevant Butte Unit's CWPP (refer to excerpts included in appendix D of this FEIS).

HFRA Section 105. This section establishes direction for federal agencies regarding predecisional administrative review procedures – planned to occur during the period after the completion of the Concow Hazardous Fuels Reduction final environmental impact statement (FEIS), and ending not later than the date of issuance of the final decision approving the project (to be disclosed in the subsequent Concow Hazardous Fuels Reduction Record of Decision). In this way, the Responsible Officials are informed of public issues prior to making federal decisions.

HFRA Section 106. This section establishes direction governing judicial review of lawsuits challenging hazardous fuel reduction projects authorized under the Act. Under HFRA, the No-action Alternative has a special legal function. Agencies are not expected to fully develop a No-action Alternative; rather, they are expected to evaluate the effects of failing to implement an action. This becomes relevant as the HFRA directs courts to balance the impacts of short- and long-term effects of an undertaking (i.e., the Proposed Action) against not undertaking the project (i.e., No-action), when weighing the equities of any request for an injunction of a hazardous fuel-reduction project (Section 106(c)(3)).

For this reason, the Forest Service (FS) and the Bureau of Land Management (BLM) agencies' analyses and documentation of the potential effects of the No-action Alternative compared to the preferred Proposed Action are central to the court's evaluation of any request for injunctive relief. Anyone may bring a civil action challenging an authorized hazardous fuel reduction project in Federal District Court, in circumstances where:

- They already raised the issue during the administrative review process, and;
- They have exhausted the administrative review process (36 CFR 218) established by the Secretary of Agriculture (refer to excerpts included in appendix D of this FEIS).

Section 106 requires lawsuits to be filed in the U.S. District Court, where the project is located, to encourage expeditious judicial review of projects (HFRA; Section 106(a)). Section 106(b)) limits preliminary injunctions and stays to 60 days, subject to renewal. At each renewal, parties to the action shall provide the court with updated information on the project (Sections 106(c)(1) and (2)).

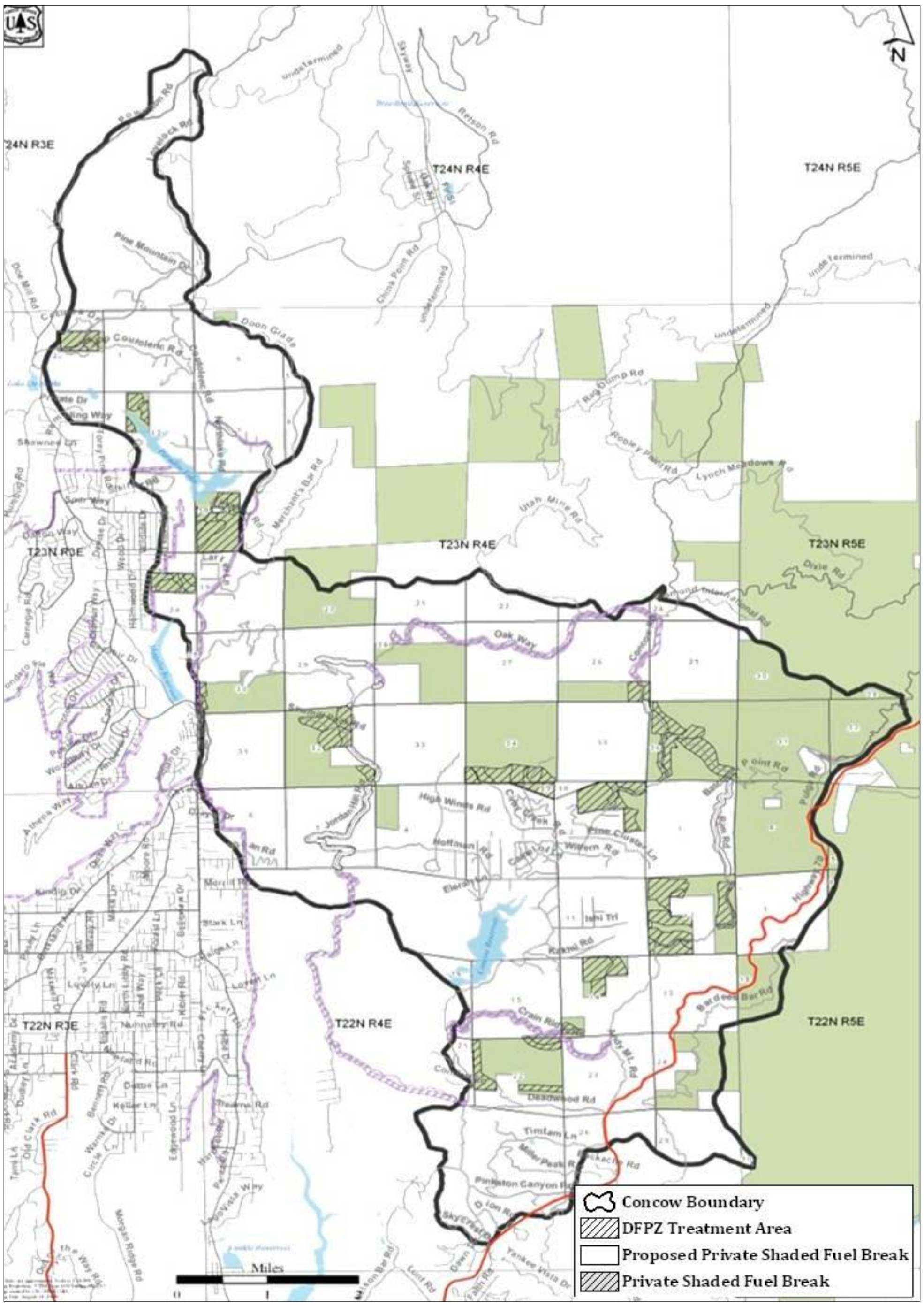
No-action Alternative. The No-action alternative would not establish a Defensible Fuel Profile Zone (DFPZ) on public land. This alternative allows for on-going administrative, federal land management within the Planning Area, such as reforestation, oak woodland stand tending, road maintenance and Roadside Danger Tree felling, fire suppression, and dispersed recreation. Although under Alternative A, no hazardous fuels reduction or vegetative management to establish DFPZs would occur at this time, the lack of action could result in discrete, indirect consequences, as described in chapter 4: Environmental Consequences of this FEIS.

Action Alternatives. The Forest Service (FS) and Bureau of Land Management (BLM) designed the Proposed Action (Alternative B) and the Alternative to the Proposed Action (non commercial funding Alternative C) to be uniquely responsive to:

- The *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act), the *Healthy Forest Restoration Act* (HFRA), all relevant land management direction, including the general location and basic method of treatments described in the Butte Unit's Community Wildfire Protection Plan (CWPP), and Region 5 (California) Guidance on Court Order for a Non-commercial Funding Alternative;
- The Purpose and Need identified in this FEIS, and;
- The Significant Issues.

Several underlying key principles influenced the scope, temporal extent and spatial extent of the action alternatives. First, fire is a dynamic process, predictable in occurrence but uncertain in scope, behavior and outcomes, varying over time and space. Fire will continue to be a frequent natural disturbance, based on the fire history within the Concow Planning Area.

Secondly, checkerboard land ownership patterns as illustrated in map 2-1 below, along with multiple right-of-way jurisdictions within the Concow Planning Area, limit the extent to which the action alternatives can alter some or any variables influencing fire behavior or habitat diversity. Consequentially, development of the Proposed Action emphasized strategically locating Defensible Fuel Profile Zones (DFPZs) to fill gaps, linking existing and planned future shaded fuelbreaks on private land, thus achieving broader scale HFQLG Pilot Project desired conditions.



Map 2-1 Checkerboard land ownership patterns

Finally, environmental constraints such as steep, inoperable mountain slopes, along with legal restrictions tied to compliance with Federal and State air and water quality regulations, may potentially restrict treatment type and intensity in some resource sensitive areas.

Specifically, the preferred Proposed Action was developed to optimally suit the Purpose and Need to achieve and sustain desired Defensible Fuel Profile Zone (DFPZ) conditions for the longest duration, considered a key priority of the Purpose and Need of this federally proposed action. This preferred management alternative also integrates fuels and vegetation treatment methods to achieve other desired conditions for multiple natural resources and for community stability. As designed, multiple spatially overlapping treatments would not only achieve DFPZ desired conditions, they would also yield commercial timber and biomass, as well as long term beneficial outcomes for enhanced habitat diversity, forest health and resiliency.

Alternative C was developed to fulfill hazardous fuels reduction elements of the Purpose and Need through solely non-commercial funding sources in a single treatment entry; consistent with Butte Unit's Community Wildfire Protection Plan (CWPP) endorsed shaded fuel break treatments being implemented on private land. Wildlife snag habitat composed of medium and large standing dead trees would be retained, with the exception of those considered an absolute imminent danger to human safety adjacent to homes and roadways. Small live trees in the unburned areas and small dead trees in the burned areas would be felled and surface fuels treated on location.

Both action alternatives would treat surface fuels in areas burned in 2008 as necessary, to reduce the potential for stand replacing future wildfire, commonly referred to as a "reburn". In addition, both action alternatives would set aside Snag Retention Areas (SRAs), encompassing expansive untreated riparian and upland places (more than ¾ of public land within the Concow Project Area), in order to provide for wildlife dependent on standing, decaying, dead tree habitat.

2.2 Alternatives Considered in Detail

This section includes a description and comparison of the No-action Alternative (Alternative A), the preferred Proposed Action (Alternative B), and the non commercially funded Alternative to the Proposed Action (Alternative C).

2.2.1 Alternative A (No-action)

The No-action Alternative would not implement the HFQLG Pilot Project or the recommendations in the Butte Unit's Community Wildland Protection Plan (CWPP). However, as required by NEPA and HFRA, the No-action Alternative is included and analyzed in this FEIS as a baseline, against which the action alternatives (i.e., Alternatives B and C) can be compared. The environmental analysis and disclosure of the No-action Alternative provides an indication of what could happen if neither the Proposed Action (Alternative B) nor Alternative C is implemented.

Description of the No-action Alternative

Fire Prevention. Current wildland fire prevention measures would continue to occur under the No-action Alternative. Wildland fire prevention involves not only informing and educating people about how and why blazes begin, but also regulating human behaviors that involve various potential ignition sources in or around flammable vegetation.

Efforts to educate the public on safe fire use would continue through personal contacts, interpretive programs, interagency fire prevention cooperatives, the use of posters, signs, radio, and press releases. Cooperative fire prevention between federal and state land managers, Fire Safe Councils, and other local interest groups, would continue efforts to prevent human-caused fires through education.

Pre-suppression. Under the No-action Alternatives, no public land management activities for the purpose of fire hazard reduction or establishing DFPZs would occur at this time on public land, although surrounding landowners have established – and most likely will continue establishing – additional shaded fuelbreaks and defensible space.

Fire Suppression. The Forest Service (FS) and Bureau of Land Management (BLM) policies for fire suppression guide tactics to be timely and efficient with a high regard for public and firefighter safety. Appropriated Federal funds for preparedness apply only to lands for which the FS and BLM have direct fire protection responsibilities. Because of this, most of the Concow Planning Area would continue to be covered by multi-agency mutual aid initial attack suppression agreements. Suppression effort by itself would not ensure that a large wildland fire would not occur within the Planning Area.

Due to the constant change in annual federal funding levels, it is difficult to predict the number and type of suppression forces that would be available for any given season. As was the case in the 2008 Butte Lightning Complex incident, during extreme 90th to 97th percentile weather conditions, suppression forces were spread thin by other local and regional incidents that require additional crews and equipment.

Administrative. The Forest Service (FS) and Bureau of Land Management (BLM) policies set forth standards for maintaining safe road conditions under their administration, replanting fire-damaged plantations to achieve desired stocking levels or tree populations, and other oak woodland and mixed conifer forest stand tending responsibilities. As shown in figure 2-1, fire damaged plantations and areas burned around the communities of Concow and Yankee Hill have recently been reforested with Douglas-fir, ponderosa pine and sugar pine, along with hand pruning of oak sprouts to accelerate tree (vs. shrub) characteristics. Under the No-action Alternative, these administrative activities would continue as needed.

Figure 2-1 Fire damaged plantation

2.2.2 Alternative B (Proposed Action)

Treatment Objectives -- Aim to either directly or indirectly alter the potential amount of fuels and their arrangement sufficient to affect fire behavior supporting 4 foot or less flame lengths; influencing size, distribution and species composition of forest vegetation.

The Proposed Action is designed to further the completion of the *Herger-Feinstein Quincy Library Group (*HFQLG) Pilot Project's larger Defensible Fuel Profile Zone (DFPZ) network, and to fill in gaps linking shaded fuelbreak networks on private land in the wildland urban-interface (WUI). For this reason, Alternative B would establish and maintain a Defensible Fuel Profile Zone (DFPZ) network on FS and BLM administered lands (maximum of 1,510 acres) around the local communities of Paradise, Magalia, Concow and Yankee Hill in Butte County, California.

This Alternative would alter fuels and vegetation conditions in three spatially overlapping treatment phases, at points in time roughly five years apart; comprising 5 percent of the Concow Planning Area (includes all land ownerships and jurisdictions), and 18 percent of the Concow Project Area (public lands only within the Concow Planning Area; a subset of the broader scale). Under Alternative B, the DFPZ network is designed through two maintenance treatments to effectively modify fire behavior during the hottest, driest (90^{th} to 97^{th} percentile) worst weather conditions for roughly the next 20 years.

As illustrated by figure 2-2, the Proposed Action would establish DFPZs in a variety of burned and unburned vegetative types, including Sierran mixed conifer, Douglas-fir, Ponderosa pine, Montane hardwood-conifer, Montane hardwood, and shrub dominated lower elevations with Mixed Chaparral and Grasslands within in the Lower-Montane ecological zone, described in detail in chapter 3 of this FEIS. On serpentine soils, closed-cone pine-cypress habitat types (McNabb Cypress and knobcone pine), would also receive DFPZ treatments. Alternative B would reforest fire damaged plantations. In burned areas, conifer trees would be planted alongside select residential properties to enhance scenic quality.

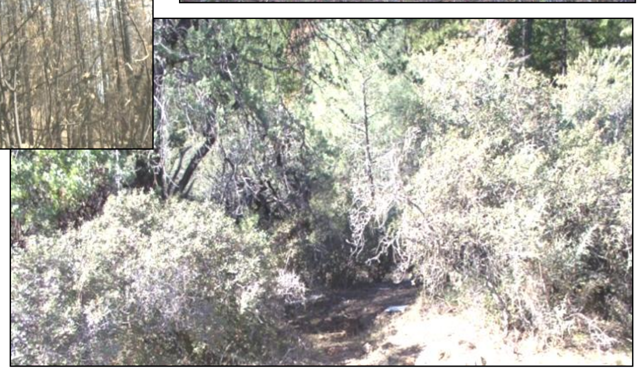


Figure 2-2 Diverse vegetation types

Inside DFPZ treatment areas, safe working places are established by felling dead hazard or danger trees[10]. Danger trees having commercial timber value would be felled and removed from the site as a forest by-product (sawlog, chips, etc.). Danger trees having excessive wood decay would be made available for personal use firewood, and may be masticated, lopped and scattered, hand cut, hand piled and burned, or underburned until desired DFPZ fuel loading levels are achieved – those predicted to support less than 4 foot flame lengths during a high severity wildfire incident. Any live or dead danger trees of any size, determined likely to fall on or roll into public roads or operational work sites, would be treated similarly as DFPZ non-Roadside Danger trees.

Felling of danger trees -- Proposed tree felling would occur to reduce potential dangers to human safety, irrelevant of the tree's size or position in the forest canopy.

Alternative B incorporates unique DFPZ treatment design features to minimize potential effects tied to Significant Issues, discussed in chapter 1 of this FEIS. For instance, the Proposed Action (Alternative B) incorporates integrated fuels reduction and forest health vegetation treatments to minimize potential adverse effects to wildlife, by strategically focusing dead tree removal near homes, private property and alongside evacuation and suppression routes; away from stream channels, high quality habitats and key migration corridors sensitive to environmental disturbances.

Snag Retention Areas (SRAs) are a key design feature providing strategically for dead tree snag habitats in the burned area and live reserve trees in the unburned area, while preserving key aquatic habitats and critical infiltration zones that catch sedimentation. SRAs include the untreated areas, encompassing about 82 percent of public land within the Concow Project Area. These SRAs overlap Riparian Habitat Conservation Areas (RHCAs) and other dispersed retention patches less than ¼ acre in size within the burned areas – where medium and large size snags would provide critical dispersal habitat across barren slopes. For example, an average of 20 snags per acre would be retained alongside Concow Creek and an unnamed tributary north of Concow Reservoir in RHCAs, as depicted in figure 2-3.

Figure 2-3 Snag retention and riparian habitat conservation area

[10] **Danger Trees—**refers to standing trees that present a hazard to people due to conditions such as, but not limited to, deterioration or physical damage to the root system, trunk, stem, or limbs and the direction or lean of the trees (FSH 6709.11, Glossary).

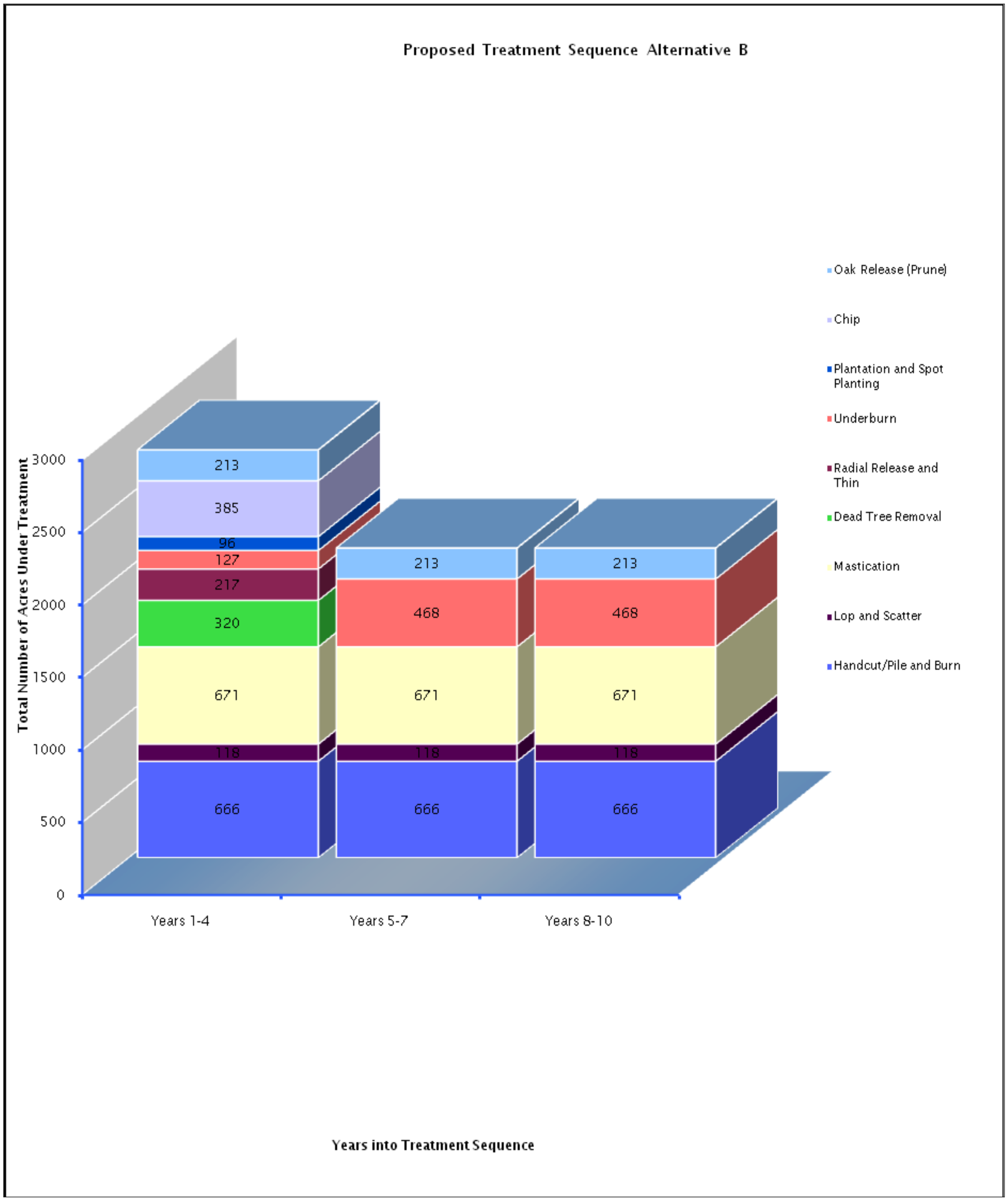
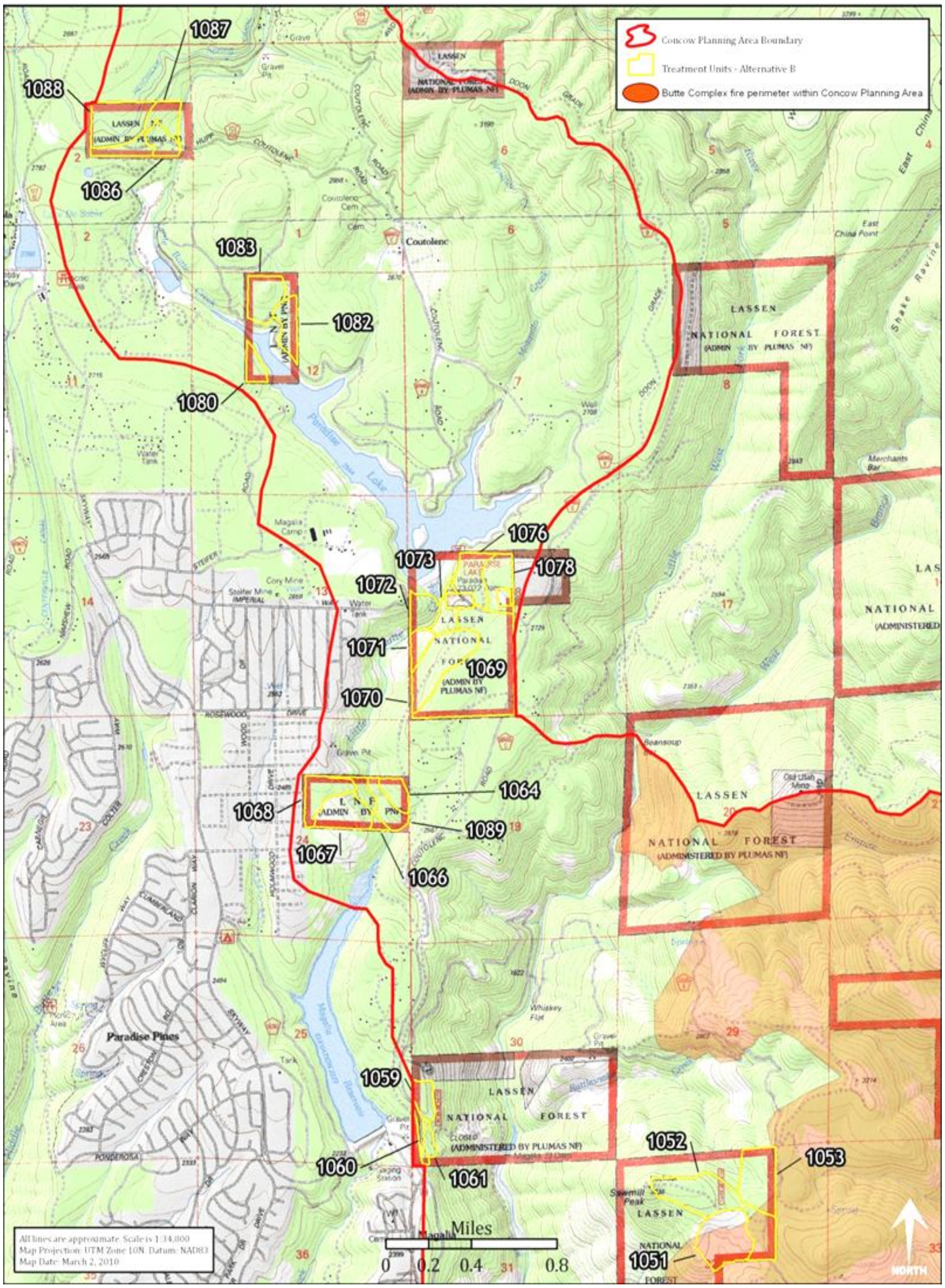


Figure 2-4 Alternative B proposed Defensible Fuel Profile Zone (DFPZ) treatment sequence

The maximum number of acres potentially treated, as displayed in figure 2-4, is further presented by treatment area, by entry, in tables 2-1 and 2-2. The sequence order does not necessarily reflect treatment priority. Proposed DFPZ maintenance treatments in years 5-10 may or may not occur, depending on the need for follow-up to retain desired conditions.

Defensible Fuel Profile Zone (DFPZ) Treatments in Unburned Areas

The Proposed Action would establish and maintain DFPZs in overcrowded forests through a combination of spatially overlapping, surface, ladder and crown (a.k.a. tree canopy) fuels treatments and complementary forest health vegetative treatments, as spatially depicted on map 2-2.



Map 2-2 Proposed Action (Alternative B) Unburned Area

As depicted in figure 2-5, thinning from below in overstocked forests would alter vegetation conditions (and thus potential fire behavior) to the point where flame lengths would be less than 4 feet, as desired – and as similar to those found in post DFPZ treatment forest conditions. Residual spacing of conifers would vary, depending on site specific, unique vegetative and fuel conditions.

Surface and ladder vegetative fuels provide a route for fire to climb into the crowns of large healthy trees, as depicted in figure 2-5 (photo at left). Crown fuels provide a route for fire to spread from tree crown to tree crown. Increasing the spacing between individual trees and tree crowns in DFPZs would influence fire behavior and promote conditions resilient to forest fires, as depicted in figure 2-5 (photo at right). The treatment preference for tree species retention would be in the following order: ponderosa pine, black oak, sugar pine, Douglas-fir, incense-cedar, true fir and tree-form tanoak. Within DFPZs, desired residual or remaining trees would be the healthiest, largest, and tallest conifers and black oaks to achieve optimal DFPZ 40 percent canopy cover. Alongside roads within DFPZs, danger trees of any size would be felled.

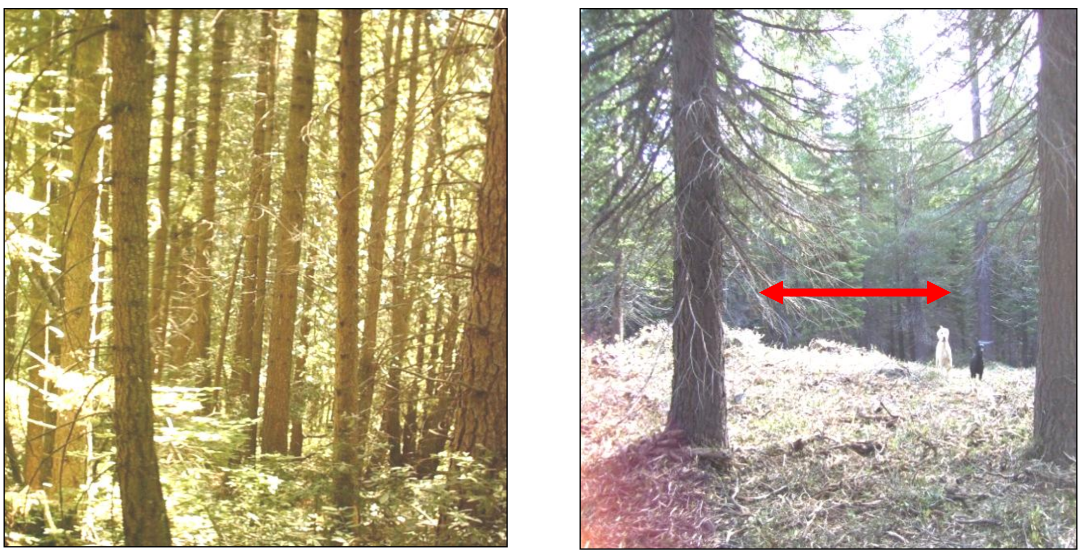


Figure 2-5 DFPZ treatment before and after

Tree removal would target select unhealthy, suppressed, intermediate and some co-dominant trees; particularly those growing underneath or near enough to compete with the healthiest, largest, and tallest conifers and black oaks to be retained. The terms suppressed, intermediate and co-dominant relate to the individual trees' crown position in the canopy, and do not necessarily correlate to individual tree size (measured by diameter at breast height [DBH]).

Ladder and canopy (a.k.a. crown) fuels would be removed by thinning from below, beginning by felling the smallest trees and proceeding according to sizes, until desired DFPZ tree crown separation is achieved. In *California Wildlife Habitat Relationships* (CWHR) system Size Class 4 stands (trees 11–24 inches DBH) and Size Class 5 stands (greater than 24 inches DBH), approximately 40 to 50 percent canopy closure would be retained, where it presently exists. Forests classified as CWHR Size Class 3 stands (averaging 6–11 inches DBH), and plantation trees would be thinned to residual spacing from approximately 18 to 22 feet (with this spacing variable by approximately 25 percent), depending on site-specific average residual tree size, fuel and forest health conditions.

Conifer trees ranging from 9.0 to 29.9 inches DBH would be felled until desired DFPZ tree crown separation is achieved. All trees 30 inches DBH or larger would be retained, unless felling is absolutely required for safety or operability (e.g., new skid trails, landings, or temporary roads).

Where California black oak is present, an average basal area of 25 to 35 square feet per acre of oaks over 15 inches DBH would be retained. In areas lacking sufficient basal area retention of oaks greater than 15 inches, smaller oaks greater than 6 inches DBH would be retained to achieve desired DFPZ inter-tree spacing, where feasible. Black oak less than 6 inches DBH and tanoak and conifers from 3.0 to 8.9 inches DBH would be machine piled and burned, unless material has commercial biomass value.

DFPZ: Radial thinning or release

Within the unburned area, forest canopy cover would be lowered via radial release or thinning, and thinning from below to achieve desired DFPZ canopy cover, ranging from 40 to 50 percent within the Size Class 4 trees (11–24 inches DBH) and Size Class 5 trees (greater than 24 inches DBH), as defined by the California Wildlife Habitat Relationship (CWHR) classification system.

Radial thinning and thinning from below not only achieve DFPZ desired conditions, these treatments also help to maintain the vigor of the older, larger trees, particularly hardwoods and pines.

Radial thinning or release would occur around large diameter pine species. Radial release of conifers would be conducted around one to three of the largest healthiest growing sugar pine, or ponderosa pine greater than 24 inches in diameter on a per acre basis. Radial thinning would correlate to tree DBH. For example a 24 inch diameter tree would have a radius thinning of 24 feet. Radial thinning or release would not exceed a 30 foot radius.

Undesirable pines less than 24 inches in diameter and all other conifers less than 28 inches in diameter would be removed in the radial release. Black oak trees greater than 6 inches in diameter would be retained during radial thinning.

Radial release would be conducted around all living black oak trees 6 inches in diameter or greater, on up to 5 trees per acre (See black oak below). The intent of the release is to promote the health and retention of black oak by removing competition while retaining large conifers. This will also promote a more fire resilient structure.

Treatments are expected to encourage acorn production for the benefit of a variety of wildlife species and promote the more vigorous growth of individual oak trees. In the inner zone surrounding the edge of the black oak tree crown, from 0-20 feet, all ponderosa pine less than 24 inches in diameter and all other conifers less than 30 inches in diameter would be removed. In the zone extending from 20-50 feet from the black oak tree crown, healthy growing conifers would be retained at an approximate density of 50 to 100 square feet of basal area.

Harvested black oak less than 6 inches DBH, tanoak 3.0 to 8.9 inches DBH and conifer trees 3.0 to 8.9 inches DBH, would be either machine piled and burned, or removed from treatment areas. All trees 30 inches DBH or larger would be retained, unless removal is required to ensure the safety of forestry workers or for operations. Residual spacing of conifers would establish a random mosaic pattern in DFPZs, responsive to unique forest stand and fuel conditions. This canopy cover reduction is illustrated in figure 1-9. Radial release treatment methods would correlate to tree diameter, and species; not to exceed a 30 foot radius. For example, a 28 inch DBH ponderosa pine tree would have a radius thinning of 28 feet, as illustrated by the red arrows in the following figure 2-6. Pine trees less than 28 inches DBH, and all other conifers less than 28 inches in diameter, would be removed within the 28 foot radial perimeter until desired DFPZ inter-tree canopy separation is achieved. Radial release would be conducted around black oak trees 6 inches DBH or greater, on up to 3 trees per acre.

Figure 2-6 Radial thinning or release

In the inner zone surrounding the edge of the black oak tree crown, from 0–20 feet, all ponderosa pine less than 24 inches DBH and all other conifers less than 30 inches DBH would be removed. In the zone extending from 20–50 feet from the outer edge of the black oak's tree crown, healthy growing conifers would be retained at an approximate density of 50 to 100 square feet of basal area per acre.

DFPZ: Mastication

Masticators or grinders are tracked vehicles (sometimes with self leveling cabs) having a forward mounted, rotating head attached to an articulated arm used to shred woody material. Under the Proposed Action, shrubs would be masticated, as would trees less than 9 inches DBH, until desired DFPZ canopy cover and inter-tree spacing are achieved. Where existing, black oaks greater than 6 inches DBH would be left where necessary to achieve desired spacing of residual conifers and black oaks of approximately 18 feet (±25 percent) in smaller tree size aggregations (less than 11 inches DBH), and from approximately 22 to 25 feet (±25 percent) in medium tree sizes (from 11 to 24 inches DBH).

DFPZ: Hand Cutting of Trees and/or Shrubs, and Pile Burning.

After thinning and radial release treatments remove canopy cover and crown fuels, existing surface and ladder fuels, along with operational generated slash concentrations (i.e., debris resulting from operations), would be hand cut, hand piled and burned. Hand cutting and pile burning would be used to reduce fuels in areas where mechanical equipment could potentially cause adverse effects to water, soils, botanical and habitat resources.

This DFPZ treatment may also involve thinning aggregations of conifers or plantation trees 1–9 inches DBH to increase inter-tree spacing. Spacing of residual conifers and black oaks would be approximately 18 feet (±25 percent), retaining the healthiest, largest, and tallest fire-resilient conifers and black oaks.

Excessive existing forest debris, along with woody debris (slash) from tree felling and shrub cutting, would be manually gathered into small piles. Once piled and covered with waxed paper, woody debris would be allowed to cure for approximately 30 days; prior to ignition. This design feature would allow woody debris to dry out prior to burning; promoting rapid consumption of debris to minimize smoke production. Wood piles would be burned just prior to or during wet weather conditions to ensure controlled fire.

Hand piled debris within 250 feet of private land infrastructures would require manual fireline construction. Fireline construction would entail manually scrapping debris (i.e., duff and forest litter) to expose mineral soil from 1 foot to 2 feet in width surrounding wood piles, prior to ignition.

DFPZ: Underburning

Underburning is a prescribed burn carried out under an existing canopy of hardwoods or conifers trees. It is designed to consume excess live and dead vegetation on the forest floor, including existing down fuels and treatment generated slash, as shown in figure 2-7. Prescribed underburn treatment(s) would occur to further reduce surface fuels, if other prior fuels reduction treatments are insufficient in achieving desired DFPZ conditions. Prescribed underburning would be conducted when environmental conditions are favorable to achieve minimal smoke dispersal and low intensity fire behavior.

Figure 2-7 Underburning

Underburn treatment areas are designed to use existing roads for control lines. Where needed, temporary control lines would be manually constructed by field crews using hand tools or with mechanical equipment. Underburning would retain less than 5 tons per acre of surface fuels of less than 3 inches DBH and an average of 10–15 tons of large down wood per acre, where it exists, over the treatment area.

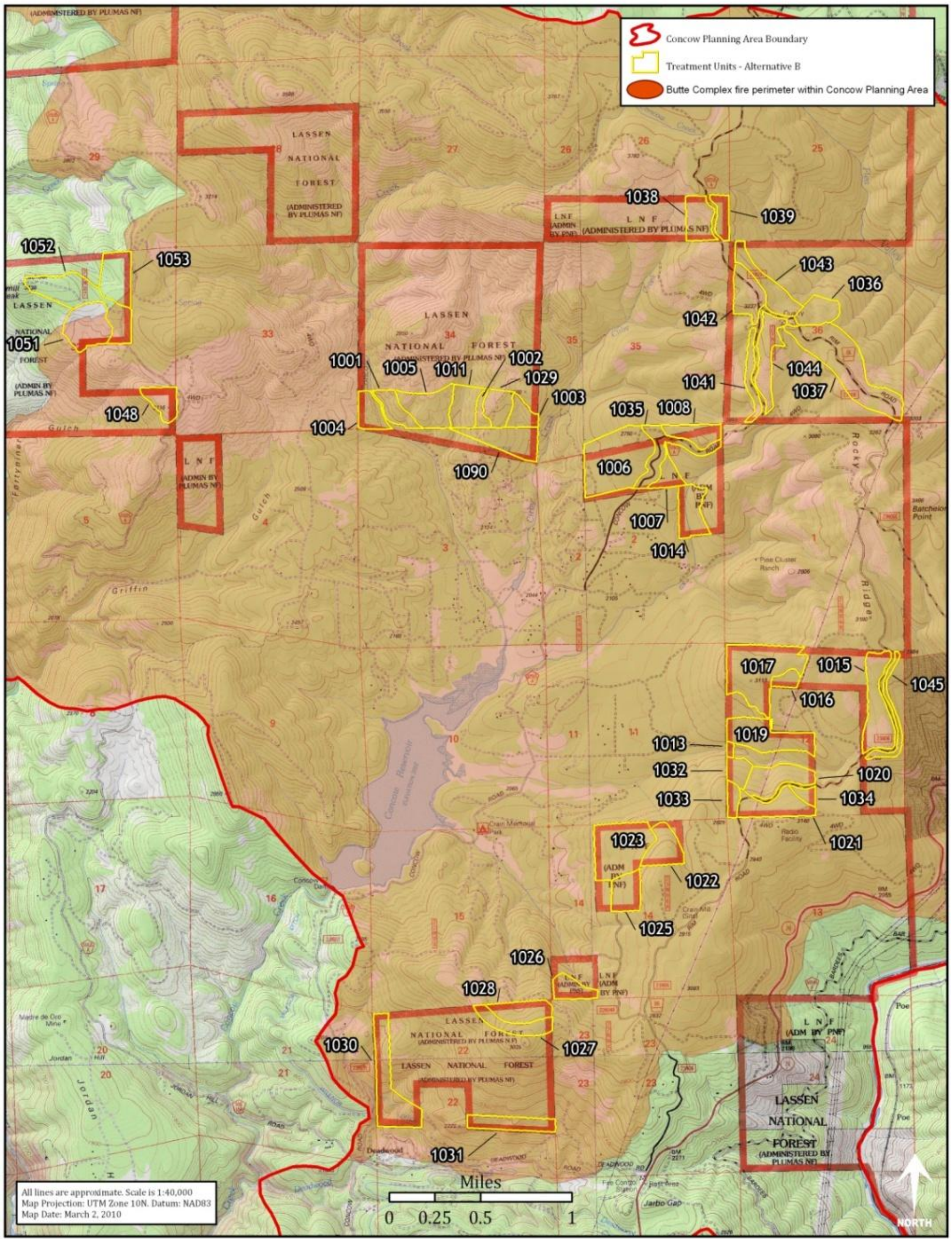
DFPZ: Riparian Habitat Conservation Area (RHCA) Treatments

Riparian Habitat Conservation Areas (RHCAs) align with perennial, intermittent and ephermal (seasonally running) streams on public land; RHCAs are intended to buffer aquatic, riparian, and meadow habitats from potentially damaging excessive land management disturbances. The RHCA stream and lake buffers vary in width depending on site-specific environmental conditions; generally the start 150+ feet from the water’s edge.

Hand cutting and hand piling followed by pile burning would be used to reduce the quantity of small ladder fuels, primarily conifer trees from 1 to 9 inches DBH. Hand piles would be located 25+ feet upslope of stream channels and then burned. Surface fuels would be treated by underburning; however, prescribed fire would be ignited upslope of RHCA buffers and allowed to back down slope. This method aims to maintain fire smoldering at a low severity to protect riparian habitats and animals. All riparian vegetation (i.e., large mixed conifer and hardwood trees) would be retained.

Defensible Fuel Profile Zone Treatments in Burned Areas

The Proposed Action would establish and maintain DFPZs in areas burned by all intensities of wildfire, as spatially depicted on map 2-3. DFPZ treatments are designed to remove dangerously high concentrations of post-fire charred, standing dead fuels, particularly alongside private property boundaries and primary evacuation routes. Post-fire regrowth would be treated to maintain DFPZ open forest conditions through a combination of spatially overlapping fuels reduction and forest health vegetation treatments to alter fire behavior. Map 2-3 illustrates planned DFPZ treatment units (yellow) near the communities of Concow and Yankee Hill within the 2008 Butte Lightning Complex burn perimeter.



Map 2-3 Proposed Action (Alternative B) Burned Area Treatment Units

DFPZ: Tree Felling and Removal

Select standing dead trees greater than 20 inches DBH with timber sawlog (lumber quality) commercial value, in excess of wildlife snag habitat retention requirements, would be felled and removed off site to be sold at fair market value. Although many trees killed in 2008 by wildfire have already succumbed to too significant a degree of wood decay to allow for commerical use as sawlogs (lumber quality), this key resource would be made available to commercial biomass markets.

Along roads within DFPZs, danger trees of any size would be felled. Dead trees 12 to 19.9 inches DBH would be felled and removed off site, sold either as wood chips (biomass), incinerated or made into fire wood.

After select danger trees in DFPZs are felled and removed off site allowing for safe working conditions, surface and ladder fuels would be reduced, removed or rearranged to accelerate wood decomposition by applying a combination of the following treatments:

- Mastication, followed by;
- Hand piling, and;
- Lop and scatter.

These post-harvest activities are described below.

DFPZ: Mastication

Masticators would be used to re-arrange dead and live vegetative fuels to achieve a mosaic pattern, by cutting, shredding or grinding, and then scattering debris from dead trees and post fire regrowth (primarily hardwood sprouts) evenly over the treatment site. Tending post fire (figure 2-8) regrowth is key to achieving and maintaining desired fuel and vegetative conditions in DFPZs over time. Select shrubs would be masticated, as would trees up to 19.9 inches DBH, retaining small, less than ¼ acre untreated areas for structural diversity.

Figure 2-8 Post Fire Regrowth

Black oak stump sprouts would be left untreated at an approximate spacing from 18 to 25 feet, with mastication in between. Mastication would also be applied as a follow-up maintenance treatment to reduce overcrowding of basal sprouts, and shrub growth. Masticators may operate on slopes up to 45 percent slope; allowable for short pitches when soil moisture is low to reduce the potential for displacement or erosion. Prior to operation or project implementation mandatory equipment specifications would be verified, including the following:

- Prime power unit – a tracked unit with maximum ground pressure that shall not exceed 5–8 psi
- Masticating or mulching head with an articulating boom reaching 20 feet or greater from machines center
- Ability to work continuously on 0–45 percent slopes
- Operating ability effective enough to limit the number of passes the machine makes for soil compaction concerns.

DFPZ: Hand Cutting and Hand Piling of Trees and/or Shrubs, and Pile Burning

This treatment involves manual cutting of shrubs and trees 1 to 9 inches DBH, including thinning overly dense aggregations of coniferous plantation trees of similar size. Debris or slash from felled trees, shrubs, and existing surface and small ladder fuels would be manually gathered into piles and burned by field crews.

In order to ensure controlled prescribed fire, wood piles to be burned within 250 feet of private properties with infrastructures would require 1–2 foot wide fireline construction. Fireline construction would entail scrapping surface debris around piles to expose mineral soil, in order to keep fire from creeping away from concentrated piled fuels. Hand piles would be covered with waxed paper and allowed to cure for approximately 30 days. This design feature would reduce woody moisture content for rapid consumption to minimize smoke production. Wood piles would be burned just prior to or during wet weather conditions, to further reduce the risk of escape.

DFPZ: Lop and Scatter Dead trees less than 11.9 inches DBH would be cut into various lengths and left on site; typically as a secondary treatment when primary surface fuels treatment are not sufficient in achieving desired DFPZ conditions.

DFPZ: Riparian Habitat Conservation Area (RHCAs) Treatments

In RHCAs within burned areas, treatment methods would vary. All live riparian vegetation would be retained. Within the initial 25 foot zone, immediately adjacent to streams, densely growing post-fire hardwood sprouts and dead trees from 1 to 9 inches DBH would be hand-felled.

Debris from dead trees felled and shrubs cut, along with excessive existing dead forest litter, would be lopped and scattered or manually gathered into piles 25 feet upslope, then burned. Unless immediately adjacent to a structure, burn piles would not require the construction of fireline. Debris wood piles would be covered with wax paper and allowed to cure for approximately 30 days; subsequently burned during wet weather conditions.

Outside of the 25 foot zone generally up to 75 feet upslope to the extent of the RHCA perimeter, select sprout and dead trees from 1 to 9 inches DBH would either be hand-thinned, hand piled and burned, masticated or chipped. If a strictly ground based removal system is used (as opposed to aerial discussed below), exceptions to the above treatment guidelines would occur within portions of Concow Creek and the unnamed tributary to Concow Creek associated RHCAs.

On the east side of Concow Creek, mechanical equipment would be allowed to use an old road bed, which runs immediately parallel to the stream channel. Along the west side of the unnamed tributary to Concow Creek, a 75 foot no ground equipment zone would be required, with a 150 foot no equipment zone on the steeper slopes (35% or greater) on the east side of the stream channel. If helicopter removal is used due to road access restrictions, commercially valuable or merchantable trees greater than 12 inches DBH would be felled and aerially removed from the RHCAs beyond the 25 feet streamside, hand cut treatment only zone.

Surface fuels would be treated by underburning as described below; however, prescribed fire would be ignited upslope of RHCAs buffers and allowed to back down slope. This design feature aims to maintain fire prescribed to smolder at a low severity to protect riparian habitats and animals.

DFPZ: Underburning

Underburning is a prescribed burn carried out under an existing canopy of trees (hardwoods or conifers). Underburning is designed to emulate naturally occurring low severity fire by consuming excess live and dead vegetation on the forest floor. This may include existing downed fuels and treatment generated slash. Prescribed burns would be implemented when micro site, environmental conditions are favorable to achieve minimal smoke dispersal and low intensity fire behavior.

Prescribed burning can result in a range of effects given a diversity of site-specific conditions influencing fire intensity. The age of vegetation, species, distribution of ladder fuels and other localized conditions, are all factors in determining the appropriate degree and pattern in which prescribed fire is ignited. In some cases, underburning would be applied as an initial primary treatment, in addition to maintenance treatments; in others, underburning would serve only as a secondary maintenance treatment.

Underburn areas would use existing roads for control lines. Where needed, temporary control lines would be constructed by hand or with mechanical equipment with minimal impacts. Underburning would retain less than 5 tons per acre of surface fuels sized less than 3 inches in diameter, and an average of 10–15 tons of large down wood per acre, where it exists, over the treatment area.

DFPZ: Contour Tree Felling

Contour felling entails felling dead trees so they fall perpendicular to the main direction of a slope (lie along the contour). This practice would help reduce downhill soil erosion by providing a catchment for soil particles. Contour felling would be utilized on burned slopes where ground cover has been consumed by wildfire, leaving soil vulnerable to erosion. This felling technique would be utilized along the unnamed tributary to Concow Creek, where slopes do not exceed 50 percent. Trees from 10 to 12 inches DBH would be cut into 10 to 30 foot lengths, placed along slopes contour, and either staked or wedged behind stumps to hold them in place.

DFPZ: Tree Planting

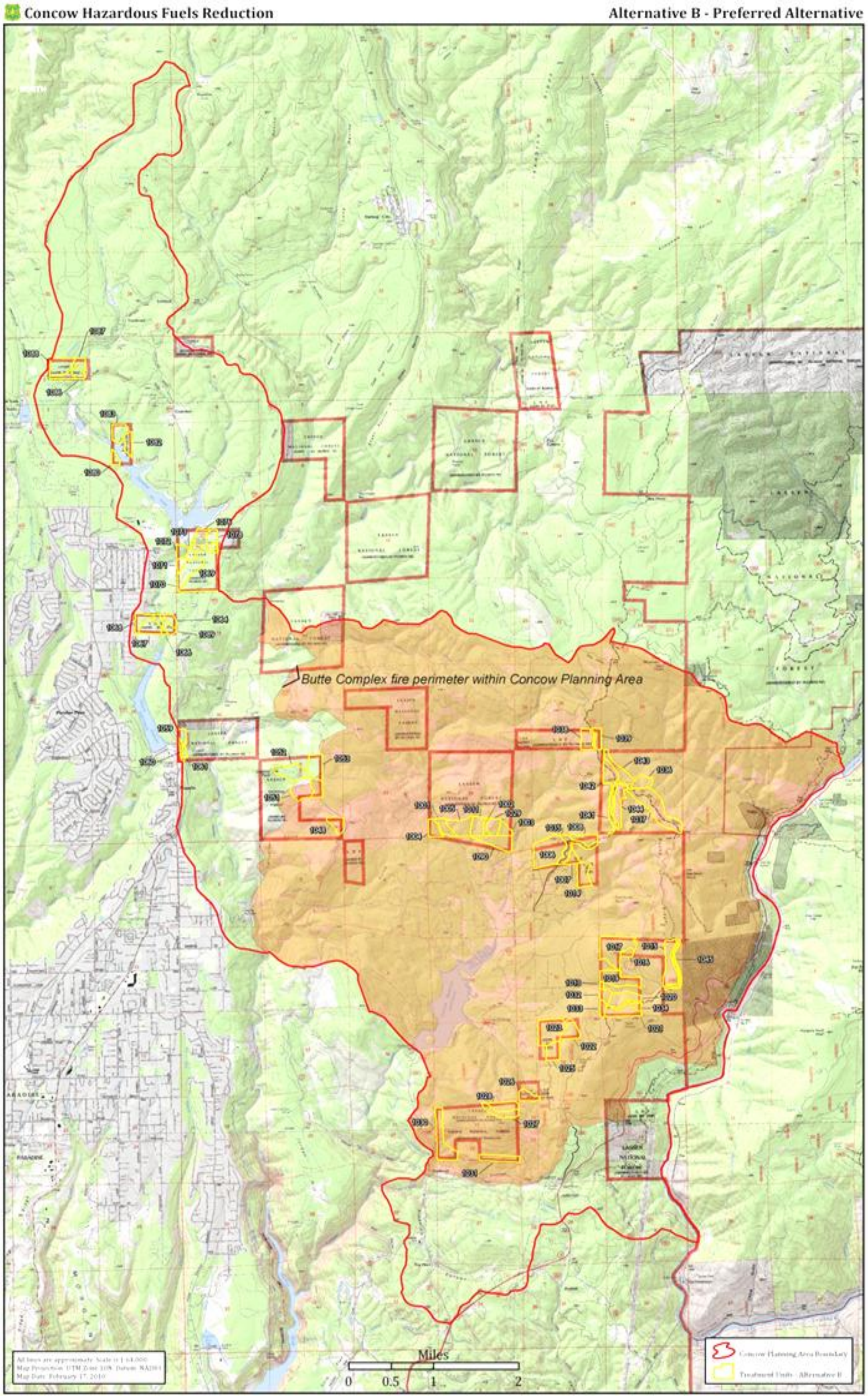
Tree species including ponderosa pine, sugar pine and Douglas-fir would be spot planted in fire damaged plantations to ensure desired stocking densities are achieved and sustained over time, as a first step toward establishing future optimal DFPZ canopy cover. Periodic manual release maintenance treatments would occur after tree planting to control competing vegetation.

DFPZ: Snags and Downed Logs

A maximum of 2 of the largest snags per acre would be left to meet wildlife needs, in DFPZ treatment areas along the Rim Road. Retained snags would be located away from community evacuation routes or fire suppression access roads to avoid potential hazardous tree falling scenarios.

In other DFPZ treatment areas, a minimum of 2 snags per acre and a maximum of 4 of the largest snags per acre would be left in clumps (less than ¼ acre in extent) to promote potential wildlife habitat continuity. As these snags continue to fall, they would contribute to the future downed woody material needs of 10–15 tons per acre. Dead trees retained within RHCAs, and outside of treatment areas, on snag retention sites, would provide additional, dispersed snag habitat throughout the Concow Planning Area.

Map 2-4 shows the DFPZs proposed in the wildland urban-interface (WUI) which are highlighted (yellow), along with treatment areas and administrative unit numbers corresponding to tables 2-1 and 2-2 Alternative B: Treatment Methods by Area. Orange shading illustrates areas burned by the 2008 Butte Lightning Complex burn perimeter. The context of these DFPZs (public land only) within the larger private land fuelbreak network is illustrated in chapter 1, map 1-3 and chapter 2, map 2-1.



Map 2-4 Alternative B Treatment Units, Proposed DFPZs, and Burned Areas

Table 2-1 Alternative B: Treatment Methods by Area (Initial Entry ONLY)

Treatment Area (Number)	Hand Cut/Pile and Burn	Lop and Scatter	Mastication	Dead Tree Removal	Radial Release and Thin	Underburn	Plantation and Spot Planting	Chip	Oak Release (Prune)	Total Treatment Acres	Landbase Area
	Estimated Maximum Acres										
1001	9		4	13				13		39	16
1002	2		3	4				4		13	6
1003	10		2				6	2	2	22	13
1004	16			14			2	14		46	16
1005	15		11	27				27		80	32
1006	3		66				6		40	115	69
1007	11	3					5		9	28	11
1008						19			11	30	19
1011	14			16				16	10	56	21
1013	2									2	2
1014	25						7		10	42	25
1015						40		25	5	70	40
1016			4	7						11	7
1017	4		64	64				10	40	182	66
1019	40									40	40
1020	9	21				10	21	15		76	30
1021			25	29				16	2	72	29
1022	3					20				23	23
1023	22		26	31			8		17	104	53
1025	3		13					8	10	34	20
1026	15									15	15
1027	1		18							19	20
1028	22		16					4		42	22
1029	4		10					10	7	31	17
1030	47	42							20	109	47
1031	22	18								40	22
1032	11	11								22	11
1033			7					4		11	7
1034	6									6	6
1035	27			27				5	7	66	27
1036	19		16				19	8		62	19
1037	76							20		96	76
1038	6		13	17				7		43	22
1039	10		2	10				2		24	12
1041	13			11				6		30	13
1042	10		12	17				7		46	25
1043	26									26	26
1044	2		22	26				18		68	28
1045	2	10						8	10	30	12
1048	16		13				16	2		47	16
1051	4		24					8		36	34
1052	2		40					5		47	51

Treatment Area (Number)	Hand Cut/Pile and Burn	Lop and Scatter	Mastication	Dead Tree Removal	Radial Release and Thin	Underburn	Plantation and Spot Planting	Chip	Oak Release (Prune)	Total Treatment Acres	Landbase Area
	Estimated Maximum Acres										
1053	4					25		2		31	29
1059			7		7			4		18	9
1060	5						2	1		8	5
1061	4									4	4
1064	1		7		8			3		19	8
1066	9									9	9
1067	19									19	21
1068	18									18	18
1069	1		87		87			35		210	90
1070	3		30		29			20		82	35
1071	2					6				8	8
1072	12									12	12
1073	3					7				10	10
1076	1		18		18			5		42	18
1078			18		18			4		40	18
1080	7									7	7
1082	3		11					5		19	14
1083	2		17					7		26	20
1086	10							1		11	10
1087	3		20		20			9		52	23
1088			30		30			10		70	31
1089	13									13	13
1090	17	13	15	7			4	15	13	84	32
Total	**666**	**118**	**671**	**320**	**217**	**127**	**96**	**385**	**213**	**2,813**	**1,510**

Table 2-1. Alternative B: Treatment Methods by Area (Initial Entry ONLY) cont'd

Table 2-2 Alternative B: Treatment Methods by Area (follow up maintenance 5–7 and 8–10 years after initial entry)

Treatment Area (Number)	Hand Cut/Pile and Burn	Lop and Scatter	Mastication	Underburn	Oak Release (Prune)	Total Treatment Acres	Landbase Area
	Estimated Maximum Acres						
1001	9		4			13	16
1002	2		3			5	6
1003	10		2		2	14	13
1004	16					16	16
1005	15		11			26	32
1006	3		66		40	109	69
1007	11	3			9	23	11
1008				19	11	30	19
1011	14				10	24	21
1013	2					2	2
1014	25				10	35	25
1015				40	5	45	40
1016			4			4	7
1017	4		64		40	108	66
1019	40			40		80	40
1020	9	21		30		60	30
1021			25		2	27	29
1022	3			20		23	23
1023	22		26		17	65	53
1025	3		13		10	26	20
1026	15					15	15
1027	1		18			19	20
1028	22		16			38	22
1029	4		10		7	21	17
1030	47	42			20	109	47
1031	22	18				40	22
1032	11	11				22	11
1033			7			7	7
1034	6					6	6
1035	27				7	34	27
1036	19		16			35	19
1037	76					76	76
1038	6		13			19	22
1039	10		2			22	12
1041	13					13	13
1042	10		12			22	25

Treatment Area (Number)	Hand Cut/Pile and Burn	Lop and Scatter	Mastication	Underburn	Oak Release (Prune)	Total Treatment Acres	Landbase Area
	Estimated Maximum Acres						
1043	26					26	26
1044	2		22			24	28
1045	2	10			10	22	12
1048	16		13			29	16
1051	4		24			28	34
1052	2		40			42	51
1053	4			25		29	29
1059			7			7	9
1060	5			5		10	5
1061	4			4		8	4
1064	1		7	8		16	8
1066	9					9	9
1067	19			21		40	21
1068	18					18	18
1069	1		87	90		178	90
1070	3		30	35		68	35
1071	2			8		10	8
1072	12			12		24	12
1073	3			10		13	10
1076	1		18			19	18
1078			18	18		36	18
1080	7			7		14	7
1082	3		11			14	14
1083	2		17			19	20
1086	10			10		20	10
1087	3		20	23		46	23
1088			30	31		61	31
1089	13			13		26	13
1090	17	13	15		13	58	32
Total Acres	**666**	**118**	**671**	**468**	**213**	**2,147**	**1,510**

Table 2-2 Alternative B: Treatment Methods by Area (follow up maintenance) cont'd.

Off-Site Forest Product Removal

Proposed treatments were not specifically designed to finance operations; however, proposed removal, radial release, thinning from below, and roadside and operational danger tree removal treatments have the potential to generate forest merchantable by-products. The Proposed Action would generate an estimated 4.1 mmbf of timber (sawlog) volume. If off-site removal does not occur in 2010, it is likely that half or more of this estimated commercial volume would experience excessive wood decay. As opportunities for cost recovery would elapse, the remaining material would be processed as biomass. Financing and cost recovery strategies as well as other forestry job creation opportunities would only be fully developed subsequent to a federal decision under NEPA.

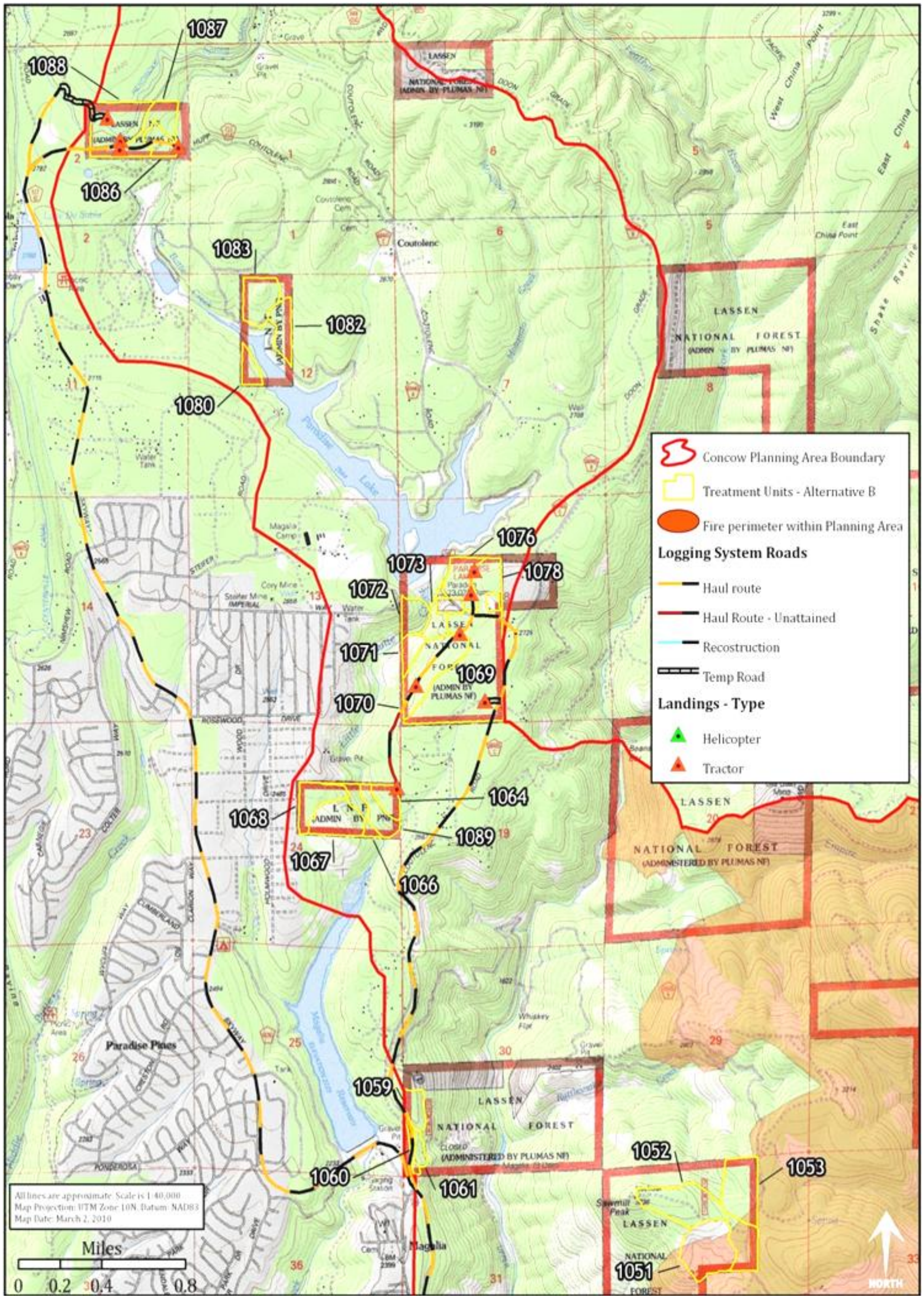
All off-site removal of hazardous fuels reduction and vegetative manipulation forest by-products must meet current land management direction along with the specific thresholds established and defined by mitigation measures contained in this document or specified by specific provision. For detailed information on proposed tree removal or extraction methods, location of proposed landing sites, haul routes, etc., (refer to maps 2-5 and 2-6).

All proposed mechanized thinning and biomass removal in DFPZ units would be conducted with feller buncher equipment. A feller buncher is logging equipment with a standard base, and an articulated arm furnished with a circular saw or a shear designed to cut small trees off at the base. The machine places the cut tree on a stack suitable for a skidder. This method of skidding uncut, whole-trees with their limbs and tree tops still attached to the main trunk, effectively reduces the need for post-project slash treatments.

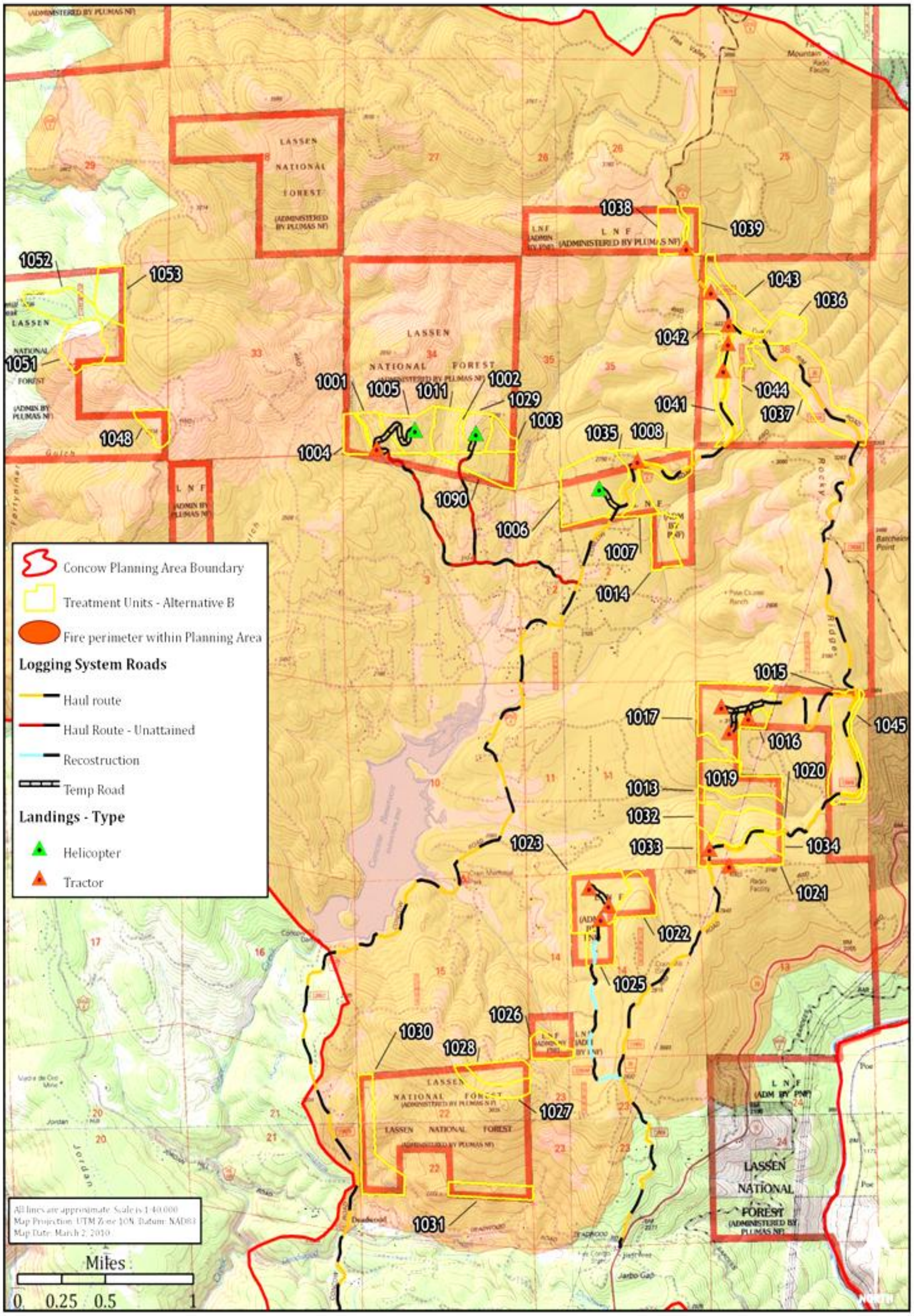
Machinery would not be allowed in Riparian Habitat Conservation Areas (RHCAs), except where Riparian Management Objectives can be fully met; specified by FS aquatic biologists.

Sawlog and Biomass Landings and Access

Some of the proposed treatment areas are essentially inholding parcels surrounded by private land ownerships. Consequentially, right-of-way permission to use private roads through key neighborhoods as sole access routes is fundamental to the feasibility of using ground based extraction methods. For this reason, the Forest Service developed two unique off-site removal scenarios; one being ground based (i.e., feller buncher or tractor), assuming right-of-way is granted; the other being aerial (i.e., helicopter), assuming permission is denied. Both require the establishment of a system of landings or staging areas to pile, sort, and load biomass and forest by-product sawlogs onto trucks, then haul them to processing facilities. Map 2-5 highlights existing landings, access routes and methods proposed for tree and biomass removal and potential commercial utilization in the unburned areas (western portion) of the Concow Planning Area. Map 2-6 highlights existing landings, access routes and methods proposed for tree and biomass removal and potential commercial utilization in the burned areas (eastern portion) of the Concow Planning Area.



Map 2-5 Alternative B Logging Systems and Haul Routes in Unburned Areas



Map 2-6 Alternative B Logging Systems and Haul Routes in Burned Areas

Alternative B - Logging Systems and Haul Routes in Burned Areas:

In the event right-of-way permission is not granted, aerial systems would remove dead fuels greater than 19.9 inches in diameter, considered commercially valuable. Helicopters would move trees from the treatment sites to the processing areas (i.e., landings). From the landings, trucks would remove logs from the forest. Helicopters may also be used to transport equipment such as portable chippers to the site for processing. The use of helicopters allows access to additional areas too steep for safe ground-based operations. Helicopters also fully suspend trees or material in transport from the treatment area to the landing area, without creating excessive ground disturbance via skid trails or corridors. For this reason, tree removal by helicopter would be permitted within 25 feet of streams. In contrast, ground-based equipment would not be allowed within 75+ feet along both sides of all stream channels.

Landings or Staging Areas. The Forest Service reviewed both public and private lands throughout the entire Planning Area to determine where suitable sites for landings already exist, as well as where new landings could be developed. This analysis for this FEIS assumes utilizing 30 of these initially identified candidate landings. To ensure adequate consequence analysis, during actual implementation there would be no additional landings authorized for use. It may be possible to exchange sites if the effects were determined to be equivalent or lesser, and the final implementation plan could potentially utilize fewer than this identified number. In addition, existing roads (in addition to or instead of additional landing construction) could potentially be used during actual implementation, as long as in compliance with California State Occupational Safety and Health Administration (CA-OSHA) guidelines.

Helicopter landings, or roadways utilized as landings are required to have adequate flight paths and drop zones under CA-OSHA. Compliance with these guidelines may require the strategic felling of some trees greater than 20 inches in diameter. The Forest Service has already minimized the likelihood of this potentiality during refinement and selection of sites. The size of new landing areas would range from an estimated 0.4 acre (roughly equivalent to a landing (80 feet × 200 feet) to approximately 0.75 acre (175 feet × 175 feet) in size. Some existing landings are larger than this. Before a final decision is made to select landing sites, further verification and refinement of these sites is expected to occur. Not all of these potential sites may be needed to facilitate operations.

Assumptions Regarding Implementation

Concurrent with implementation, monitoring would be conducted by the authorizing agencies to ensure that the effects of any decision are equal to or lesser than those documented in NEPA planning analysis and decision. Under NEPA, there is a need to accurately estimate the extent of treatments, their locations, and the degree of environmental effects.

At a landscape (Project Area) scale, the NEPA process predicts this extent in order to predict potential consequences. These predictions are used to set limits or thresholds on this extent. With extensive active and concurrent monitoring, these thresholds would allow implementation of the decision under NEPA, and ensure that the decision would not exceed the established thresholds and thus the predicted effects. Because of these sideboards, the scope of this project and its analysis under NEPA will not include analyzing administrative planning expenditures, or deciding financing or packaging of implementation contracts. The exact locations of stands and areas that meet treatment criteria would be more accurately determined over the next several years. The combinations of contractual treatment units would be variable, with many site-specific factors affecting this variability.

Methodology for Application of Treatments

There are a number of options for implementing proposed fuel reduction treatments. The various aspects of the project proposals could be accomplished through a number of acquisition methods, or combination of methods, such as stewardship contracts, timber sale contracts, formal agreements, volunteers, community-service crews and Forest Service work crews. For example, stewardship contract is a term applied to a service contract that bundles or combines numerous actions into contracts to capitalize on economies of scale and more efficient scheduling of work, in addition to minimizing impacts on the land through staging of the work.

The type of contract, agreement, or work crews selected would be part of an overall project implementation strategy and plan, based on methods that best meet each project goal or objective, combined with Federal acquisition regulations and financing available for implementation. At this time, a likely scenario for implementation of this multi-year proposal for hazardous fuels reduction treatments is the use of service and stewardship authorities for contracting.

Mitigation Measures and Management Requirements

The Forest Service is required to identify all relevant, reasonable mitigation measures that could improve the project, as is mandated by the CEQ Regulations for implementing the procedural provisions of NEPA. Mitigation, as defined in the CEQ Regulations (40 CFR 1508.20) includes:

- Avoiding the impact altogether by not taking a certain action or parts of an action;
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- Rectifying or eliminating the impact over time by preservation and maintenance operations during the life of the action;

- Compensating for the impact by replacing or providing substitute resources or environments;
- Rectifying the impact by repairing, rehabilitating or restoring the affected environment;
- Proposed mitigation measures and standard operating procedures as well as Best Management Practices (BMP) designed to avoid or minimize adverse effects (or implement positive impacts) for the Proposed Action as identified by resource topic area, and;
- Mitigation measures identified within this document are specific to the implementation of actions considered within this FEIS. Also incorporated by reference as required measures are Standards and Guidelines and mitigation measures identified in the PNF Land and Resource Management Plan as amended by the 2004 Sierra Nevada Forest Plan Amendment Record of Decision and standard operating practices (referred to as B provisions).

A detailed description of mitigation measures incorporated into Alternatives B and C (described next) are included in the FEIS: appendix A. These measures would be applied during project implementation under the action alternatives, and monitored throughout the duration of project activities. Upon a final decision as documented in a Record of Decision, selected measures would become a requirement.

Monitoring

Monitoring of DFPZs is required to ensure that proposed land management activities are conducted in compliance with forest, regional and national standards. Monitoring is fundamental to informed decision making that can influence future conditions. The objective of the Concow Monitoring Plan is to: 1) gather new information to determine the effectiveness of management decisions; 2) establish a baseline for various measures prior to project implementation and mitigations, and; 3) verify the accuracy of analysis assumptions and conclusions. The Concow Monitoring Plan is contained in appendix A.

2.2.3 Alternative C (Alternative to the Proposed Action)

Alternative C is designed to further the completion of the HFQLG Pilot Project's larger Defensible Fuel Profile Zone (DFPZ) network, and to fill in gaps linking shaded fuelbreak networks on private land in the wildland urban-interface (WUI). For this reason, Alternative C would establish a DFPZ network on FS and BLM administered lands (maximum of 1,363 acres) around the local communities of Paradise, Magalia, Concow and Yankee Hill in Butte County, California. While Alternative C would create DFPZs it does not propose to maintain them; the necessity and scope of follow up treatments would be developed and assessed in a separate environmental analysis.

Alternative C would alter multiple aspects of fuels conditions simultaneously in a single entry phase (1-4 years to allow operations to be implemented during optimal environmental conditions). This would occur in an area comprising 4 percent of the Concow Planning Area (includes all land ownerships and jurisdictions), and 17 percent of the Concow Project Area (public lands only within the Concow Planning Area; a subset of the broader scale). Under Alternative C, the DFPZ network is designed to alter fire behavior during the hottest, driest (90^{th} to 97^{th} percentile), worst weather conditions for roughly the next 10 years.

Alternative C would fulfill hazardous fuels reduction elements of the Purpose and Need through solely non-commercial funding sources; consistent with Butte Unit's Community Wildfire Protection Plan (CWPP) endorsed shaded fuel break treatments being implemented on private land. For this reason, this action alternative would establish DFPZs in a variety of unburned and burned vegetative environments by reducing selected surface and small live ladder fuels less than 9 inches DBH, and dead ladder fuels up to 11 inches DBH, similar to shaded fuelbreaks; a treatment many private land owners are using in cooperation with local Fire Safe Councils. It also allows for felling operational imminent danger trees around work areas (i.e., adjacent to biomass and log landings, along skid trails, etc.).

Figure 2-9 Overcrowded Forest

Wildlife snag habitat composed of medium and large standing dead trees would be retained, with the exception of those considered an absolute imminent danger to human safety adjacent to homes and roadways. Small live trees in the unburned areas and small dead trees in the burned areas would be felled and surface fuels treated on location. Larger wood debris resulting from tree felling operations would be made available for personal firewood cutting. Tree stems (generally less than 3 inches DBH) may be left untreated on-site to provide adequate soil cover, while excess, concentrated surface fuels composed of large limbs and tree tops (slash) may chipped and scattered, hand cut, hand piled and burned, or lopped and scattered on site to succumb to natural wood decomposition.

As a first step toward establishing optimal desired DFPZ open forest conditions, post-fire regrowth would be treated through a combination of spatially overlapping surface and small ladder fuels treatments, as described below (sequence order does not necessarily reflect treatment priorities). As depicted in figure 2-8, DFPZ treatments would reduce overcrowded mixed conifer forest conditions with characteristic horizontal and vertical fuel connectivity to maintain flame lengths less than 4 feet during a fire incident. The potential maximum acres treated displayed below is further presented by treatment area, by entry, in tables 2-3 and 2-4. Each treatment area number listed in these tables correlates to the area numbers shown on maps 2-2, 2-3, and 2-5, providing a spatial context over the broader landscape relative to burned and unburned treatment areas within the Concow Planning Area.

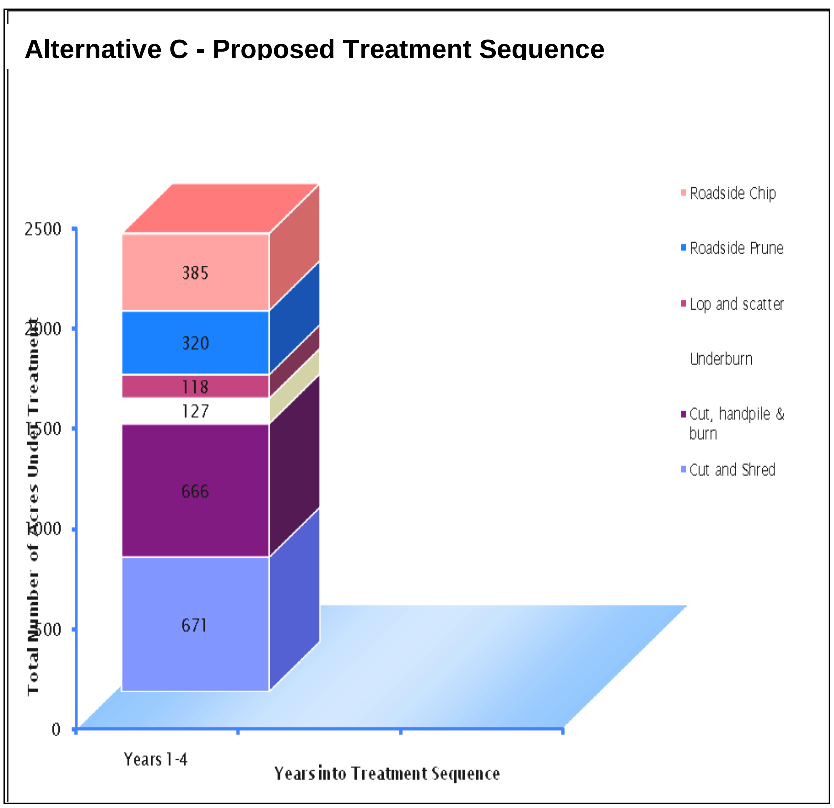


Figure 2-10 Alternative C Proposed Treatment Sequence

Defensible Fuel Profile Zone Treatments Methods in Unburned Areas

Alternative C would establish DFPZs in overcrowded mixed conifer forests through a combination of spatially overlapping surface and small ladder fuels treatments, as spatially illustrated by map 2-2.

Surface and ladder vegetative related fuels provide a route for fire to climb into the crowns of larger healthy trees, as depicted in figure 2-19. Increasing the spacing between individual trees and tree crowns in DFPZs would influence fire behavior. The treatment preference for tree species retention would be in the following order: ponderosa pine, black oak, sugar pine, Douglas-fir, incense-cedar, true fir and tree-form tanoak. Within DFPZs, desired residual or remaining trees would be the healthiest, largest, and tallest conifers and black oaks with variable inter-tree spacing to reduce canopy cover, where environmental conditions allow.

DFPZ: Thinning from below

DFPZ fuels reduction treatments are designed to increase the spacing between individual trees and tree crowns to influence fire behavior. Small ladder fuels would be reduced using thinning from below, whereby the smallest, unhealthiest or most suppressed trees would be felled first, followed by select intermediate trees less than 8.9 inches DBH, to achieve desired DFPZ inter-tree spacing. One particular focus would be removing those small to intermediate trees growing underneath or near enough to compete with healthy large trees to be retained. The terms suppressed and intermediate relate to the individual tree's crown position in the canopy, and do not describe individual tree size.

Thinning from below would reduce tree canopy cover, while retaining all live trees greater than 9 inches DBH in the *California Wildlife Habitat Relationship* (CWHR) system Size Class 4 stands (trees 11–24 inches DBH) and Size Class 5 stands (trees greater than 24 inches DBH). Thinned hardwoods less than 6 inches DBH, and conifers 2.0 to 8.9 inches DBH would be handcut, handpiled and burned, or lopped and scattered. Residual spacing between trees would be variable based upon unique fuels conditions.

Shade intolerant species prefer full, open sunlight on the forest floor to establish and grow. The preference for the residual trees is shade intolerant, fire resistant species (i.e., ponderosa and sugar pine, and hardwoods), where they exist. Where California black oak is present in treatment areas, an average basal area of 25 to 35 square feet per acre of oaks over 15 inches DBH would be retained. In areas where preferred larger oaks are not present, black oaks greater than 6 inches DBH would be retained.

DFPZ: Mastication

Mastication re-arranges fuels by grinding woody shrubs or trees into smaller pieces and scattering the material evenly over the site. Shrubs would be masticated in a mosaic pattern, as would select conifers less than 8.9 inches DBH to move conditions toward desired DFPZ inter-tree spacing and canopy cover. Hardwoods less than 6 inches DBH would be masticated, unless needed to achieve desired inter-tree spacing. Mechanical ground based equipment would be used for mastication, and permitted only on slopes less than 35 percent, except for short pitches on up to 45 percent slope.

DFPZ: Hand Cutting of Trees and/or Shrubs, and Pile Burning

Hand cutting and pile burning would be used to reduce fuels in Riparian Habitat Conservation Areas (RHCAs) and other areas where mechanical equipment is not allowed. This method would also be utilized adjacent to private property to achieve desired DFPZ surface and ladder fuels conditions.

This treatment involves manual cutting of shrubs, conifers 1 to 8.9 inches DBH from beneath overstory trees, and hardwoods less than 6 inches DBH. This treatment may also involve thinning aggregations of 1 to 8.9 inches DBH coniferous plantation trees. Debris from trees felled, shrubs cut, and existing forest debris would be manually gathered into piles and burned. The majority of brush (dead or alive) would be removed to allow15 to 20 foot spacing between clumps, beginning at the brush line near the road edge, leaving only individual specimens to minimize impacts to visual quality.

In order to ensure controlled prescribed fire, wood piles to be burned within 250 feet of private properties with infrastructures would require 1–2 foot wide fireline construction. Fireline construction would entail scraping surface debris around piles to expose mineral soil, in order to keep fire from creeping away from concentrated piled fuels. Hand piles would be covered with waxed paper and allowed to cure for approximately 30 days. This design feature would reduce woody moisture content for rapid consumption to minimize smoke production. Wood piles would be burned just prior to or during wet weather conditions, to further reduce the risk of escape.

DFPZ: Pruning

Remaining conifers, including saplings, would be pruned up to a 16’ height or one-third of the healthy live crown, whichever is less, within the 100 ft. prism along the roads throughout the Project Area, where the potential for human caused ignition of fire is most likely.

DFPZ: Underburning

Prescribed underburning would be conducted when environmental conditions are favorable, to achieve desired smoke dispersal and low intensity fire behavior. After burning, residual surface fuels of less than 3 inches diameter would not exceed an average 5 tons per acre. An average of 10–15 tons of large down wood per acre would be retained, where it exists, over the treatment area.

Figure 2-11 Underburning

Underburn treatment areas are designed to use existing roads for control lines, as depicted by figure 2-11. Where needed, temporary control lines would be constructed by hand or with mechanical equipment.

DFPZ: Riparian Habitat Conservation Area (RHCAs) Treatments

Within RHCA stream and lake buffers (variable widths depending on site-specific environmental conditions; generally 150+ feet from the water's edge), surface and small ladder fuels, primarily conifer trees from 1 to 8.9 inches DBH would be reduced. Hand cut debris located immediately adjacent to streams, would be gathered into piles 25+ feet upslope, than burned when weather permits. If surface fuels are not sufficiently reduced to achieve DFPZ desired conditions, prescribed fire would be ignited upslope of RHCAs buffers and allowed to back down slope as a secondary treatment. This design feature aims to maintain fire prescribed to smolder at a low severity to protect riparian habitats and animals. All riparian vegetation (i.e., large mixed conifer and hardwood trees) would be retained.

Defensible Fuel Profile Zone Treatments Methods in Burned Areas

Alternative C would establish DFPZs in areas burned by all intensities of wildfire. DFPZ treatments are designed to remove dangerously high concentrations of post-fire charred, standing dead fuels, particularly alongside private property boundaries and primary evacuation routes. Post-fire regrowth would be treated to maintain DFPZ open forest conditions through a combination of spatially overlapping surface and small ladder fuels reduction treatments to alter fire behavior, as spatially illustrated by map 2-3. Figure 2-12 illustrates the condition after the 2008 wildfires within the project area, and provides a record of the damage to former, well established plantations.

DFPZ: Mastication


Figure 2-12 Fire damaged plantation

Mastication would re-arrange surface and ladder fuels by cutting, shredding or grinding woody shrubs and dead trees up to 11.0 inches DBH, then scattering the material on site.

Black oak stump sprouts would be left untreated spaced roughly 15-20 ft., with mastication in between. All masticated stumps would be 6 to 8 inches off the ground. Mechanical ground based equipment would be used for mastication, operating on slopes up to 35 percent, except for short pitches up to 45 percent slope. Equipment specifications would include:

- prime power unit – a tracked unit with maximum ground pressure that shall not exceed 5–8 psi;
- machine(s) equipped with a masticating or mulching head with an articulating boom that can reach 20 feet or greater from the center of the machine;
- machinery capable of minimizing the number of passes the machine makes for soil compaction concerns.

Masticators would be prohibited within 75 feet of either side of all stream channels**.** On the east side of Concow Creek, masticators may use an old road bed, which runs parallel to the channel. On the steep, east slopes of the unnamed tributary to Concow Creek, masticators would be restricted from working within 150 feet on either side of the stream channel.

DFPZ: Hand Cutting and Hand Piling of Trees and/or Shrubs, and Pile Burning

This treatment would involve the following:

- Manual cutting of shrubs;
- Manual cutting of trees 1 to 8.9 inches DBH;
- Manual cutting of hardwoods less than 6 inches DBH, and/or;
- Thinning aggregations of 1 to 8.9 inches DBH conifers or plantation trees.

The majority of brush (dead or alive) would be hand cut, hand piled and pile burned to achieve 15 to 20 foot inter-plant spacing, beginning at the brush line near the road edge, leaving only individual specimens to minimize reducing visual quality. All hand cut stumps would be 2 to 4 inches off the ground. Debris from cut trees and shrubs (slash), and existing forest debris, would be manually gathered into piles and pile burned.

Wood piles located adjacent to private land and infrastructures would have 1 to 2 foot wide firelines scraped to mineral soil to ensure full containment of prescribed fire. Handpiles would be covered with waxed paper and allowed to cure for approximately 30 days. This method would promote rapid consumption to minimize smoke production.

Wood piles would be burned just prior to or during wet weather conditions to ensure controlled fire behavior. Unless immediately adjacent to a structure or private property, hand scraped fire lines would not be constructed. Wood piles would be covered with wax paper and allowed to cure for approximately 30 days, then burned during wet conditions.

Lop and Scatter. Brush or dead trees less than 11.0 inches DBH would be cut into 3 foot lengths and left on the site, in locations where fuel loading is minimal to provide soil cover on barren slopes.

DFPZ: Riparian Habitat Conservation Area (RHCA) Treatments

In RHCAs within burned areas treatment methods would vary. Hand cutting and pile burning would be used to reduce small ladder fuels in portions of selected RHCAs and other areas where mechanical equipment is not allowed.

Within the initial 25 foot zone immediately adjacent to streams, shrubs and trees from 1 to 9 inches in diameter would be hand-thinned. Cut trees and shrubs would be lopped and scattered or gathered into piles 25+ feet upslope and burned.

If fuels are not sufficiently reduced to achieve DFPZ desired conditions, prescribed fire would be ignited upslope of RHCA buffers and allowed to back down slope as a secondary treatment. This method aims to maintain fire prescribed to smolder at a low severity to protect riparian habitats and animals. All riparian vegetation (i.e., large mixed conifer and hardwood trees) would be retained.

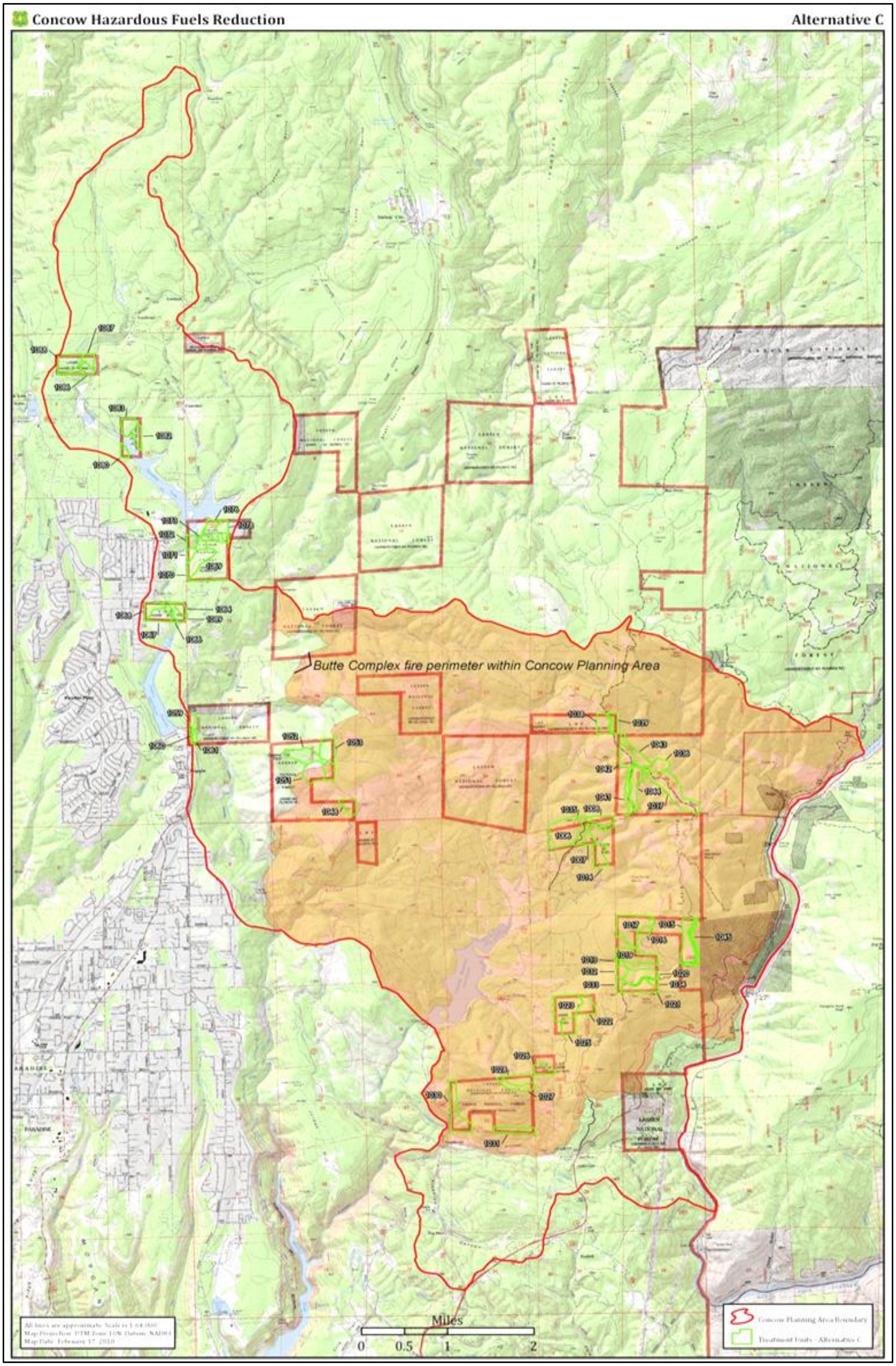
DFPZ: Underburning

Underburning is a prescribed burn method carried out under an existing canopy of trees (hardwoods or conifers). It is designed to consume excess live and dead surface fuels on the forest floor. This may include existing downed fuels and treatment generated slash. Prescribed burns would be conducted when environmental conditions are favorable to achieve desired smoke dispersal and low intensity fire behavior. The age of vegetation, the species, and the distribution of ladder fuels and other localized conditions, would all factor into determining the appropriate degree and pattern in which prescribed fire is ignited. In some cases, underburning would be applied as a primary treatment. Underburn areas are designed to retain less than an average of 5 tons per acre of less than 3 inches DBH and an average of 10–15 tons of large down wood per acre. When feasible, existing roads would be used as control lines. Where needed, control firelines would be constructed by hand.

DFPZ: Roadside Treatment

All dead trees would be left in place, with the exception of imminent danger trees within 100 feet of either side of main roads (open all year long); these trees would be left in place. Dead down woody material ¼ inch to 3 inches in diameter would be chipped and piled 100 feet along both sides of the road. Tree stems greater than 6 inches in diameter would be left on the ground as down logs.

Map 2-7 illustrates DFPZs proposed in the wildland urban-interface (WUI) highlighted (green) along with treatment areas and administrative unit numbers, which correspond to tables 2-1 and 2-2 Alternative B: Treatment Methods by Area. Orange shading illustrates areas burned by the 2008 Butte Lightning Complex burn perimeter. The context of these DFPZs (public land only) within the larger private land fuelbreak network is illustrated in chapter 1: map 1-3 and chapter 2: map 2-1.



Map 2-7 Alternative C

Table 2-3 Alternative C: Treatment Methods by Area

Treatment Area	Handcut/Pile & Burn	Lop & Scatter	Mastication	Underburn	Roadside Chip	Roadside Prune	Total Treatment Area	Landbase Area
(Number)	Estimated Maximum Acres							
1006	3		66				99	69
1007	11	3					14	11
1008				19	3	3	25	19
1013	2						2	2
1014	25						25	25
1015				40	8	8	56	40
1016			4				4	7
1017	4		64				68	66
1019	40						40	40
1020	9	21		10	3	3	46	30
1021			25		5	5	35	29
1022	3			20			23	23
1023	22		26				48	53
1025	3		13				16	20
1026	15						15	15
1027	1		18				19	20
1028	22		16		2	2	42	22
1030	47	42					89	47
1031	22	18					40	22
1032	11	11					22	11
1033			7		1	1	9	7
1034	6				1	1	8	6
1035	27				17	17	61	27
1036	19		16		1	1	37	19
1037	76				22	22	120	76
1038	6		13		3	3	25	22
1039	10		2		1	1	14	12
1041	13				5	5	23	13
1042	10		12		8	8	38	25
1043	26				1	1	28	26
1044	2		22		3	3	30	28
1045	7	7			4	4	22	12
1048	16		13		1	1	31	16
1051	4		24		2	2	32	34
1052	2		40		19	19	80	51
1053	4			25	4	4	37	29
1059			7				7	9
1060	5						5	5
1061	4						4	4
1064	1		7				8	8
1066	9						9	9
1067	21						21	21
1068	18						18	18
1069	1		87		5	5	98	90
1070	3		30				33	35
1071	2			6			8	8
1072	12						12	12
1073	3			7	1	1	12	10
1076	1		18		3	3	25	18
1078			18		2	2	24	18
1080	7						7	7
1082	3		11				14	14
1083	2		17				19	20
1086	10				4	4	18	10
1087	3		20		7	7	37	23
1088			30		6	6	42	31
1089	13						13	13
Total Acres	586	102	626	127	142	142	1757	1363

2.3 Comparison of Alternative Considered in Detail

Table 2-4 Comparison of Alternatives Considered in Detail - Summary

Alternative	Description
Alternative A: No-action Alternative	The No-action Alternative provides a baseline against which to compare the other alternatives. The No-action Alternative would not establish Defensible Fuel Profile Zones (DFPZs) on public land, nor implement the recommendations in the Butte Unit's Community Wildland Protection Plan (CWPP). This Alternative allows for on-going administrative, federal land management within the Planning Area, such as reforestation, oak woodland stand tending, road maintenance and Roadside Danger Tree felling, fire suppression, and dispersed recreation.Under the No-action Alternative, current management plans would continue to guide management of the Project Area.
Alternative B: Proposed Action	The Proposed Action is designed to further the completion of the Herger-Feinstein Quincy Library Group (HFQLG) Pilot Project's larger Defensible Fuel Profile Zone (DFPZ) network, and to fill in gaps linking shaded fuelbreak networks on private land in the wildland urban-interface (WUI). The Proposed Action would establish a DFPZ network over a maximum of 1,510 acres on lands administered by the Forest Service and Bureau of Land Management. Forest health treatments would allow for the removal of conifer trees ranging from 9.0" to 29.9" at dbh. Treatments such as radial release around oaks and pines are designed to have long term beneficial outcomes for enhanced habitat diversity and resiliency to wildfire disturbance. Follow up DFPZ maintenance treatments would occur over a 10 year period, once DFPZs have been established. Hence, the Forest Service would perform three sets of treatments: an initial entry, then the first follow up maintenance entry 5-7 years later, followed by the final maintenance entry 8-10 years later. This Alternative would generate commercial forest by-products up to 2 million board feet of timber volume and 3,750 tons of biomass; contributing potentially 30 forestry-related jobs in Butte County, California.
Alternative C	Alternative C is designed to further the completion of the HFQLG Pilot Project's larger DFPZ network, and to fill in gaps linking shaded fuelbreak networks on private land in the wildland urban-interface (WUI). Alternative C would establish a DFPZ network on FS administered lands over a maximum of 1,363 acres; consistent with Butte Unit's Community Wildfire Protection Plan (CWPP) endorsed shaded fuel break treatments being implemented on private land. For this reason, small live trees less than 9" at dbh the unburned areas and small dead trees less than 11" at dbh in the burned areas would be felled and surface fuels treated on location. While Alternative C would create DFPZs, it does not propose to maintain them; the necessity and scope of follow up treatments would be developed and assessed in a separate environmental analysis. Alternative C would alter multiple aspects of fuels conditions simultaneously in a single entry phase (1-4 years to allow operations to be implemented during optimal environmental conditions). This Alternative would contribute potentially 15 forestry-related jobs in Butte County, California.

Table 2-5 Comparison of Alternatives Considered in Detail – Treatment Methods

Alternative A	Alternative B		Alternative C
Proposed DFPZ Treatments: 0 acres	**Proposed DFPZ Initial Entry Treatments:** Handcut Pile and Burn 666 acres Lop and Scatter 118 acres Masticate 671 acres Remove Dead (Burned) Trees 320 acres Radial Release and Thin 217 acres Underburn 127 acres Plantation and Spot Planting 96 acres Chip 385 acres Oak Release (Prune) 213 acres Construct up to 2 miles of temporary road Implement road maintenance on up to 4 miles Minor Bridge Improvement	**DFPZ Maintenance Entry Treatments:** Handcut Pile and Burn 666 acres Lop and Scatter 118 acres Masticate 671 acres Underburn 468 acres Oak Release (Prune) 213 acres	**Proposed DFPZ Treatments:** Handcut Pile and Burn 586 acres Lop and Scatter 102 acres Masticate 626 acres Underburn127 acres Roadside Chip 142 acres Roadside Prune 142 acres

Table 2-6 Comparison of Alternatives - Purpose and Need

Purpose	Need	Desired Condition	Measurement Indicators	No-Action (Alternative A)		Proposed Alternative (Alternative B)		Alternative to the Proposed Action (Alternative C)	
1. Reduce risk to rural Communities from wildfires.	**1. Thin overcrowded unburned forest and selectively remove dead trees within the Wildland urban interface.**	Openness of crown fuels along with open conditions around large trees allow only slow-moving, low intensity fires. Absence of most small trees and low amount of surface fuels yield very low probability of sustained crown fire. (1) Flame lengths less than or equal to 4 ft.; (2) Rate of spread less than or equal to 4 chains/hour	Flame Length measured in feet (ft.) in unburned treatment areas (short term)	Average 6 ft.		Average 2 ft.		Average 3 ft.	
			Flame Length measured in feet (ft.) in burned treatment areas (3 time periods)	Year 1	< 1 ft.	Year 1	2 - 4 ft.	Year 1	1 - 3 ft.
				Year 10	6 - 11 ft.	Year 10	3 - 4 ft.	Year 10	5 - 8 ft.
				Year 20	26 - 40 ft.	Year 20	3 - 4 ft.	Year 20	13 - 26 ft.
			Rate of spread in chain(s) per hour (pre treatment and post treatment) in the unburned treatment areas	16 chains per hour		4 chains per hour		5 chains per hour	
2. Establish and maintain Defensible Fuel Profile Zones (DFPZs) to improve fire suppression capacity for controlling and containing wildfire.	**2. Provide safer and more effective locations for firefighters to initiate fire suppression**	Even under high fire weather conditions, surface and ladder fuels within DFPZs are such that crown fire ignition is highly unlikely. (1) Fuels smaller than 3 in. are less than 5 tons/acre averaged over the treatment area; (2) Fuels larger than 3 in. (preferably greater than 20 inches DBH; 10 ft. or longer) are less than 15 tons/acre averaged over the treatment area; (3) Average canopy base height is under 15 ft.; (4) Fewer than 4 dead trees per acre exist within DFPZ treatment areas.	Fuel loading in the unburned treatment area measured by tons per acre of dead woody material smaller than 3 in. diameter	Year 1	9 tons/acre	Year 1	6 tons/acre	Year 1	7 tons/acre
			Canopy Base Height in the unburned area measured in feet from ground level	5 ft.		52 ft.		38 ft	
			Fuel loading in the burned treatment area measured by tons per acre of dead woody material smaller than 3 in. diameter	Year 1	0.23 tons/acre	Year 1	.64 tons/acre	Year 1	.48 tons/acre
				Year 10	1.39 tons/acre	Year 10	1.01 tons/acre	Year 10	1.54 tons/acre
				Year 20	1.99 tons/acre	Year 20	1.22 tons/acre	Year 20	2.16 tons/acre
			Fuel loading in the burned treatment area measured by tons per acre of dead woody material larger than 3 in. diameter	Year 1	1.61 tons/acre	Year 1	3.13 tons/acre	Year 1	2.42 tons/acre
				Year 10	11.49 tons/acre	Year 10	7.82 tons/acre	Year 10	12.39 tons/acre
				Year 20	19.50 tons/acre	Year 20	11.17 tons/acre	Year 20	20.56 tons/acre
			Average number of snags per acre in the burned treatment areas	Year 1	409/acre	Year 1	40/acre	Year 1	191/acre
				Year 10	159/acre	Year 10	21/acre	Year 10	82/acre
				Year 20	64/acre	Year 20	11/acre	Year 20	3/acre

Purpose	Need	Desired Condition	Measurement Indicators	No-Action (Alternative A)		Proposed Alternative (Alternative B)		Alternative to the Proposed Action (Alternative C)	
3. Restoring degraded and recently fire-damaged forest, to promote forest health and habitat diversity.	**3. Restore and sustain diverse, fire-adapted ecosystems on public land.**	Tree densities have been reduced to a level consistent with the site's ability to sustain healthy forests and habitat during drought conditions. (1) Less than 40 percent tree canopy cover considering all tree size classes; Average basal area and canopy closure is retained mostly in the larger tree size classes to provide forest structural and habitat diversity (CWHR Size Classes 4 & 5). (2) Retain well distributed snag habitat	Average numbers of Trees per Acre by Size Class CWHR 4 & 5: - Before and After treatment in the unburned area	CWHR Size Class 4	1696	CWHR Size Class 4	88	CWHR Size Class 4	116
				CWHR Size Class 5	1360	CWHR Size Class 5	41	CWHR Size Class 5	157
			Average Basal Area per Acre by Size Class CWHR 4 & 5 : Before and After Treatment in the unburned area	CWHR Size Class 4	235	CWHR Size Class 4	180	CWHR Size Class 4	200
				CWHR Size Class 5	399	CWHR Size Class 5	229	CWHR Size Class 5	357
			Average Canopy Cover by Size Class CWHR 4 & 5: - Before and After Radial Release (Thin) Treatment in the unburned area	CWHR Size Class 4	80%	CWHR Size Class 4	40%	CWHR Size Class 4	72%
				CWHR Size Class 5	83%	CWHR Size Class 5	60%	CWHR Size Class 5	70%
			Average Snag Fall in the burned area (based on FVS modeling; Smith & Cluck).	1-10 Years post-fire – Predicted 95% Snag Fall (of which 90% will be less than 15 inches in diameter).	10+ post-fire – 5% Snag Fall	See above for Average Snags Per Acre Post Treatment (Note inverse relationship to fuel loading)		See above for Average Snags Per Acre Post Treatment (Note inverse relationship to fuel loading)	
4. There is a need to encourage local labor involvement, while offering forest by-products resulting from ecologically appropriate vegetative and fuels reduction treatments.	**4. Contribute to the stability and economic health of local communities.**	Community including forestry-related jobs in economy, befitting number of jobs available, given fluctuations in federal timber supplies. (1) Number of forestry-related jobs are maximized; (2) DFPZ forest-by products are commerically optimized	Forestry related employment opportunities measured by total number of potential full-time jobs created	0		30		15	
			DFPZ commerical forest by-products measured by timber (sawlog) volume in million board feet (MMBF) and biomass in tons.	0		2.0 MMBF 3750 Tons		0	

Note: All measurement indicator values are approximate, based on predicted outcomes related to fulfilling the Purpose, while also responding to the Need (refer to chapter 1 for detailed information).
* Danger tree felling: Occupational Safety Hazard Administration (OSHA) directs the felling of trees having certain characteristics attributed to potential for instability, considered an imminent threat to human safety.

Comparison of Alternatives In Terms of Significant Issues.

Issues are defined in this analysis as points of discussion, debate, or dispute about the environmental effects of a Proposed Action or alternatives. Significant Issues as used in this environmental analysis are those that are used to evaluate alternatives, affect the design of component proposals, prescribe mitigation measures, and/or describe important and variable environmental effects. They are significant because of the extent of their geographic consequence, the duration of the effects, or the intensity of interest or resource conflict. The following table briefly describes the environmental effects for each of the alternatives.

Table 2-5 Comparison of Alternatives - Significant Issues

Significant Issue	Indicator			No-Action (Alternative A)	Proposed Action (Alternative B)			Alternative to the Proposed Action (Alternative C)
				Percent total Threshold of Concern (TOC) by subwatershed				
		SWA #	% PL	Existing	Post Treatment (PT) – Year 1	PT – Year 5	PT – Year 10	Post Treatment (PT) – Year 1
Cumulative effects to municipal and other watershed resources (burned and unburned areas)	Municipal Watershed Resources: Subwatershed (SWA #) at risk – Threshold of Concern (% TOC) linked to percent public land (% PL)	1	2.6	103%	107%	97%	80%	105%
		6	6.8	167%	167%	99%	78%	167%
		7	28.2	143%	147%	96%	77%	145%
		8	0	169%	169%	132%	104%	169%
		9	14.3	144%	151%	97%	81%	149%
		11	27.5	112%	122%	64%	54%	117%
		12	21.3	164%	173%	114%	91%	167%
		13	27.8	162%	180%	139%	114%	172%
		14	67.7	97%	101%	47%	41%	100%
	Determination of cumulative effects for Forest Service (Region 5) Sensitive Fish Species and Habitat: Determination of effects for Hardhead minnow (*Mylopharodon conocephalus)*			NA	Will Not Affect			
	Determination of cumulative effects for Federally-listed Threatened Aquatic Species and Habitat: Determination of effects for California red-legged frog (*Rana aurora draytonii*)			NA	Will Not Affect			
	Determination of cumulative effects for Forest Service (Region 5) Sensitive Aquatic Species and Habitat: Foothill yellow-legged frog (*Rana boylii*)			NA	May affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability			Will Not Affect
	Determination of cumulative effects for Forest Service (Region 5) Sensitive Aquatic Species and Habitat: Northwestern pond turtle *(Clemmys marmorata marmorata*)			NA	May affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability			

Significant Issue	Indicator	No-Action (Alternative A)	Proposed Action (Alternative B)	Alternative to the Proposed Action (Alternative C)
	Management Indicator Species (MIS) Determination of cumulative effects for Aquatic Species and Habitat: Project-level Habitat Impacts to Bioregional-scale Aquatic Macroinvertebrates Habitat	NA	Project related short term, small scale effects, will not affect the Sierra Nevada bioregion existing trend in habitat for aquatic macroinvertebrates	
	Management Indicator Species (MIS) Determination of cumulative effects for Aquatic Species and Habitat: Project-level Habitat Impacts to Pacific tree frog *(Pseudacris regilla)*		Will Not Affect	
Cumulative effects to terrestrial wildlife–Snag Habitat	Determination of cumulative effects for Forest Service (Region 5) Sensitive terrestrial Species and Habitat: Pallid bat	NA	May affect individuals, but is not likely to result in a trend toward Federal listing or loss of species viability	Will Not Affect
	Determination of cumulative effects for Forest Service (Region 5) Sensitive terrestrial Species and Habitat: Western red-bat		Will Not Affect	
	MIS determination of cumulative effects for Black-backed woodpecker (*Picoides arcticus)*		Will Not Affect	
	MIS determination of cumulative effects for Hairy woodpecker (*Picoides villosus)*		Will Not Affect	
Social Debate over Forest management of public land – Economic Recovery (burned and unburned areas)	Estimated commercial timber sawlog volume (live trees) measured in million board feet (MMBF)	NA	2.0 MMBF	0
	Estimated commercial biomass (dead fuels) measured in tons		3750 TONS	0

Comparison of Alternatives In Terms of Other Relevant Issues

Other Relevant Issues, as used in this analysis, differ from Significant Issues in that they often describe minor and/or non-variable consequences, typically fully mitigated by project design features. The following table briefly describes the environmental effects for each of the alternatives. Table 2-6 provides a simple comparative review of alternatives considered in detail, using a relative index on a scale of 0 to 6, with a 0 score representing the worst case scenerio or potential for adverse effects.

Table 2-6 Comparison of Alternatives – Other Relevant Issues

Other Issues	Indicator	No-Action	Proposed Action	Community Alternative
Air Quality	Estimated annual tons of PM_{10} produced from operations	NA	88.7 (tree removal, mastication & underburning	88.4 (mastication & underburning)
Terrestrial Forest Service Sensitive (FSS) Wildlife, and Plumas NF: amended1988 Forest Plan Management Indicator Species (MIS)	FSS determination of effects for Bald Eagle (*Haliaeetus leucocephalus)*	NA	Will Not Affect	
	FSS determination of effects for Northern goshawk (*Accipiter gentilis)*	NA	Will Not Affect	
	FSS & MIS determination of effects for California spotted owl (*Strix occidentalis occidentalis)*	NA	Will Not Affect	
	MIS determination of effects for mule deer *(Odocoileus hemionus)*	NA	Will Not Affect; may be beneficial by diversifying forage habitat vegetative structure and age classes	
	MIS determination of effects for Neotropical migratory birds	NA	Will Not Affect	
	MIS determination of effects for Mountain quail *(Oreortyx pictus)*	NA	Will Not Affect	

Other Issues	Indicator	No-Action	Proposed Action	Community Alternative
	MIS determination of effects for Northern flying squirrel (*Glaucomys sabrinus)*	NA	Will Not Affect	
	MIS determination of effects for fox sparrow *(Passerella iliaca)*	NA	Will Not Affect	
	MIS determination of effects for yellow warbler (*Dendroica petechia)*	NA	Will Not Affect	
	MIS determination of effects for sooty (blue) grouse *(Dendragapus obscurus)*	NA	Will Not Affect	
Botanical – Forest Service (Region 5) Sensitive (FSS)	FSS determination of effects for Jepson's onion (*Allium jepsonii)*	NA	May impact individuals, but not likely to cause a trend toward federal listing or loss of viability	
	FSS determination of effects for Butte County calycadenia (*Calycadenia oppositifolia)*	NA		
	FSS determination of effects for Butte County morning-glory *(Calystegia atriplicifolia ssp. buttensis)*	NA	May impact individuals but not likely to cause a trend toward federal listing or loss of viability	
	FSS determination of effects for Mosquin's clarkia (Clarkia mosquinii)	NA	May impact individuals,but not likely to cause a trend toward federal listing or loss of viability	
	FSS determination of effects for Ahart's sulphur flower (Eriogonum umbellatum var. ahartii)	NA		

Other Issues	Indicator	No-Action	Proposed Action	Community Alternative
	FSS determination of effects for Butte County fritillary *(Fritillaria eastwoodiae)*	NA		
	FSS determination of effects for cut-leaved ragwort *(Packera eurycephala var. lewisrosei)*	NA		
	FSS determination of effects for *Phaeocollybia olivacea*	NA		
Botanical – Forest Service (Region 5) Sensitive (FSS)	FSS determination of effects for *Arabis constancei*	NA	Will Not Affect	
	FSS determination of effects for *Balsamorhiza macrolepis var. macrolepis*	NA		
	FSS determination of effects for *Clarkia mildrediae ssp. Mildrediae*	NA		
	FSS determination of effects for *Hydrotheria venosa*	NA		
	FSS determination of effects for *Packera layneae*	NA		
Non-Native Plant Species	Risk of new infestations and potential increase in distribution of existing populations	Current levels of risk would continue	Slight increase in risk due to increased ground disturbing activities. Risk is proportional to amount of ground disturbed; minimized through avoidance mitigation where known invasive plants exist	
Scenic Quality	Effects to scenic quality objectives	No change	Both Action Alternative would have short-term minor effects to scenic quality– Over long-term, scenic objectives would be met	

Other Issues	Indicator	No-Action	Proposed Action	Community Alternative
Recreation and Public Safety	Effects to recreation users	No change	Short-term conflicts between users and fuel reduction activities may occur as access is limited; determined to have no effect to human safety through avoidance mitigation – Long-term effect would be a change in character to more open stands and more varied landscapes	
Heritage Resources	Affects to historical or archeological heritage sites	No effect	Either Action Alternative was determined to have no effect undertaking to known historic properties through avoidance mitigation	

Chapter 3. Affected Environment

3.1 Introduction

This Chapter describes the current social and environmental conditions in the Concow Planning Area, organized into three major categories including: 1. Human Environment; 2. Biological Environment, and; 3. Physical Environment. The first section describes key land management policies and community efforts associated with communities dependent on natural resources, at high risk of damage from wildfire, followed by a prehistoric and historic background section highlighting cultural resources and recreational (including scenery, lands, and minerals), as a backdrop against which other major environmental issues are analyzed for this project in chapter 4. The section on the biological environment includes a discussion on fire and fuels, vegetation, botany and wildlife. The last section of chapter 3 describes the physical environment presenting information about soils, hydrology, air quality and climate. For color versions of maps, figures, and tables please see the CD-ROM version of this FEIS, and the online official website for the Plumas National Forest.

3.2 Human Environment

In 2001, the U.S. Congress funded the National Fire Plan, to facilitate efforts to preserve natural resources on public land (USDA, USDI 2001). To help protect people and their property from potential high severity wildfire, the 2001 National Fire Plan directed funding to projects designed to reduce fire risks to the communities.

A fundamental step in achieving this goal was the identification of communities that are at high risk of damage from wildfire. In 2001 the Federal Register published a list of these high risk communities identified within the wildland urban-interface (WUI): the area where homes and wildlands intermix. There are 1,264 communities currently on the Communities at Risk List, managed by the California Fire Alliance, including the communities of Paradise, Magalia, Concow and Yankee Hill.

Due to the checkerboard ownership pattern, the Concow Hazardous Fuels Reduction Project is located within and adjacent to the rural communities of Paradise, Magalia and Yankee Hill, in Butte County, California. For this reason, agencies and local community members work actively, through a number of different resources, to collaborate on fuels reduction projects.

3.2.1 Herger-Feinstein Quincy Library Group Project and the *Healthy Forest Restoration Act*

In 1993, the Quincy Library Group (QLG), a grassroots citizen group interested in collaborative management of national forest lands, developed the "Community Stability Proposal," eventually lobbying for passage of the 1997 *Quincy Library Group Forest Recovery and Economic Sustainability* Act (QLG Bill). The QLG Bill directs the implementation of a Pilot Project in the northern Sierra, including Lassen and Plumas National Forests, and the Sierraville District of the Tahoe National Forest.

The QLG Bill describes the creation of Defensible Fuel Profile Zones (DFPZs), to support fire suppression activities. As indicated in the QLG Bill, "DFPZs should be viewed as the initial step (not exclusive) in bringing large portions of landscapes into more defensible and fire resilient conditions. As the hazard level of various landscapes is brought down, the DFPZs will tend to blend into the surrounding landscapes. It must be recognized that desirable fuel conditions, once achieved, will require periodic maintenance or conditions will revert to hazardous states" (pp. 5, 15).

The Pilot Project "attempts to reflect the fact that a healthy forest and a stable community are interdependent; we cannot have one without the other". Furthermore, the Pilot Project Proposal includes the recommendation "...to create a forest that will more closely mimic the historic natural landscapes of the Sierra" (QLG Case Study 1998). Project inter-related resource management activities promote healthy, fire-resilient forests that maintain ecological integrity, construct DFPZs that provide for safe and effective fire suppression, and promote local economic stability.

Numerous documents and forest plan amendments were developed to facilitate the implementation of the QLG Act across the Pilot Project Area. A combination of litigation and prescriptive constraints in the documents delayed full implementation within the legislated timeframe. Hence, the *Consolidated Appropriations Act* (HR 2764), extends the *Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act* and *Economic Sustainability Act* pilot period from 2009 to 2012. It also states the *Healthy Forest Restoration Act* (HFRA), specifically Title I - Hazardous Fuel Reduction on Federal Land, Section 104 (Environmental Analysis [EA]), Section 105 (Special Administrative Review process) and Section 106 (Judicial Review in United States District Courts), applies to HFQLG projects. The February 13, 2008 letter from Randy Moore, USDA Forest Service, Regional Forester for California states, "The Forest Service interprets this to mean that HFRA Sections 104–106 apply to newly initiated HFQLG projects…that would otherwise require the preparation of an Environmental Assessment or EIS [Environmental Impact Statement]."

3.2.2 Butte County Fire Safe Council.

The Butte County Fire Safe Council is a non-profit, public benefit corporation formed in March of 1998. The Butte County Fire Safe Council strives to reduce damage and devastation through their mission "to provide education, exchange information, foster fire prevention and fire safety within the County of Butte." The Butte County Fire Safe Council assists residents in developing defensible space around their homes. Defensible space is described as an area surrounding a home where vegetation is managed to reduce fuels. In January of 2005, Public Resource Code 4291 increased the required defensible space around rural residences from 30 feet to 100 feet (or to the property boundary if it is within 100 feet).

Through their Residents Assistance Program, the Butte Fire Safe Council is able to assist qualifying low income, senior, and physically disabled residents create defensible space around their homes, and meet PRC 4294. Their free Chipper Program has provided service to over 1,114 residents and has treated hazardous fuels on 1,064 acres since the program began in 2003 (www.buttefiresafe.org). Since 2001, the Butte County Fire Safe Council has collaborated in fuels reduction projects, improving the safety of over 30 miles of roads used for evacuation and fire fighting access throughout Butte County.

Additionally, the Butte Unit Community Wildfire Protection Plan (CWPP) is an important planning document for Butte County and represents significant community and agency collaboration. The primary goal of the CWPP is to reduce the destruction and associated costs from wildfire by protecting assets at risk through focused pre-fire management treatments. This slan systematically assesses the existing level of wildland fire protection service, identifies high-value and high-risk areas vulnerable to costly and damaging wildfires, and ranks these areas in terms of both priority needs and recommendations for pre-fire hazardous fuels reduction projects. Finally, the plan recommends measures to reduce the ignitability of structures (California Department of Forestry and Fire Protection, 2005).

Along with state and federal partners, the Butte County Fire Safe Council, as well as other local fire safe councils and watershed groups review the CWPP annually, which serves the unincorporated areas of Butte County and the Town of Paradise. The Butte Unit CWPP is the foundation upon which pre-fire planning activities are identified, prioritized and implemented through the cooperative efforts of responsible fire agencies and fire safe councils.

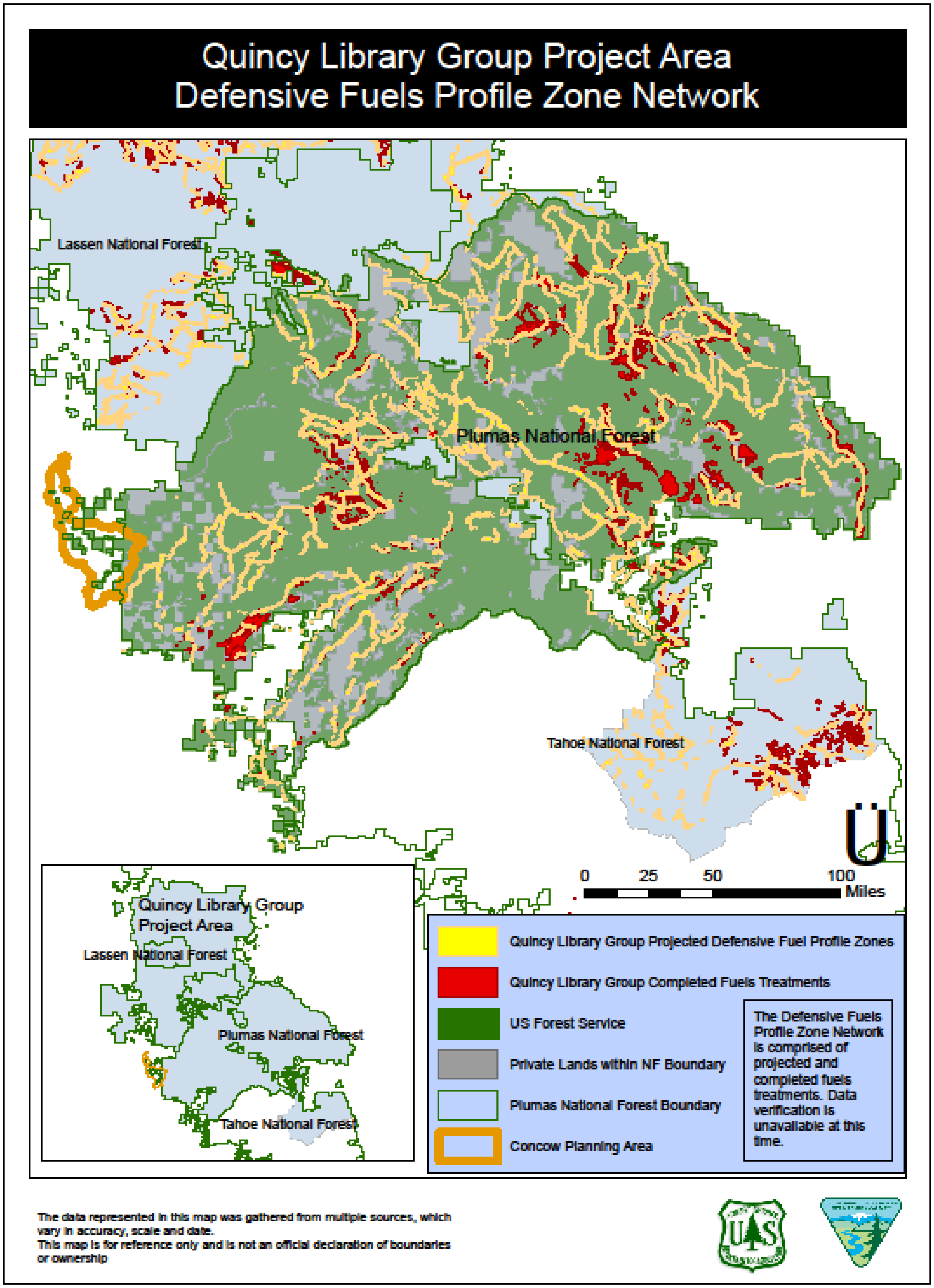
3.2.3 Yankee Hill Fire Safe Council.

The Yankee Hill Fire Safe Council has served residents in the Pulga, Concow, Big Bend, and Yankee Hill area since its inception in 2002. The Yankee Hill Fire Safe Council has coordinated a number of projects in its community, including wildfire prevention education, community evacuation plans, and shaded fuel break development. Within the Concow Planning Area, the Yankee Hill Fire Safe Council acquired funding for several miles of shaded fuel breaks along key transportation corridors in the Concow community (Jordan Hill Road, Concow Road, and Andy Mountain Road) and in two wildfire assembly areas (Crain Park and Camelot).

Other projects the Yankee Hill Fire Safe Council has spearheaded include generating a fire recovery fund after the Butte Lightning Complex burned through in 2008, a Yankee Hill Emergency Communication System, the Yankee Hill Evacuation Plan, a dooryard education visit program clean-up of illegal dumpsites (including the Cherokee which included 350 tires plus other debris), multiple roadside fuel reduction demonstration sites for grade-school and community member education, a post-fire clean-up of charred abandoned cars and other debris, and numerous fuels reduction and fuel break projects.

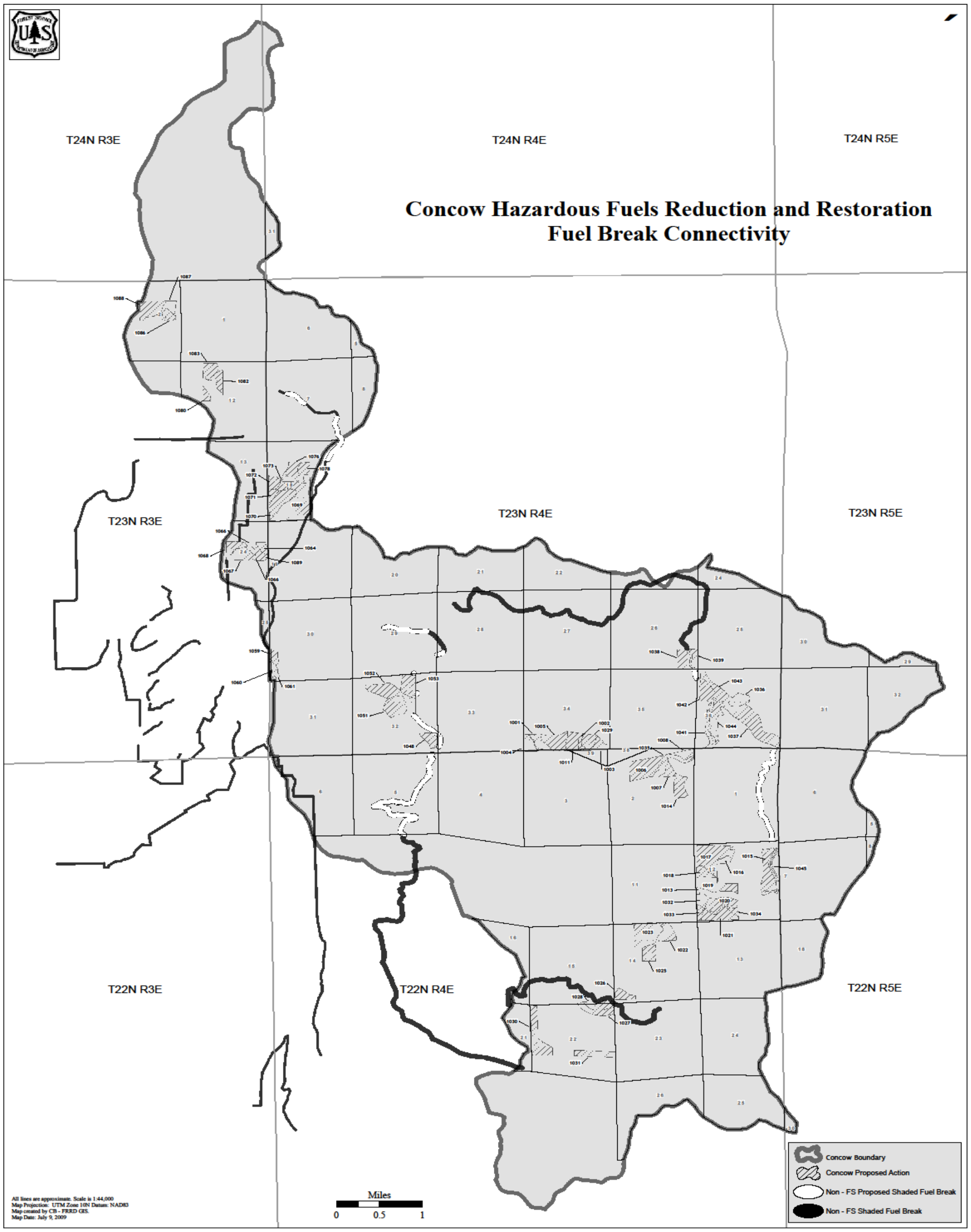
3.2.4 Upper Ridge Fire Safe Council.

The Upper Ridge Fire Safe Council is comprised of residents living on the Upper Ridge, including the communities of Old Magalia to Stirling City, with a mission to provide wildfire safety on the Upper Ridge through education and hazard mitigation. Some specific projects the Upper Ridge Fire Safe Council has already completed include numerous, coordinated fuel reduction and fuel break projects, participation in the Wildland Safety Fair, establishing a radio station specific to that area, conducting a dooryard education program, fostering a Preservation Alliance, and establishing watershed protection areas.



Map 3-1 Defensible Fuel Profile Zone Network

Many local fire safe councils, in cooperation with federal, state and local agencies, have begun the process of developing community fire wise and evacuation planning and hazardous fuel reduction, as depicted by map 3-2.



Map 3-2 Concow Area Fuel Break Connectivity

3.2.5 Prehistoric Background

9000 BC to 6000 BC is the first period that shows evidence of use for the northern Sierra and southern Cascade Mountains. This period is represented in the Sierra Cascade area by unprovenienced fluted points recovered in Big Meadows (Pippen & Hattori 1980), a Parman point near Lake Davis, and Great Basin Stemmed points at Bucks Lake (Kowta 1988). Two possible Parman points were identified at Dead Man's Cave on Mill Creek (Greenway 1982). The Deadman deposit was mixed and was poorly dated possibly indicating that these two points were not Parman points. Two projectile points from CA-PLU-607 resemble the Great Basin Stemmed series (Greenway 1985). Recently, a possible Parman point was found at CA-TEH-1766 in Battle Creek Meadows (Dougherty 2003). Fluted points are associated with the Clovis Tradition, while the Parman and Great Basin Stemmed points are thought to belong to Western Pluvial Lakes Tradition. Both of these represent nomadic life ways and are represented by shallow sites indicative of temporary camps (Kowta 1988: 50-58).

6000 BC to 3000 BC also has scant evidence of occupation. Stemmed points recovered from around Eagle Lake may possibly date to this period. Northern Side-notched points found at Bucks Lake, and Pinto points recovered at Lake Davis and Bucks Lake may also represent this occupation. These points are believed to belong to the Great Basin Archaic Tradition. It has been hypothesized that the use of the Pinto points reflects the exploitation of Mountain Sheep. A seed processing technology may have been initiated during the Milling Stone horizon circa 6000 BC (Kowta 1988: 58-66).

3000 BC to AD 500 is the first major occupation of the area, referred to as the Martis Tradition. Projectile points associated with the Martis Tradition belong primarily to the Elko and Martis series. Sites associated with the Martis Tradition include winter villages, summer base camps, temporary campsites, bedrock milling stations and biface quarry sites (Kowta 1988: 67-132).

In the Oroville area, the Mesilla Complex is identified as belonging to this period dating between 1000 BC and AD 1. Though little is known about the subsistence patterns of this complex, it is believed to be a local variation of the wider Martis Tradition based on the similarity of artifacts (Kowta 1988: 91-97). The Bidwell Complex that extended from AD 1 to AD 800 follows the Mesilla Complex. Little is known about this complex either, though it may be a continuation of the Mesilla complex and acts as a transition period to the Sweetwater Complex. The Bidwell Complex appears to mark the end of the Martis Tradition in the Oroville area (Kowta 1988: 101-103).

AD 500 to AD 1200 is the Early Kings Beach phase, a continuation of the Martis Tradition, adding changes in technology. The use of manos and metates continue in this phase with the addition of hopper mortars, bedrock mortars (BRM's) and pestles. Atlatl use changes to bow and arrow resulting in smaller projectile points represented by the Rose Spring, Eastgate and Cottonwood Series.

These points are manufactured primarily from obsidian and cryptocrystalline silicates (CCS) rather than basalt (Kowta 1988: 133-134). A dryer period in the region results in prehistoric populations concentrating around Lake Tahoe for fishing, in eastern California for raw material resources (CCS and obsidian) and the western Great Basin for Pinion gathering (Kowta 1988: 138-144, 197). Kowta associates this contracting population as the ancestors of the ethnographic Washoe. The resulting void was filled by the intrusion of Maiduian speakers from the south in the Oroville area, circa AD 800. The Maidu arrival has been referred to as the Sweetwater Complex.

The Sweetwater Complex is characterized by the presence of anomalous extended burials and unusual mortuary gifts, coupled with fatal arrow wounds, indicates cultural intrusion and conflict (Kowta 1988: 152). During the Sweetwater Complex, which extends from about AD 800 to AD 1600, populations increased and procurement shifted to a technology associated with acorn exploitation. Shell beads indicate the formation of exchange networks and an increase in luxury goods. The Sweetwater complex overlaps the Late Kings Beach. Maiduian Speakers were moving into the area by AD 1000.

The Sweetwater Complex was followed by the Oroville Complex, lasting from AD 1600 to AD 1850. This period saw two house types, a small residential conical bark house and a large dance house. Steatite vessels are replaced by coiled basketry although steatite cooking slabs, arrowshaft straighteners and pipes are still used (Kowta 1988: 152).

AD 1200 to AD 1850 is the Late Kings Beach Phase. The main point types during this period are the Desert Side-notched, which ranged from AD 1200 to historic times and the Cottonwood Series, which started in the Early Kings Beach Phase around AD 900 and lasted to historic times. The Late Kings Beach phase is largely seen as a continuation of the Early Kings Beach Phase (Kowta 1988: 134).

Post AD 1850. Ethnographically, the area was occupied by three California Penutian speaking groups. These groups were the Konkow, Mountain Maidu and the Nisenan. Although these groups are all considered to be Maidu (they shared many common traits) there were several differences between these three groups. To obtain more information on these tribes consult the Handbook of North American Indians, California volume 8 (Heizer 1978) or the Handbook of the Indians of California (Kroeber 1925).

3.2.6 Historic Background

The historic period for the project area started with the 1849 Gold Rush. It is this event that pushed Euro Americans into the project area. The gold rush caused a mass migration into the area with many communities established due to mining. During the late 19th century placer mining gave way to hydraulic and hard rock mining. By the early 20th century many of the communities that sprung up around the gold mines were abandoned or only had small populations remaining.

Other activities slowly replaced gold mining in the project area; these activities included ranching, logging, agriculture and tourism. During the early 1900’s the Concow area fell along the major transportation route that connected Stirling City to Mayaro (Tibbetts 2006); this route played an important role in the regions lumber industry. Lumber mills and flumes dotted the landscape throughout this region.

3.2.7 Recreation, Visuals, Non-federal Land Uses (Minerals & Other Special Uses)

The amended 1988 Plumas NF Land and Resource Management Plan (LRMP) characterized the ecological and social conditions in the Concow Project Area and provided a context for future forest management decisions. The USDA Forest Service Recreation Opportunity Spectrum (ROS) Users Guide (1982) provides for six classes: Primitive, Semi-Primitive Non-Motorized, Semi-primitive Motorized, Roaded Natural (RN), Rural, and Urban.

The Land Resource Management Plan (LRMP) divided the RN class into subclasses of Roaded Modified (RM) and Roaded Natural (RN). The Forest was inventoried and divided into five ROS classes: Primitive, Semi-primitive, RM, RN, and Rural during the forest planning process. The Concow Project Area was inventoried and classified as Roaded Modified, Roaded Natural, and Rural (shaded text). Excerpts from the 1982 ROS User Guide (Tables 5, 6, and 7) are presented below (Tables 3-1, 3-2, 3-3).

Table 3-1 Evidence of Humans Criteria

Primitive	Semi-primitive Nonmotorized Urban	Semi-primitive Motorized	Roaded Natural	Rural	Urban
Setting is essentially an unmodified natural environment. Evidence of humans would be unnoticed by an observer wandering through the area.	Natural* setting may have subtle modification that would be noticed but not draw the attention of an observer wandering through the area.	Natural* setting may have moderately dominant alterations but would not draw the attention of motorized observers on trails and primitive roads with the area.	Natural* setting may have modifications which range from being easily noticed to strongly servers within the area. However, from sensitive** travel routes and use areas these alterations would remain un-noticed or visually subordinate.	Natural* setting is culturally modified to the point that it is dominant to the sensitive** travel route observer. May include pastoral, agricultural, intensively managed wildland resource landscapes, or utility corridors. Pedestrian or other slow moving observers are constantly within view of culturally changed landscapes. Setting is strongly structure dominated.	Natural or natural-appearing elements may play an important role but be visually subordinate. Pedestrian and other slow moving observers are constantly within view of artificial enclosure of spaces.
Evidence of trails is acceptable, but should not exceed roads and/or high standard to carry expected use.	Little or no evidence of primitive roads and the motorized use of trails and primitive roads.	Strong evidence of primitive roads and the motorized use of trail and primitive roads.	There is strong evidence of designed roads and/or highways.	There is strong evidence of designed roads and/or highways.	There is strong evidence of designed roads and/or highways and streets.
Structures are extremely rare.	Structures are rare and isolated.	Structures are rare and isolated.	Structures are generally scattered, remaining visually subordinate or unnoticed to the sensitive** travel route observer. Structures may include power lines, microwave installations, etc.	Structures are readily apparent and may range from scattered to small dominant clusters including power lines, microwave installations, local ski areas, minor resorts and recreation sites.	Structures and structure complexes are dominant, and may include major resorts and marinas, national and regional ski areas, towns, industrial sites, condominiums or second home developments.

*In many southern and eastern forests what appear to be natural landscapes may have in actuality been strongly influenced by humans. The term natural-appearing may be more appropriate in these cases.**Sensitivity level 1 and 2 travel routes from Visual Management System USDA Handbook 461.

Table 3-2 Social Setting Criteria

Primitive	Semi-primitive Nonmotorized Urban	Semi-primitive Motorized	Roaded Natural	Rural	Urban
Usually fewer than 6 parties per day encountered on trails and fewer than 3 parties visible at campsites.	Usually 6–15 parties per day encountered on trails and 6 or fewer visible at campsites.	Low to moderate contact frequency.**	Frequency of contact is: Moderate** to High on roads; Low to Moderate on trails and away from roads.	Frequency of contact is Moderate** to High in developed sites, on roads and trails, and on water surfaces; Moderate away from developed sites.	Large numbers of users onsite and in nearby areas.

*These criteria apply during the typical recreation use season. Peak days may exceed these limits.**Specific numbers must be developed to meet regional and local conditions.

Table 3-3 Managerial Setting Criteria

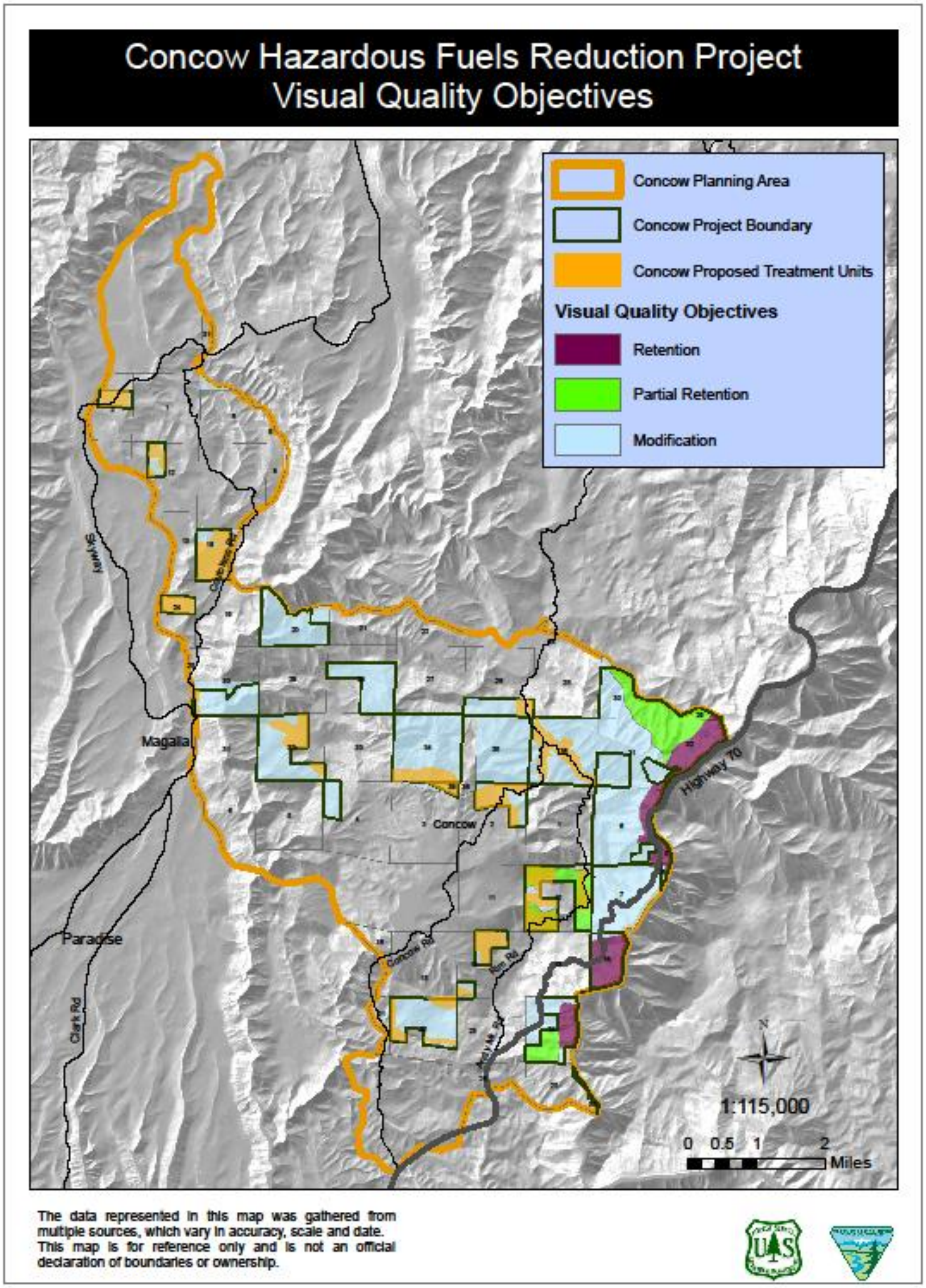
Primitive	Semi-primitive Nonmotorized Urban	Semi-primitive Motorized	Roaded Natural	Rural	Urban
On-site regimentation is low and controls* primarily off-site.	On-site regimentation and controls* present but subtle.	On-site regimentation and controls* present but subtle.	On-site regimentation and controls* are noticeable, but harmonize with the natural environment.	Regimentation and controls* obvious and numerous, largely in harmony with the man-made environment.	Regimentation and controls* obvious and numerous.

*Controls can be physical (such as barriers) or regulatory (such as permits).

- **Roaded Modified (RM)**—those RN areas that are also coded as Middle Ground, Background or Unseen, and Sensitivity Level II or III. This is the general resource management area of the forest, typified by pickup trucks and many miles of dirt and gravel roads. Other than trails and trailheads, virtually no improvements are present. Users experience low interaction with each other. Approximately 50 percent of the project area is classified as a RM setting where the sights and sounds of people are moderate. Roads, landings, and debris are evident.

- **Roaded Natural (RN)**—those original RN 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. Approximately 10 percent of the project area is classified as a RN 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.

- **Rural**—a substantially modified natural environment. Sights and sounds of people are evident. Renewable resource modification and utilization practices enhance specific recreation activities or provide the protection of vegetative soil cover.



Map 3-3 Visual Quality Objectives in the Concow Project Area

Visual Quality Objectives (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:

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

- Modification—Activities may dominate the characteristic landscape, but must, at the same time, utilize naturally established form, line, color, and texture. Activities should appear as a natural occurrence when viewed in the foreground or middleground.

Motorized recreation is an important use of the project area. Off-highway vehicle (OHV) use has increased dramatically over the last decade both locally and nationally, and is expected to increase in the future, according to need. An OHV Route Inventory and Designation (RI&D) process is in progress to identify OHV routes and areas to be established by a final Forest Order under a travel management strategy. Other recreational features include, but are not limited to, photography, mushroom picking, Christmas tree cutting, and collection of basket weaving material.

Mineral operations (Notice of Intents [NOIs] and Plan of Operations [POs]) and non-federal land uses (Special Use Authorizations) are known within the project area. These types of uses were individually evaluated to determine what impact the Concow project would have on these activities.

Recreation Opportunity Spectrum and Visual Quality Objectives. The majority of the project area (just over 50 percent, roughly) is classified under the ROS as Roaded Modified. Approximately ten percent of the Concow Project Area is in the RN class. An estimated 40 percent is classified as Rural. A VQO of Modification is assigned to approximately 70 percent of the project area, while the remaining area is considered in the Partial Retention component. The current VQOs were impacted by the catastrophic fire event in 2008 and are not met.

Other Recreational Uses (Roads, Trails, Picnic Area). Historically, roads and trails in the Concow Project Area were developed to access mining claims and private lands, to support fire suppression efforts, and for Forest Service and U.S. Bureau of Land Management (BLM) administrative uses. Most roads and trails were built to accommodate pack and saddle stock and were primary access routes into the project area. A day use picnic area exists on the south shore of Paradise Lake and is operated by special use authorization from the Paradise Irrigation District.

Motorized use by OHVs has increased in the last several years and continues to do so. Effective January 1, 2009, interim Forest Order 18-08, derived through the OHV RI&D in 2006, process was issued to prohibit motorized vehicles on National Forest System roads, except for routes, open areas, and National Forest system trails designated on a travel management plan map.

A Record of Decision (ROD) supporting the Forest's travel management strategy is anticipated to be completed late in 2009. Roads proposed for decommissioning or closure in this project area will not be closed, unless the following criteria apply:

- They are dead end spurs or routes that show no evidence of OHV use, which are also contributing to resource damage.
- They are user created routes in areas that are already closed by existing Forest Orders.
- They are routes that are creating egregious resource damage, to the extent that a delay in their closure would result in unacceptable and irrecoverable impacts to the resource.

Mineral Operations. Mineral operations occur on a limited basis in the project area. There are no Notices of Intent or Plans of Operations on file; however, there are some known minor operations (suction dredging).

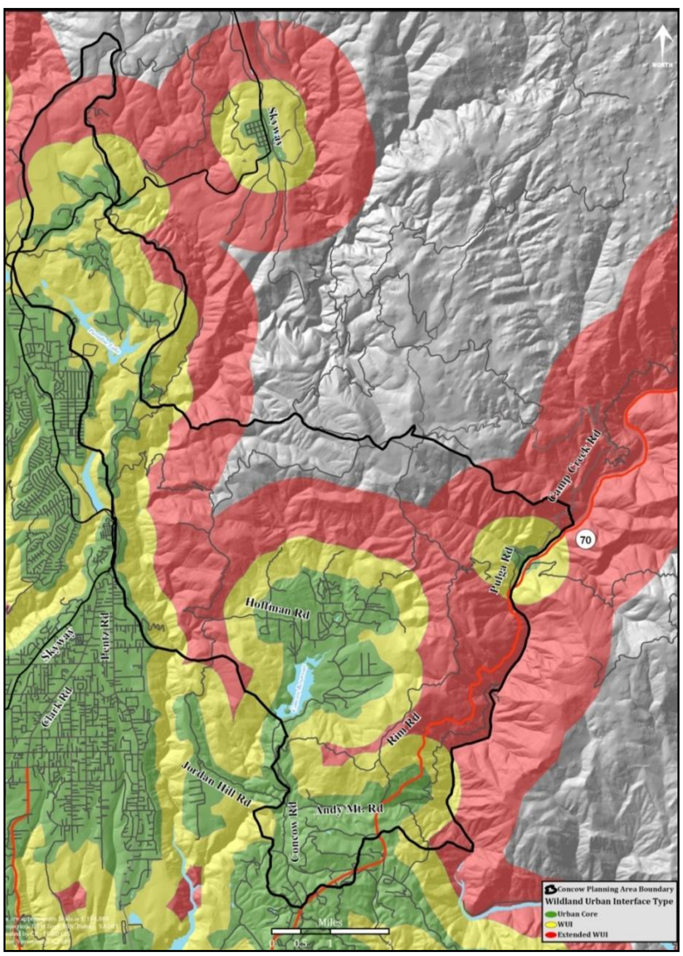
Non-Federal Land Uses. Several non-federal land uses are authorized by Special Use Authorizations and include a picnic area for Paradise Irrigation District, power lines for Pacific Gas and Electric, telephone lines for Pacific Bell, access road to private property and communication facilities at Sawmill Peak for several entities.

3.3 Biological Environment

3.3.1 Fire and Fuels

In addition to an abundance of surface and ladder fuels creating potential for larger more intense fires, impassable roads, distance of travel for second alarm resources, and steep inaccessible canyons make rapid access to fires on the Feather River Ranger District a problem for fire managers. The slopes in the Concow Project Area vary considerably, ranging between 0 and 100 percent with steep pitches in drainages and near ridge tops. Potential fires burning on steep slopes are problematic for multiple reasons: preheating of fuel results in rapid uphill rates of spread, ignition of rolling material may start fire below suppression resources, anchor points are difficult to establish, and there is increased probability of injury to fire fighters.

Approximately 91 percent of the Concow Project Area, covering an estimated 28,188 acres, is within the wildland urban-interface (WUI). Public lands make up 28 percent of the WUI in the Project Area, while the remaining 72 percent is privately owned. As depicted in map 3-4, there are three distinct zones associated with the WUI: green shaded urban core areas, or community centers where the majority of people live, yellow shaded WUI, and red shaded extended WUI.



Map 3-4 WUI Zones in and around the Concow Planning

The WUI zone in closest proximity to communities encompasses areas characterized by high densities of residences, commercial buildings, and/or administrative sites with facilities. This zone generally extends ¼ mile out from these core areas. The extended WUI includes areas where infrastructure density is lower, but fire behavior modification on public land would enhance suppression capabilities on the private land.

The extended WUI generally extends 1.25 miles from the outer zone of the urban core area adjacent WUI boundary; however, delineation is based on fire history, local fuel conditions, topography, values at risk, and natural and human-made barriers to fire. As illustrated in map 3-4, there is an area east of the Planning Area where the extended WUI has been expanded to accommodate the Highway 70 corridor, due to the infrastructure of dams and watershed protection.

Fire History. Historically the Lower Montane ecosystems experienced frequent fires that burned with low to mixed intensity removing fuel accumulation and vegetation density. A combination of management and land use practices have allowed for a large build up of surface, ladder, and canopy fuels, which if ignited would contribute to high fire intensity.

The Butte Lightning Complex started on June 21, 2008. The complex totaled 41 fires burning approximately 55,143 acres. The fires in the 2008 Butte Complex exhibited extreme fire behavior, resulting in high vegetative mortality and severe impacts to the WUI, watersheds and wildlife habitat in the Concow Planning Area. One civilian fatality and 69 injuries can be attributed to the fires. 106 residences and 11 outbuildings were destroyed. The fires burned for over a month before full containment was reached on August 1, 2008.

Today, the resulting landscape is largely made up of fire-killed trees that will eventually fall, depositing large amounts of heavy surface fuel. The fire area will have a flush of brush growth and the vast number of dead standing trees will fall over time, further increasing fuel loading while the remaining snags will pose a threat to public and firefighter safety for many years to come.

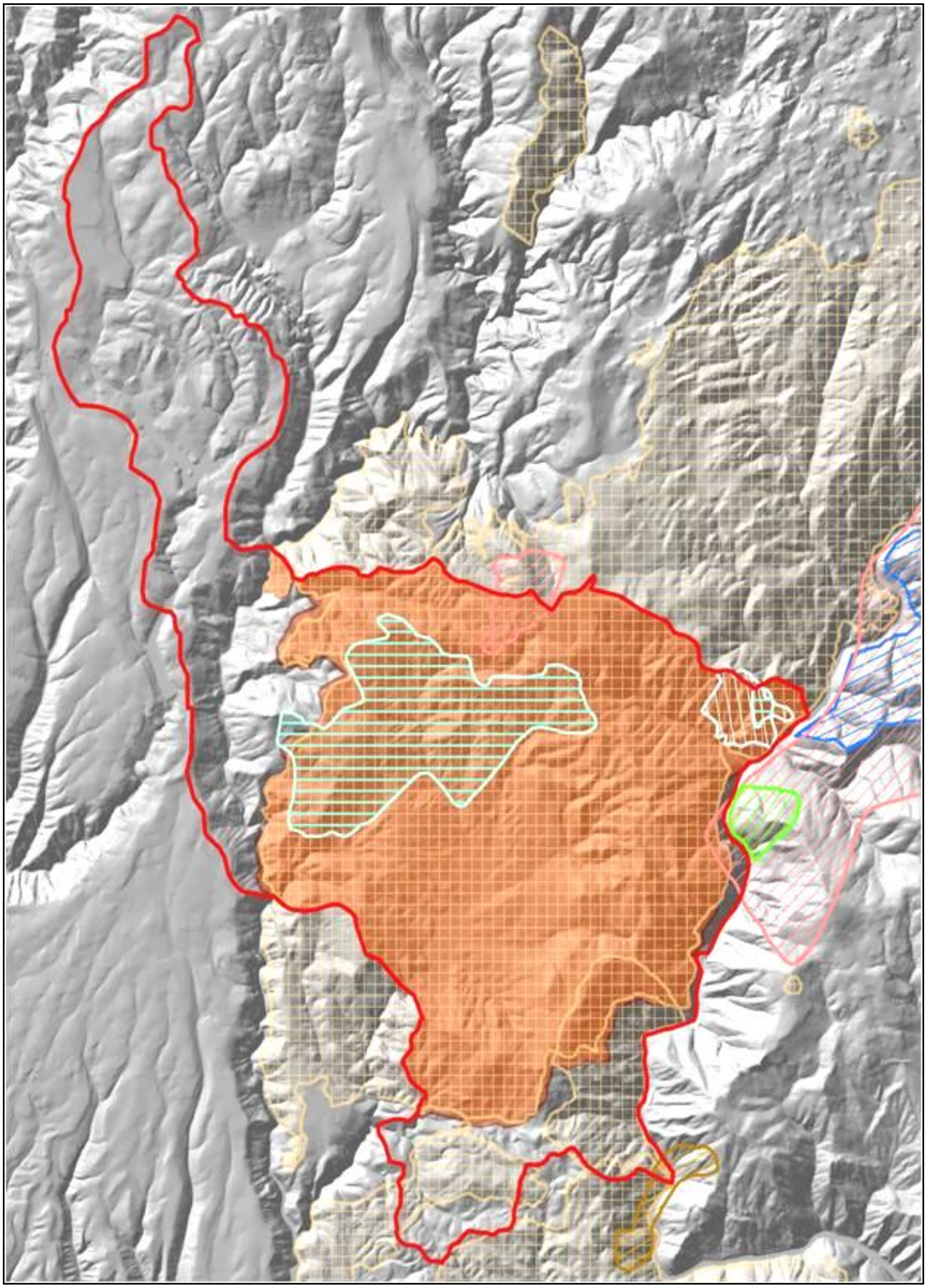
Records of large fires show a total of 12 fires that affected or may have affected the Concow Planning Area. These fires ranged from 59 acres to over 54,000 acres in size, with the largest being the most recent Butte Lightning Complex. This fire history suggests fire will continue to influence ecosystems and the people living within the Concow Planning Area. Research suggests climate change may be playing a role in increased fire severity and size in California (Miller et al. 2008). The effects of climate change on vegetation are difficult to assess, however, scientific computer models indicate that effects could be seen in future forests (Pacific Northwest Research Station, 2004).

Table 3-4 shows a list of large fires in the Planning Area greater than 50 acres in size that occurred between 1917 and 2009. Figure 3-2 depicts the geographical extent of previous fires.

Table 3-4 Fire History

Year	Cause	Total Fire Size (acres)
1917	Unknown/unidentified	466
1920	Lightning	236
1930	Unknown/unidentified	396
1951	Miscellaneous	21,978
1951	Unknown/unidentified	471
1965	Miscellaneous	59
1966	Unknown/unidentified	3,345
1972	Unknown/unidentified	396
2000	Equipment	1,835
2001	Arson	1,693
2001	Arson	8,055
2008	Lightning	59,440

*Fires greater than 50 acres in size within the Concow Planning Area.



Map 3-5 Large Fire History

Burned Areas

Of the 55,143 acres that burned during the 2008 Butte Lightning Complex, over 14,660 acres burned with high severity resulting in greater than 75 percent basal area mortality. Of the 55,143 acres that burned, 18,720 acres were consumed within the Concow Planning Area. Of the 18,720 acres burned 7,862 acres (42 percent) burned with high severity, 3,370 acres (18 percent) burned with moderate severity and 7,488 acres (40 percent) burned with low severity. Immediately and shortly after the 2008 fires, surface fuels in many locations were negligible due to consumption by fire.

Flame Length. As a result of the 2008 fire, burned area flame lengths are predicted to be low to non-existent, one to two years post-fire. Surface fuel loads needed to sustain fire have been eliminated even in much of the low severity burn areas. One or two years after the fire incident, any needles on the trees killed by the fire will drop, but will not present a fuels problem in terms of potential fire. Without vertical or horizontal continuity of fuels, potential fire size is estimated to be small. Initially, predicted fire behavior would be of low intensity, with flame length less than 1 foot. As time passes the number of snags falling will increasingly contribute to the build up of surface fuels. Over time, fuel sizes, live and dead fuel loading (tonnage), compactness, horizontal continuity, and vertical arrangement could contribute to flame lengths greater than 4 feet in height (see table 3.5).

Table 3-5 Flame Lengths under Current Condition

Percent Slope	20 Percent	40 Percent	60 Percent	80 Percent
Flame Length	0.5 feet	0.6 feet	0.7 feet	0.8 feet

Fuel Loading. Surface fuel loading is low (average fuel loading of about 1 ton per acre) in the burned area, as nearly all material less than 3 inches in diameter was consumed in the 2008 fire. Figure 3-1 illustrates the lack of surface fuels within the Concow burned areas, photo was taken in Section 34, Township 23N, Range 4E on March 4, 2009.

Figure 3-1 2008 Fires Consume Surface Fuels in the Concow Project Area

As time goes by snags will deteriorate and fall contributing to future surface fuel loading. Brush and grass will respond quickly, adding an additional live and dead fuel load of 2–5 tons per acre. Standing tons per acre of woody material (1 to 24 inches in diameter) is varied across the project area.

Table 3-6 Range of Standing Tons per Acre*

Size Class	1 to 6 inches DBH	6 to 12 inches DBH	11 to 24 inches DBH
Tons per Acre	27 – 97 t/a	12 – 187 t/a	119 – 166 t/a

*Data derived from Forest Industry and Analysis plots calculated using Forest Vegetation Simulator (FVS) at stand level

Standing Dead Fuels. Wildland fire fighting is an inherently high risk occupation, in which numerous injuries and fatalities occur each year. Historically, falling trees, snags, and rocks account for over 8 percent of Federal wildland firefighter fatalities (Wildland Firefighter Fatalities in the United States, 1990–2006, MTDC, 2007). The 2008 Concow Fire has left a landscape of fire killed trees within the WUI area, where fire suppression resources are expected to protect life and property.

It is recognized that standing, dead fuels provide wildlife snag habitat post-fire, but it is the high number of snags, as indicated in table 3-7, in close proximity to residents and within the proposed DFPZ that concern fire managers. The structural integrity of charred trees in the burned area has been compromised by burning of the bole and tops. These trees can fall unpredictably by root pull, wind, or rot. Some of the smaller dead trees have already lost their bark, and a few tops have broken out over the last two winters. For this reason, these snags or danger trees pose a serious threat to the public and firefighter safety.

Table 3-7 Number of Dead Trees per Acre in the Burned Area within the Planning Area

Diameter in inches	0–6	6–11	11–20	20–30	>30
Trees per acre	400–1,500	40–284	40–180	10–35	0–20

*Number of dead trees per acre in the burned area within the Planning Area (given as a range) data gathered post fire using 1/50th acre plots

Unburned Areas

Historically fires in this region burned with low to moderate intensity, reducing fuel accumulations and vegetation density periodically. Fire return intervals were shorter (5–15 years) on drier, southern aspects and longer (15–25 years) on moist, northern aspects (Sugihara et al. 2006). As naturally occurring fire cycles are skipped, fuels accumulate and less fire adapted, shade tolerant tree species grow in forest understories.

Within the unburned portion of the Concow Planning Area, dead and down fuel loading is high and fuel ladders are present due to growth of a dense understory making for low canopy base heights. More intense fires, including higher incidence of passive and active crown fires, high mortality of both surface and crown vegetation, and greater impacts on watersheds are expected to occur under modeled fire conditions. Figure 3-2 depicts results of skipped fire cycles in forested stands with heavy surface fuel loads, and hundreds of small trees per acre, would contribute to high severity fire behavior.

Flame Length. Vegetative conditions are intimately linked to fire behavior and fuel loading. The current average flame length for the unburned portion of the Concow Planning Area is 6 feet, modeled under high fire weather conditions. Heavy surface fuel loads and low canopy base heights increase potential flame lengths and possible torching (Graham et al. 2004). Horizontal continuity of surface fuels and vertical continuity of ladder fuels allow for rapid spread of fire

Potential fire types within the Concow Planning Area vary with topography, weather conditions, fuel loading, arrangement and recent fire activity. Surface fires are generally lower in intensity and easier to suppress—though may still have high mortality rates if fuel accumulations are great. Passive crown fires, which include surface fires that occasional torch individual or clumps of trees, are indicative of higher fire intensity and severity. Fire behavior is predicted to produce passive crown fire in 10 of the 14 stands modeled using 97th percentile weather conditions. Fire intensity is highest in active and independent crown fires, or when fire runs continuously through both surface and canopy fuels. These fires generally are difficult to fight and require more resources to suppress.

Fire exclusion, past harvesting practices, and changes in various other land practices have decreased the periodic incidence of historic low intensity fires, allowing for a build-up of surface and canopy fuels (Peterson et al. 2005). Fires burning in over-crowded stands have greater potential for crown fire.

Fuel loading. Fuel loading is varied across the Concow Planning Area. Accumulations of limb wood over time create a fuelbed of light slash. The Forest Service estimates that 12 tons per acre of dead and down woody debris less than 3 inches in diameter (Fuel Model [FM] 10) cover 17 percent of the unburned federal lands. (See table 3.8 for description of Fuel Models.) Brush accounts for 40 percent of the area; with lack of disturbance, brush becomes decadent, increasing dead fuel loading. Fuel models 8 and 9 make up 33 percent of the unburned area, meeting the surface fuel loading component of the desired condition.

Van Wagtendonk (2004) reports there are landscapes today where accumulations of dead woody debris and dense stands of shade-tolerant understory trees and shrubs have made the fuel and vegetation complex nearly homogeneous, resulting in a fire that cannot be suppressed becoming larger, and burning more intensely. The distribution of FMs on private lands is: FM 10–38 percent, FM 9–8 percent, FM 8–9 percent, brush FMs 4, 5, and 6–29 percent, grass FMs 1 and 2–11 percent.

Table 3-8 Fuel Models (FM) used in Analysis of the Current Environment

Fuel Model	Typical Fuels Type	Fuel Loading Material <3 inches Diameter (tons per acre)	Initial Attack Production Rates (chains[b] per hour)		Fuel Model Description
			Type 1 Crew (20 person)	Type 3 Engine (5 person)	
4	Brush–6 feet	Dead fuel load 13 Live fuel load 5	5	20	Mature shrubs >6 feet in height; higher percentage of dead fine woody material in the crowns of the shrubs than other brush FMs. Fires can burn with high intensity and rapid rates of spread due to the higher percentage of dead woody material associated with this FM. Deeper litter layer may also hamper suppression efforts in this FM.

Fuel Model	Typical Fuels Type	Fuel Loading Material <3 inches Diameter (tons per acre)	Initial Attack Production Rates (chains[b] per hour) Type 1 Crew (20 person)	Initial Attack Production Rates (chains[b] per hour) Type 3 Engine (5 person)	Fuel Model Description
5	Brush–2 feet	Dead fuel load 3.5 Live fuel load 2	6	20	Shrub and sapling fuel types indicative of some type of disturbance. Fires generally are not intense due to the low surface fuel loadings. Only under late summer conditions and/or extreme weather condition do live fuels in FM 5 pose a threat of becoming large fires.
6	Dormant brush, hardwood slash	6	6	20	Wide range of shrub conditions. Shrubs may be older in FM 6 than FM 4 but may not be tall and/or have the dead woody component seen in FM 4. Fires may carry better through FM 6 than FM 5; however, a moderate wind (greater than 8 mph) is required. Fires will drop to the ground in lesser wind speeds or at openings in the stand.
8	Closed timber litter	5	7	24	FMs 8 and 9 are single-story, early-to-mid successional stands with little dead and down material or ladder fuels. Fires burn with low intensity with little spread or tree mortality. Initial attack in these fuel types is highly successful. Only under extreme fire conditions (such as high wind speeds) do these fuel types pose a resistance to control.
9	Hardwood litter	3.5	28	22	
10	Timber–litter and understory	Dead fuel load 12 Live fuel load 2	6	20	Decadent late-stage succession, characterized by multistoried stands with ladder fuels and a significant component of dead and down materials. Due to the heavy down fuel component and presence of ladder fuels, fires in FM 10 burn with a high intensity. Common spotting, torching, and crowning in overstory trees. Fires are difficult to control under initial attack conditions.
11	Light logging slash	11.5	15	20	Light logging slash as could be represented by light thinning slash or masticated fuels. Spacing of fuels, light fuel loads or aging of fine fuels may limit fire potential.
TL1	Low Load compact conifer litter	1.0	7	24	Primary carrier is compact forest litter. Light to moderate load, fuels 1 to 2 inches deep. May be used to represent a recently burned forest. Spread rate is very low; flame length very low.

Sources: Anderson 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. USDA Forest Service Gen. Tech. Report INT-122; Fireline Handbook NWCG Handbook 3, 2004. Burgan and Scott 2005. Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model. USDA Forest Service Gen. Tech. Report RMRS-GTR-153.

Notes: a. FMs are used to reflect fuel loading and depths in this analysis. FMs used in this analysis that have a live fuel load that may contribute to fire behavior are 4, 5 and 10. FMs 8 and 9 represent desired conditions for forested stands. Brush, timber and logging slash models that reflected actual Concow Project conditions were used in the Concow analysis. General fuel loading of small material is estimated by fuel model, as are the speed fire fighters are able to advance against wildfires. The latter is estimated by two types of fire fighting units. Finally, details of average fire behavior and the ability of fire fighters to combat fires in each model are described.

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

3.3.2 Vegetative Conditions

Tree Species Composition. The Concow Planning Area is characterized by a very diverse group of vegetation and habitat types. The primary vegetation habitat types (Mayer and Laudenslayer 1988) found in the Planning Area include Sierran mixed conifer, Douglas-fir, Ponderosa pine, Montane hardwood-conifer, and Montane hardwood and shrub dominated lower elevations with mixed chaparral and grasslands.

Figure 3-2 Serpentine Slope - East of the Rim Road

Inclusions of closed-cone pine-cypress habitat type (McNabb Cypress) are found on serpentine soils.

The Forest Survey Site Class within the area ranges from 2 to 7, with 7 being the least productive site. The Forest Survey Site Class corresponds to the Region 5 Site Class, used to characterize vegetative productivity.

The following is a brief description of the habitat types and potential vegetative species associated with each, present within the Concow Planning Area:

The **mixed conifer type** includes the following species: white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), sugar pine (*Pinus lambertiana*), Douglas-fir (*Pseudotsuga menziesii*), and incense cedar (*Calocedrus decurrens*).

The **Ponderosa pine type** includes the following species: Ponderosa pine (*Pinus ponderosa*), (either in pure stand or mixed species, in which 50 percent of the canopy is Ponderosa pine), white fir (*Abies concolor*), sugar pine (*Pinus lambertiana*), Douglas-fir (*Pseudotsuga menziesii*), California black oak (*Quercus kelloggii*), Pacific madrone (*Arbutus menziesii*) and tanoak (*Lithocarpus densiflora*).

The **Douglas-fir type** are dominated by Douglas-fir (*Pseudotsuga menziesii*), tanoak (*Lithocarpus densiflora*), and Pacific madrone (*Arbutus menziesii*), in association with sugar pine (*Pinus lambertiana*), ponderosa pine (*Pinus ponderosa*), black oak (*Quercus kelloggii*), and canyon live oak (*Quercus chrysolepis*).

The **Montane hardwood-conifer type** transitions between the conifer and montane hardwood type. Species include California black oak (*Quercus kelloggii*), Pacific madrone (*Arbutus menziesii*), California bay (*Umbellaria californica*) and tanoak (*Lithocarpus densiflora*), with ponderosa pine (*Pinus ponderosa*), white fir (*Abies concolor*), incense cedar (*Calocedrus decurrens*), Douglas-fir (*Pseudotsuga menziesii*), and sugar pine (*Pinus lambertiana*) forming the overstory.

The montane hardwood habitat is found along the steep inner slopes of the river canyon and on both lower and higher elevations on serpentine soils. Common species found are Canyon live oak (*Quercus chrysolepis*) and Douglas-fir (*Pseudotsuga menziesii*).

At higher elevations, montane hardwood may transition into mixed conifer and California black oak (*Quercus kelloggii*). At lower elevations, gray pine (*Pinus sabiniana*), tanoak (*Lithocarpus densiflora*) and Pacific madrone (*Arbutus menziesii*) may be found. A minor component of blue oak woodland is also found in the analysis area. Figure 3-3 illustrates the Montane hardwood transition zone at the lower elevations in the southeastern portion of the Concow Planning Area, prior to the 2008 wildfires.

The **shrub dominated** lower elevations, may include the following species (not all inclusive): whitethorn ceanothus (*Ceanothus cordulatus*), green leaf manzanita (*Arctostaphylos patula*), toyon (*Heteromeles arbutifolia*), and California coffeeberry (*Frangulacalifornica*), as illustrated in figure 3-3. As shown in figures 3-2 and 3-4, serpentine soils support a sparse conifer overstory over a shrub understory. Tree and shrub species such as McNabb Cypress (Cupressus macnabiana), and gray pine (Pinus sabiniana) have adapted to unique serpentine habitats.

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Figure 3-3 Montane Hardwood-Conifer Vegetation and Habitat Type

Figure 3-4 McNabb Cypress and Gray Pine Vegetation and Habitat Type

Past Influences on Vegetation Composition and Structure. As the Concow Planning Area is near the site of early travel and trade activities, forests were logged to fulfill lumber market demands, transportation and mining purposes (O'Brien 1999). Mining drew many to Butte County during the mid to late 1800s. Lumbering during that period was limited and mainly in support of mining activities and building of small rural communities

Early accounts by explorer Leiburg in *Forest Conditions of the Sierra Nevada* (1902) indicated most cutting activity was taking place below Forest Service boundaries, with lumber from the North and Middle Forks of the Feather River bound for Oroville (McKelvey and Johnston 1992). These authors suggest that most of the Plumas National Forest was at the limits of transportation during that time period and that logging probably consisted mostly of high grading of sugar pine.

Leiburg characterizes the Planning Area as being composed of, "Mixed forest, cut and culled, here and there open stands of large sized sugar pine and yellow pine." Throughout the analysis area trees had been removed selectively (Leiburg 1902). Sheep grazing and burning prior to 1900 were extensive and likely altered regeneration of forest trees and stand structure across the landscape (McKelvey and Johnston 1992). When these activities ceased for an extended period, dense stands of saplings followed (Leiburg 1902).

The areas surrounding Paradise and Magalia to Stirling City were extensively logged during the period of the early 1900s through the mid 1950s by Diamond Match Company (Colby and McDonald 2005), after which the area was acquired by Sierra Pacific Industries. Later, truck hauling and a more extensive road network opened areas to further harvest and utilization.

The influence of natural and person caused fire has affected vegetative development and composition patterns throughout the Planning Area. Much of the vegetation within the Planning Area is adapted to fire; hardwood and shrub species that sprout from the root or stump following fire (tanoak, black oak, big leaf maple and many shrub species), and those that require fire to open serotinous cones, as in the case of McNabb Cypress and gray pine, or brush seed germination that is stimulated by fire (manzanita) (Brown and Smith 2000).

The amount of sprouting from hardwoods and shrubs is affected by the age of a given plant and the fire severity. Where fire effects are severe, conifer seed sources may be absent for extended periods, leaving hardwoods and shrubs to dominate (Fryer 2008). In addition, seed of various shrub species stored in the soil may either be stimulated to germinate by light fire, or destroyed if the fire's effects are severe.

Fire exclusion practices since the early 1900s have affected compositional changes in some vegetation types by allowing conifers to overtop and dominate former hardwood or chaparral types (Brown and Smith 2000). In the absence of periodic fire, conifer and hardwood saplings and pole size trees numbered in the thousands per acre have grown in amongst dense, decadent brush fields of manzanita, ceanothus, and other species.

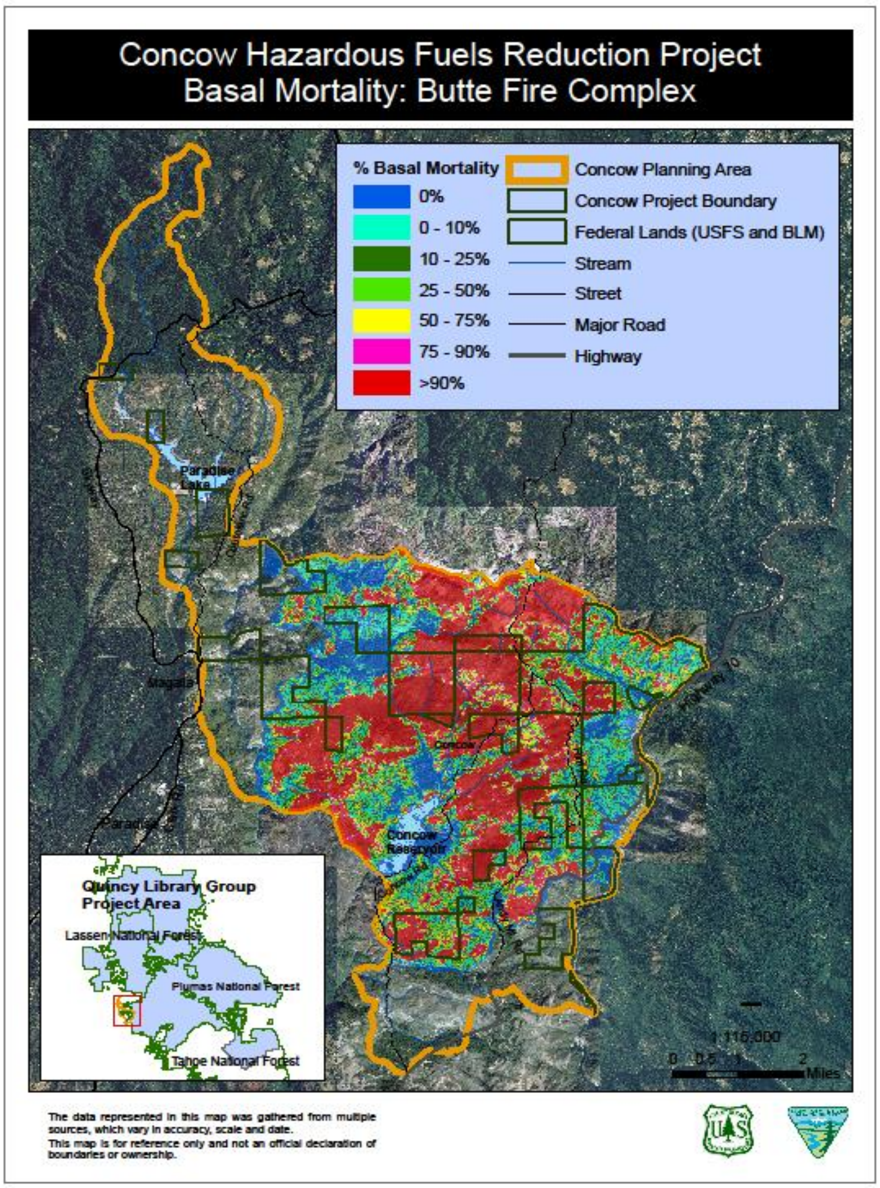
Successional trends show an increase in the number of white fir and incense cedar over pine species, as these former species are shade tolerant. Shade intolerant species such as pine need bare mineral soil as a substrate for regeneration and full sunlight to grow, conditions that are not available under dense shade created by fir and cedar. These dense conditions have created excessive surface fuel loading and overstocked forest conditions that are conducive to drought related mortality, increased risk of insect infestation and the potential for catastrophic fire (McKelvey and Johnston 1992; Brown and Smith 2000).

Climatic Influences on Fire. Modeling of climate change related effects on vegetation indicates there is potential for increased vegetation growth, which could lead to change in and increased fire risk in some areas of the United States, particularly in the west. Some predictions indicate that not only will the range of certain tree species increase, their growth rate may also increase as a result of changes in precipitation and warmer temperatures. In other recent studies, a small decrease in the number of large trees has been noted with anticipated warming temperatures.

Many factors, such as increased drought and insect activity, are causing the decline in large tree species, but the effect of climate change is noted as the likely source of increased tree mortality (Knutson 2006). Other recent studies suggest that the increases in forest fire size, burned area and severity may be linked to climatic effects of increased precipitation and subsequent increases in forest growth and fuel loading (Safford et al. 2009). There are significant differences in opinions regarding appropriate response to climate change and its effects on forests.

Burned Areas

Forest Health. Following fire containment, extensive field reconnaissance was completed to verify the extent and severity of mortality and residual canopy cover in areas that were subject to high and moderate severity burn. Nearly 60 percent of the Concow Analysis Area was burned in the Butte Lightning Complex fires in 2008. Of the total acreage on public land, approximately 38 percent was classified as high severity. Within these high severity areas, greater than 75 percent of the trees were killed; most trees lost all foliage, and bark char was extensive. Downed fuels and ground cover were largely consumed by the fire.



Map 3-6 Butte Lightning Complex: Vegetation Burn Severity (Percent Basal Area Mortality)

In moderate severity areas, which covered 17 percent of public land, large pockets of overstory trees were killed. Intermixed with areas of moderate mortality, are areas of lesser intensity. Low severity areas, approximately 45 percent of public land within the Planning Area, include pockets where overstory trees survived mostly intact, but most small trees and brush did not.
Mortality estimates are based on imagery collected following the fires by utilizing a relative index, called the relative differenced Normalized Burn Ratio (RdNBR) (Miller and Thode 2007). In this relative index, referred to as “RdNBR,” all patches of stand replacing fire are assigned a severity classification (Miller et al. 2008; Miller 2007; Miller and Fites 2006). Pre- and post-fire imagery is compared and the difference between the two images is a measure of deforestation due to stand replacing fire. A map of Vegetation Burn Severity (percent basal area mortality) for the Planning Area is shown below (map 3-5).

The vegetation has been altered by the 2008 fires as described in the following Table 3-9. The California Wildlife-Habitat Relationships System (CWHR) is linked to vegetative mapping and collected forest inventory data. The extent of both pre and post fire vegetation types and the percent change in CWHR is listed for all ownerships within the Analysis Area.

Table 3-9 Concow Project Analysis Area, Extent of California Wildlife-Habitat Relationships (CWHR) Vegetation Types, Pre- and Post-fire, All Ownerships

CWHR Vegetation Type	Total Acres Pre-fire	Percent of Analysis Area	Total Acres Post-fire	Percent of Analysis Area	Percent change
Urban	11	0%	11	0%	0
Barren	130	0%	130	0%	0
Water	481	1%	481	1%	0
Mixed chaparral	2,794	9%	2,794	9%	0
Montane chaparral	31	0%	31	0%	0
Blue Oak/Foothill Pine	303	1%	247	1%	0
Blue Oak Woodland	54	0%	54	0%	0
Montane Hardwood	7,564	24%	13,079	42%	+18%
Montane Hardwood-Conifer	5,229	17%	3,369	11%	-6%
Ponderosa Pine	3,510	11%	2,450	8%	-4%
Sierran Mixed conifer	5,068	16%	4,098	13%	-4%
Douglas-fir	5,506	18%	3,879	12%	-6%
Closed Cone Cypress	9	0%	14	0%	0
Cropland	28	0%	28	0	0
Montane Riparian	14	0%	14	0	0
Annual Grassland	178	0%	234	1	0
Total	30,910	100%	30,910	100%	

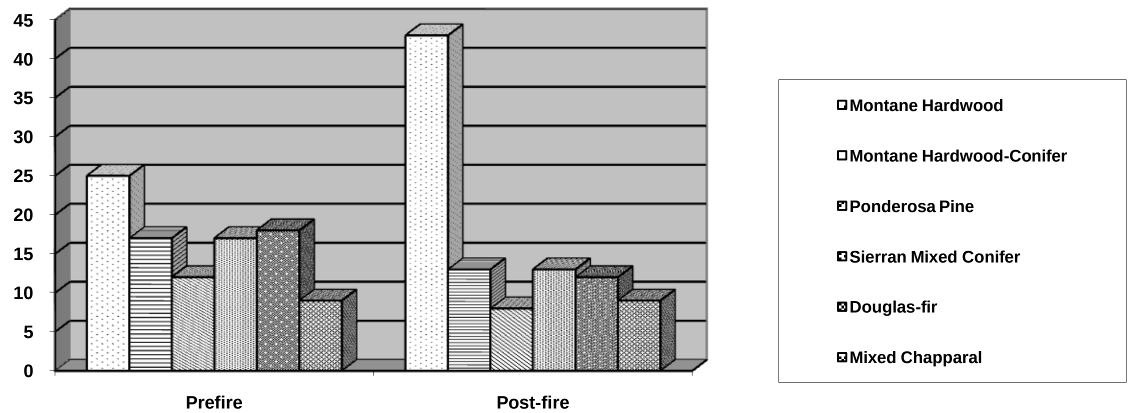


Figure 3-5 Percent of Major Vegetation Types Pre- and Post-fire

While the majority of conifers have been killed in high fire severity areas, hardwoods have resprouted profusely, creating an increase in acreage of montane hardwood and black oak forest types. The existing condition is not static however, and the burned area is expected to increase in brush and forb cover in a relatively short period of time.

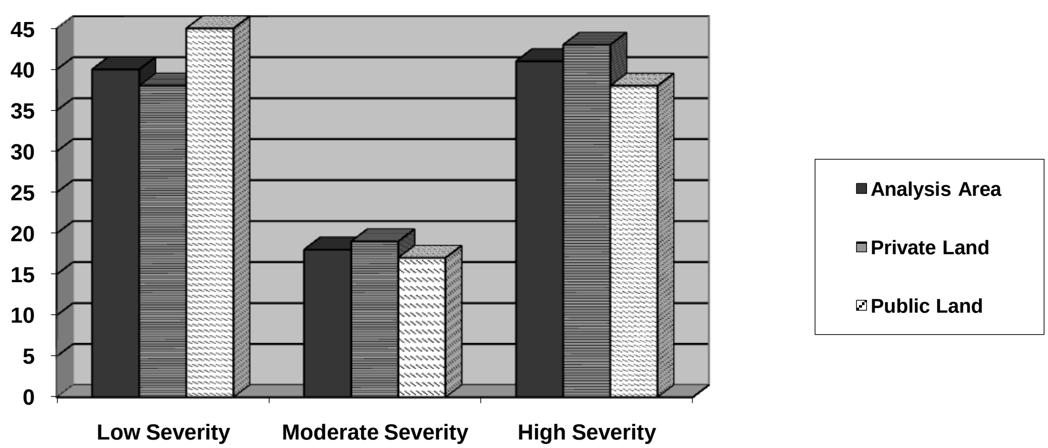


Figure 3-6 Vegetation Burn Severity by Percent of Total Lands Burned in the Analysis Area

Studies in other conifer-hardwood types have shown that, with fire, forests may eventually become more heavily dominated by fire-adapted hardwoods and shrubs, or a conifer-hardwood mixture (Fryer 2008). Hardwoods, particularly tanoak, may dominate burned areas in early post-disturbance years (McDonald and Tappeiner 1987). Conifers eventually overtop hardwoods decades later, with tanoak often becoming dominant in the subcanopy.

Table 3-10 Vegetation Burn Severity (Percent Basal Area Mortality) on Public and Private Lands

Percent Basal Area Mortality	Low Severity	Moderate Severity		High Severity	Total for All Severity Classes
	Mortality 0–25%	Mortality 25–50%	Mortality 50–75%	Mortality 75–100%	—
Total burned acres within Analysis Area	7,522	1,866	1,588	7,743	18,720
Percent of burned acres in Analysis Area	40%	10%	8%	41%	100%
Burned acres on private land	4,852	1,267	1,144	5,506	12,769
Percent on private land	38%	10%	9%	43%	100%
Burned acres on public land	2,670	599	444	2,237	5,951
Percent on public land	45%	10%	7%	38%	100%

Table 3-11 Analysis Area, Extent of CWHR Vegetation Types, Pre- and Post-fire, on Public Land (Forest Service and BLM)

CWHR Vegetation Type	Total Acres (Pre-fire)	Percent of Analysis Area	Total Acres (Post-fire)	Percent of Analysis Area	Percent Change
Urban	0	0	0	0	0
Barren	55	<1	55	<1	0
Water	42	<1	42	<1	0
Mixed chaparral	949	12	949	12	0
Montane chaparral	5	0	5	0	0
Blue Oak/Foothill Pine	57	<1	36	<1	0
Blue Oak Woodland	0	0	0	0	0
Montane Hardwood	2,333	29	3,936	49	+20
Montane Hardwood-Conifer	1,248	16	761	10	-4
Ponderosa Pine	765	10	494	6	-4
Sierran Mixed conifer	827	10	437	5	-5
Douglas-fir	1,669	21	1,214	15	-6
Closed Cone Cypress	9	0	9	0	0
Grass/Forbs	1	0	22	<1	<1
Montane Riparian	0	0	0	0	0
Unknown	0	0	0	0	0
Totals	**7,960**	**100**	**7,960**	**100**	—

Figure 3-7 illustrates the change in vegetation both pre-fire and post-fire on public land. Prior to the fire, public land within the Analysis Area contained the full spectrum of forest seral stages. Small and medium to large trees dominated the landscape, and early seral stages (seedlings, saplings and pole size trees) were minimally represented.

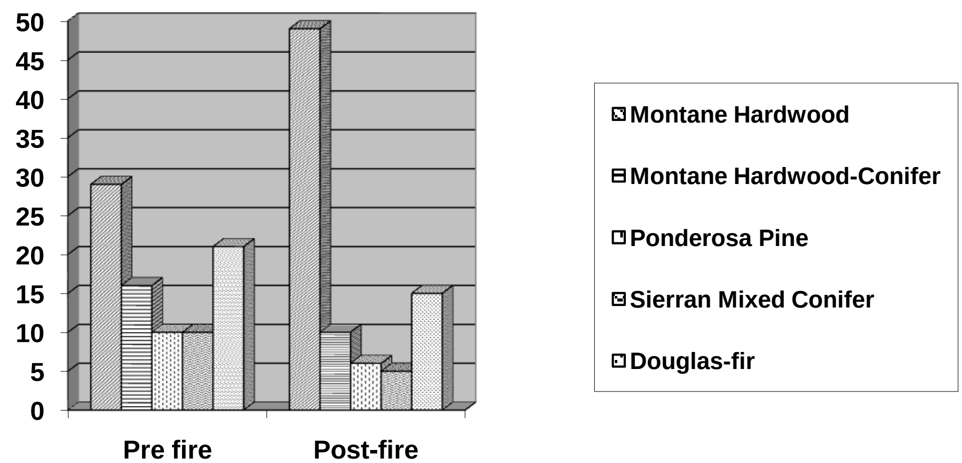


Figure 3-7 Percent Change in Vegetation Pre- and Post-fire on Public Land

Following the fire, CWHR conifer and hardwood habitats in the analysis area are dominated by small trees (11–24 inches in diameter). Acres of CWHR Size Class 1 and 2 have increased due to conifer mortality and post-fire sprouting of hardwoods.

Table 3-12 Landscape Distribution of CWHR Size Classes on National Forest as Percent of Total Acres for the Concow Project, Existing Condition Post-fire

	CWHR				
	Size 1 and 2	Size 3	Size 4	Size 5	Non-stocked
Stand Type	Seedlings and saplings	Poles	Small trees	Medium-large trees	N/A
Seral Stage	0–6 in. dbh	6–11 in. dbh	11–24 in. dbh	>24 inches	N/A
Percent distribution across the landscape	25%	17%	27%	18%	13%

Table 3-13 shows age class distribution as delineated by CWHR size classes, which are roughly equivalent to seral stages or age classes across the Planning Area. This table represents age class distribution of entire forest types across the Planning Area. This information is displayed graphically in figure 3-8 below.

Table 3-13 Concow Planning Area, Pre- and Post-fire Vegetation Size Class and Density as Classified by CWHR on Public Lands

CWHR Size Class[a]	CWHR Density[b]	Pre-fire Acres	Pre-fire % of Acres	Post-fire Acres	Post-fire % of Acres	Percent Change
Conifer						
1	Total	0	0	0	0	0
2	Total	123	1	20	0	-1
3	Total	242	3	165	2	-1
4	S	177	2	74	<1	-3
	P	123	2	122	2	0
	M	284	4	215	3	-1
	D	1,978	25	1,140	14	-11
5	S	0	0	53	<1	<1
	P	73	1	54	<1	0
	M	201	3	175	2	-1
	D	1,317	17	896	11	-6
	Total	4,518		2,914		
Hardwood						
1	Total	0	0	2,016	25	+25
2	Total	2	<1	0	0	0
3	Total	1,385	17	1,201	15	-2
4	S	0	0	13	<1	0
	P	0	0	5	<1	0
	M	227	3	171	2	-1
	D	583	7	400	5	-2
5	S	0	0	1	0	0
	P	11	<1	8	<1	0
	M	116	1	113	2	1
	D	66	<1	45	<1	-1
	Total	2,390		3,973		
Shrub		954	12	954	12	0
Other		98	1	119	<1	0
		7,960	100	7,960	100	

a. CWHR Size Classes

Seedling	1 = <1 inch dbh
Sapling	2 = 1–6 inches dbh
Pole	3 = 6–11 inches dbh
Small Tree	4 = 11–24 inches dbh
Medium/Large Tree	5 = >24 inches dbh

b. Canopy Cover

S = Sparse	10–24%
P = Open	25–39%
M = Moderate	40–59%
D = Dense	60–100%

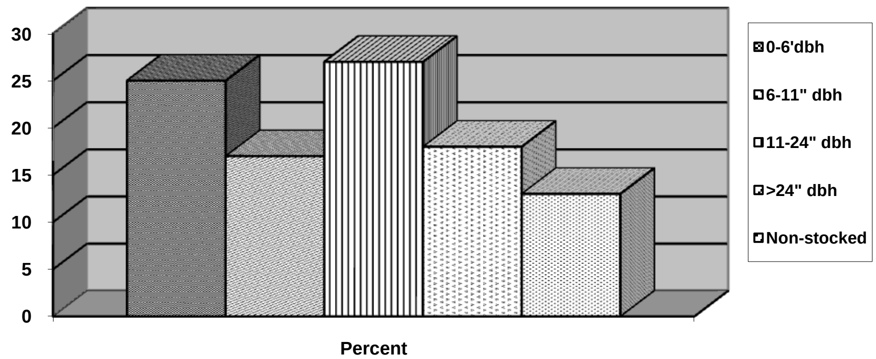


Figure 3-8 Landscape Distribution of CWHR Size Classes on National Forest as a Percent of Total Acres for the Concow Project, Existing Condition Post-fire

Across the landscape, the high and moderate severity burn areas within the Butte Lightning Complex contain a patchy mosaic of dead conifers, hardwoods, and brush patches. Tree size and the number of trees per acre vary widely. The highest loss of trees was in the CWHR size class 4 stands, followed by CWHR Size Class 5, as illustrated in table 3-13 above.

Prior to the BTU fire, hardwoods such as black oak and tanoak were represented well throughout the range of diameter classes. Though most oaks were killed in areas affected by severe fire, vigorous sprouting is occurring creating a new age class of these hardwood species on the landscape. New tanoak and black oak sprouts are estimated to range from several hundred to one thousand per acre, depending on their distribution prior to the 2008 fire (FVS 2009). Sprouts of both black oak and tanoak are 2 to 3 feet tall less than one year following the fire.

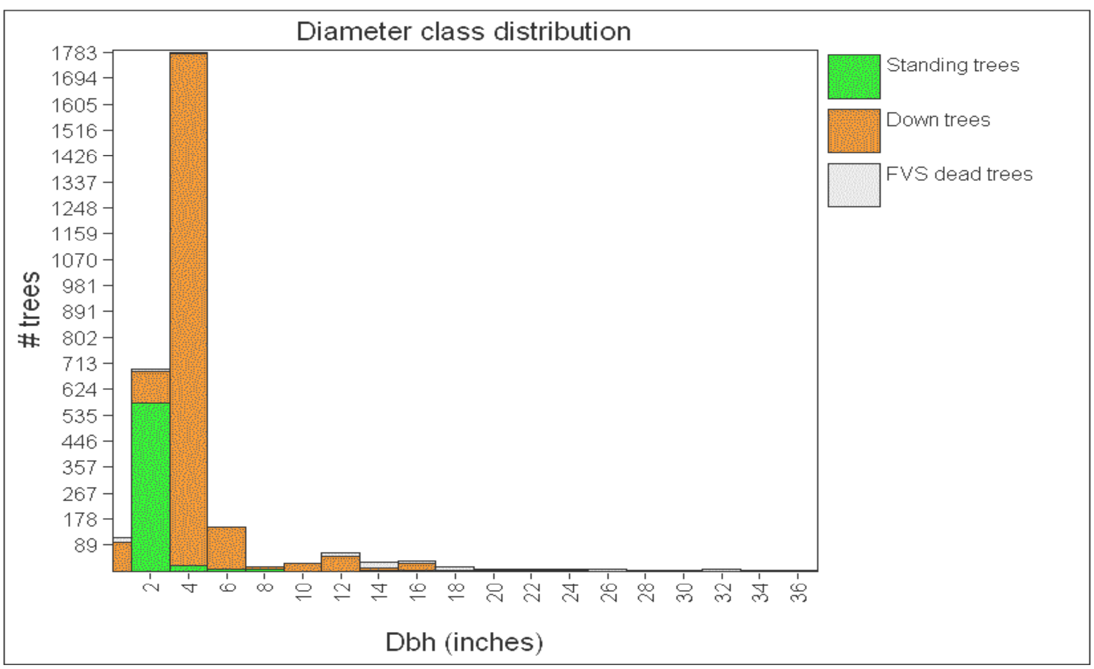


Figure 3-9 Number of Trees, Both Live and Dead, by Diameter Breast Height (FVS 2009) for Recovering Stand Within the Burned Area

Following the fire, the existing vegetation has shifted from a conifer-dominated landscape to one more completely dominated by hardwoods. Nearly all conifer types found within the analysis area had an existing hardwood understory prior to the fire. While the majority of conifers have been killed in high fire severity areas, hardwoods have resprouted profusely, creating an increase in acreage of montane hardwood and black oak forest types. The existing condition is not static however, and the burned area is expected to increase in brush and forb cover in a relatively short period time. Studies in other conifer-hardwood types shown that with fire, forests may eventually become more heavily dominated by fire-adapted hardwoods and shrubs or a conifer-hardwood mixture (Fryer, 2008). Hardwoods, particularly tanoak may dominate burned areas in early post- disturbance years (McDonald and Tappeiner, 1987). Conifers eventually overtop hardwoods decades later, with tanoak often becoming dominant in the subcanopy.

Unburned Areas

Stand density and Structure. Stand density and structure are described in terms of trees per acre, basal area per acre and canopy cover percent. Table 3-14 shows the interrelationship of these elements.

Table 3-14 Average Stand Attributes for Proposed Unburned Treatment Areas

Diameter at Breast Height (inches)	0–6	6–11	11–20	20–30	>30	Total
Trees per acre	1,418	89	58	190	9	1,597
Basal area ft^2	14	33	69	78	66	261
Canopy cover percent*	31	24	28	22	16	75

*Total canopy cover includes crown overlap.

The high number of trees per acre in the small diameter classes, composed of both hardwoods and conifers, results from fire exclusion and past management practices. These small trees that make up the lower canopy classes are referred to as the more shade-tolerant trees (Douglas-fir, tanoak, and incense cedar): trees that are able to grow in the shade of other conifers. These small trees have a lower canopy base height (crown), which, along with brush, may act as a fuel ladder to carry fire into the forest canopy (see figure 3-10).

Density related mortality is caused by overcrowded forest conditions. In the absence of disturbance (and the interruption of several fire cycles due to fire exclusion), forest stands increase in numbers of trees and stand basal area per acre to a maximum level. At maximum they reach a biologic condition where individual tree mortality increases and trees begin to die. Above this threshold overstocked stand mortality increases, indicating a limit to forest resilience to disturbance. Competition for the supply of water and nutrients is the primary cause of tree decline (Daniel et al. 1979) in this situation. This upper limit or threshold above which overstocked stand mortality increases is an indicator of a condition where forest resilience to disturbance is limited. Very dense forested stands of trees have lower vigor and tend to be more susceptible to environmental stresses including drought, insects and disease. In addition, the combined mortality of small trees and brush, due to extreme competition and shading, often contribute to increased ground and surface fuels.

Basal area in square feet per acre in the project area ranges from 200 to 400 ft^2. The higher ranges of basal area indicate that these stands are outside the range of normal conditions and are experiencing increased mortality and susceptibility to insect activity.

Multiple layers of both conifer and hardwood species, especially those in the lower crown classes, contribute to what is called "ladder fuels" which have potential to carry fire into the overstory. The horizontal profile in figure 3-10 below illustrates the vertical and horizontal connectivity of tree crowns in untreated stands in the unburned area.

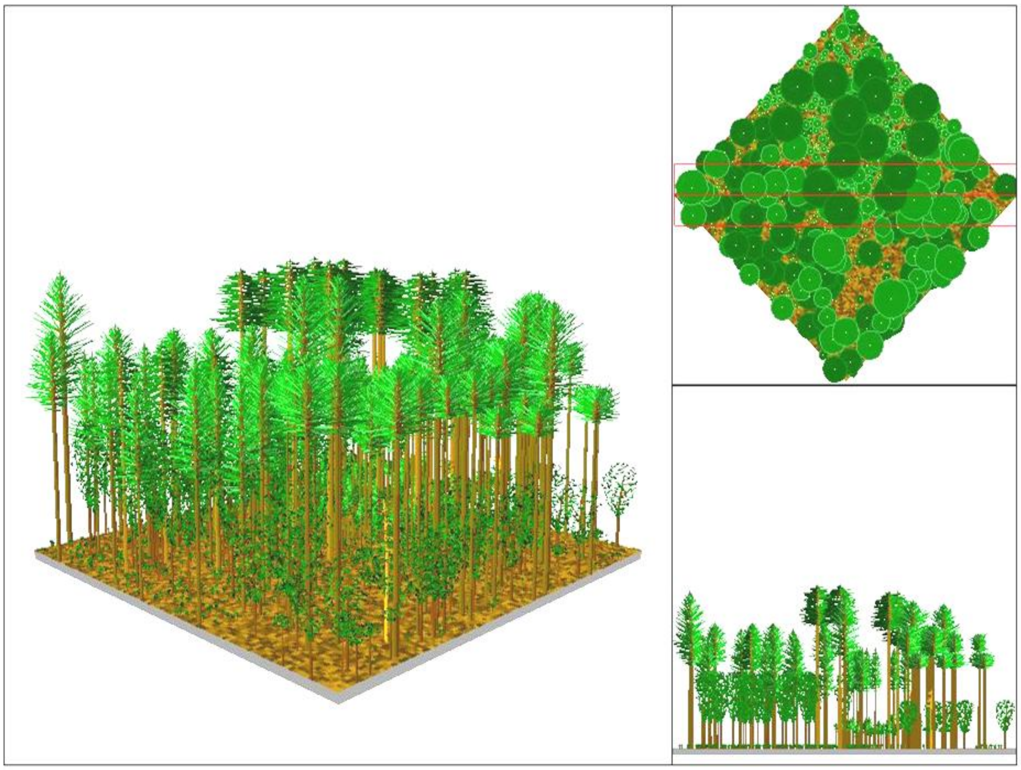


Figure 3-10 Typical Forest Stand in the Unburned Area Simulated by FVS 2009

Species Composition. Through a series of photographs matching historic and recent landscapes in the Sierras, Gruell (2001) documented vegetation changes due to such influences as fire exclusion, mining and grazing. On the lower elevations of the Sierra Nevada, black oak may have historically occupied drier south and west aspects in the lower elevational forests. In the absence of disturbance, conifers more common to northerly and easterly slopes have infilled into former oak woodland. Regular low or mixed severity fire likely maintained the patchy nature of mixed conifer vegetation across the lower elevation landscape.

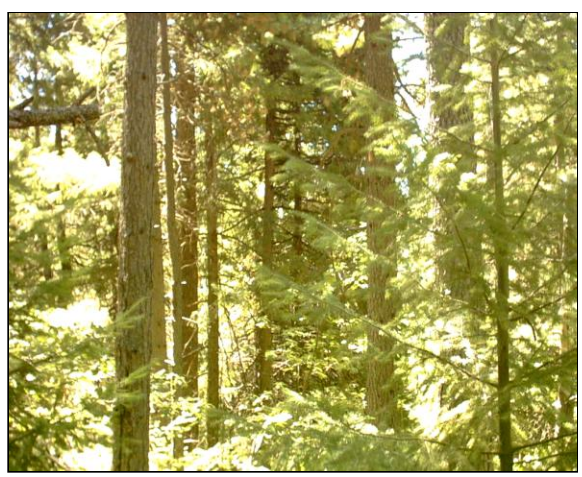


Figure 3-11 Unnaturally Dense Forests

High levels of shade tolerant species such as white fir, Douglas-fir and incense cedar are present today in stands formerly dominated by sugar pine and ponderosa pine. Tanoak, a hardwood that is shade tolerant, often grows in large numbers beneath a conifer overstory. The component of large black oak is decreasing in stands, being shaded out by overtopping conifer tree canopies. Intolerant fire resistant species such as ponderosa pine and sugar pine are unable to regenerate naturally in the overstocked shaded conditions currently present.

While present in high numbers in the lower diameter classes, black oak seedlings and saplings will linger and die without exposure to sunlight, in the shade of conifers. Lacking disturbance that would normally remove conifer ingrowth and stimulate black oak regeneration and different age classes through sprouting, very few trees survive to reach larger sizes to contribute to wildlife mast and habitat. Pressure from woodcutting in the surrounding areas also contributes to the loss of larger oaks near urban areas.

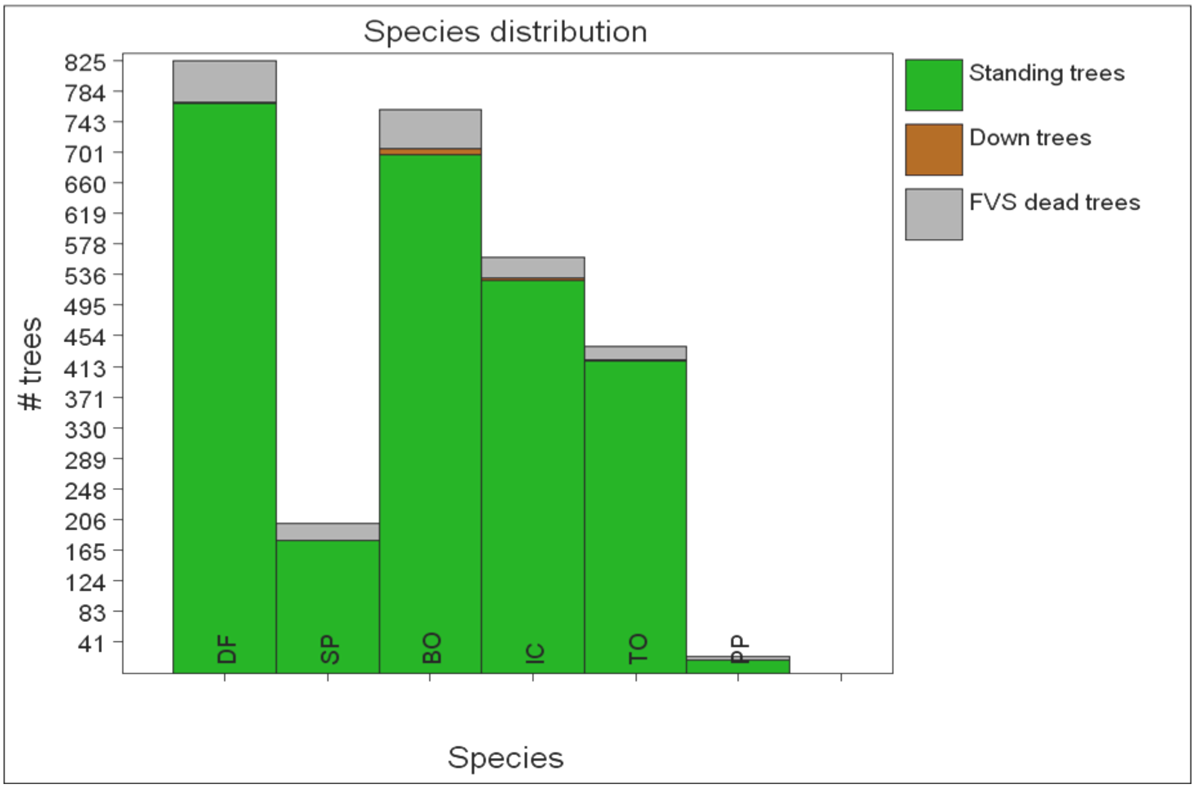


Figure 3-12 Percent Species Composition 2009, FVS

Table 3-15 Unburned Area: average number of black oak trees per acre by diameter size classes

Trees per acre (TPA) (inches)	0–6	6–12	12–16	16–20	20–24	24–28	TPA GT 30	Total TPA
	303	12	1	1	1	1	1	320

3.3.3 Botanical Species and Habitats

The Project Area is characterized by a very diverse group of vegetation and habitat types. The primary vegetation types found in the analysis area include Sierran mixed conifer, Douglas-fir, Ponderosa pine, montane hardwood-conifer, montane hardwood and shrub dominated lower elevations with mixed chaparral and grasslands.

Figure 3-13 Scarlet Fritillary

In amongst a variety of habitat types are areas of the project on serpentine soil. Serpentine soils are characterized by high levels of magnesium and iron and deficient in the critical element calcium. Serpentine soils also contain high levels of toxic heavy metals including chromium, cobalt, and nickel. Due to the unique soil chemistry, most plants cannot survive on serpentine soils (Kruckeberg 2006). However, some plants have the ability to cope with these soils and are only found in these areas. These plants are called “serpentine endemics” and compose a large number of the rare plants in the project area. There are approximately 3,800 acres of serpentine soil in the project area.

Unburned and Burned Areas

Existing Sensitive vascular plants within the Project Area. The Plumas National Forest provides habitat for over 2,000 vascular plant taxa (Clifton 2005), which represent approximately 35 percent of the California flora (Hickman 1993). Of these, 43 are on the Plumas National Forest Sensitive Species List. Floristic botanical field surveys were conducted by Forest Service botanists in 2005, 2006, and 2009 (Christofferson Flea FRRD Botany Survey report 2005, 2006, 2009). All plant surveys attempted to identify all species encountered. Non-vascular plant surveys were conducted by Colin Dillingham, VMS, Forest Service Enterprise Team, and David Toren, Forest Service Botanist, 2005.

Field surveys were designed around the flowering period and ecology of the rare species. For each rare plant, information was collected that described the size of the occurrence and habitat characteristics, and also identified any existing or potential threats.

Region 5 sensitive plant species occupy approximately 1,500 acres within the Project Area. For one species of Region 5 sensitive fungi, *Phaeocollybia olivaceae*, a potential habitat model (VMS 2006) identified 1,140 acres of potential low and medium quality habitat within the project area. However, less than one acre is located within treatment areas. Approximately 249 acres of rare plants are located within treatment areas. Distribution of sensitive species in the project and treatment areas are identified in tables 3-16 and 3-17.

Location information was collected using a Global Positioning System (GPS). Of the 43 vascular plant taxa on the Plumas National Forest Sensitive Species List, field surveys identified the presence of the following Region 5 sensitive species:

Table 3-16 Sensitive Species Located within the Project Area

Species	Common Name	Plumas National Forest Status	Global Rank/ CNPS Rank
Allium jepsonii	Jepson's onion	Sensitive	G1 / 1B.2
Calycadenia oppositifolia	Butte County calycadenia	Sensitive	G3 / 4.2
Calystegia atriplicifolia ssp. *buttensis*	Butte County morning-glory	Sensitive	G5T3 / 1B.2
Clarkia mosquinii	Mosquin's clarkia	Sensitive	G1 / 1B.1
Eriogonum umbellatum var. *ahartii*	Ahart's sulphur flower	Sensitive	None
Fritillaria eastwoodiae	Butte County fritillary	Sensitive	G3Q / 3.2
Packera eurycephala var. *lewisrosei*	Cut-leaved ragwort	Sensitive	G4T2 / 1B.2
Phaeocollybia olivacea		Sensitive	None
Sedum Albomarginatum		Sensitive	

Status: S – Forest Service Sensitive

Global Rank: G1-Critically Imperiled; G2-Imperiled; G3-Vulnerable; G4-Apparently secure; G5-Secure (NatureServe 2008)/California Native Plant Society (CNPS) Rank: 1B- Rare, Threatened or Endangered in California and Elsewhere; 2-Rare, Threatened or Endangered in California, But More Common Elsewhere, 3-About Which We Need More Information, 4-Plants of Limited Distribution (California Native Plant Society 2008).

Table 3-17 Type of Sensitive plants growing within treatment areas

Species	Total Acres in Project Area	Acres in Treatment Areas
Allium jepsonii	79.2	58.5
Calycadenia oppositifolia	38.1	14.6
Calystegia atriplicifolia ssp. *buttensis*	13.7	12.3
Clarkia mosquinii	0.2	0
Eriogonum umbellatum var. *ahartii*	40.6	32.7
Fritillaria eastwoodiae	48.4	21.7
Packera eurycephala var. *lewisrosei*	846.5	109
Sedum albomarginatum	0.1	0

Allium jepsonii (Jepson's onion)

Figure 3-14 Jepson's onion

This plant is known from 23 occurrences in eastern Butte and Tuolumne Counties in the northern Sierra Nevada (CNDDB 2008). In Butte County, it grows on serpentine soils in foothill woodland or mixed conifer forest. On the Plumas National Forest, this plant is known from fifteen occurrences that are found on steep, relatively undisturbed, serpentine outcrops between 1,400 and 3,800 feet in elevation in the western portion of the Forest.

Most occurrences are small, containing only hundreds of individuals. The trend for this plant on the Plumas National Forest appears to be stable, based on 30 years of field observations by Linnea Hanson, (former Plumas National Forest Botanist). There are 791 acres of Allium jepsonii within the project area; 73 percent of the occurrences are located within treatment areas. These occurrences are located on relatively rocky, serpentine soils.

Calycadenia oppositifolia (Butte County calycadenia)

Butte County calycadenia is an annual herb that is restricted to a narrow band of habitat in the foothills of the Sierra Nevada and Cascade Mountain Range in Butte County, California. It is found in grassy openings in woodland, chaparral, and forested habitats below 3,100 feet in elevation. It often occurs on shallow, serpentine soils, but can also be found on volcanic or granitic parent materials. Threats to this species include livestock grazing, road construction and maintenance, off-highway vehicle use and urban development.

Figure 3-15 Butte County calycadenia

Calycadenia oppositifolia has been observed in disturbed areas; however, the greatest concentrations of the species have been found in undisturbed openings (Lawrence Janeway, Personal Communication, 2009). There are a total of 38 acres of Butte County calycadenia within the project area and approximately 38 percent of the occurrences are located within treatment areas. These occurrences are located on relatively rocky, serpentine soils.

Calystegia atriplicifolia ssp. *buttensis* (Butte County morning glory)

Figure 3-16 Butte County morning glory

Butte county morning glory is a perennial species that occurs in lower montane habitats in northern California. It ranges from Butte County in the south to Shasta County in the north. This morning glory is very tolerant of ground disturbance and is frequently observed along roadsides and other open, disturbed areas. According to the California Natural Diversity Database (cnddb_Feb2009_nca_plants_untm10_nad83), there are 106 element occurrences. Within the project area, there are 14 acres of the morning glory, 12 acres of which are located within treatment areas.

Clarkia mosquinii (Mosquin's clarkia)

Figure 3-17 Mosquin's clarkia

This annual species occurs in the foothill woodland and lower elevation mixed conifer forest of Butte and Plumas Counties. This species was thought to be extinct when the only known location was eliminated with the formation of Lake Oroville. *Clarkia mosquinii* was rediscovered in 1992 by local botanist, Lawrence Janeway. *Clarkia mosquinii* is probably a fire follower and wildfire suppression has likely restricted the amount of suitable habitat for this species. This species often occurs in road cuts and on decomposing granite. To date, 45 occurrences have been documented within the lower elevations of the Plumas National Forest, while 14 occurrences have been reported from outside of the Forest boundary. There are 0.2 acre of Mosquin's clarkia within the project area; all are outside treatment areas.

Eriogonum umbellatum var. *ahartii* (Ahart's sulfur flower)

Figure 3-18 Ahart's sulfur flower

This newly described species is restricted to Butte, Yuba, and Plumas Counties in California. This species occurs on serpentine slopes in open chaparral and mixed conifer forests. The current trend for this species is unknown. Eleven occurrences have been recorded on the Plumas National Forest and an additional three occurrences are on Lassen National Forest lands that are administered by the Plumas National Forest. There are a total of 41 acres of Ahart's sulfur flower located within the project area. Approximately 81 percent of these plants are located within treatment areas.

Fritillaria eastwoodiae (Butte County fritillary)

Figure 3-2 Butte County fritillary

There are 75 known occurrences of Fritillaria Eastwoodiae on the Plumas National Forest and seven on the Tahoe National Forest. There are at least two locally known, though undocumented, occurrences on the Shasta-Trinity National Forest. It is also known from private lands in the foothills. There are 160 element occurrences recorded in the California Natural Diversity Database.

Despite this large number of occurrences, most are small and the individuals can be easily counted. Typically, on the Plumas National Forest, there are fewer than 10 flowering stalks in each occurrence; the total number of sexually reproductive plants is very low.

This species can be found in a variety of habitat types. This species has been found on serpentine substrate, however it is not restricted to serpentine and has been found on a variety of volcanic and granitic soils. It is typically found on dry slopes in open canopied mixed conifer forest, or semi-shaded chaparral in foothill woodland. The main habitat indicator appears to be a partly-open canopy with moderate litter.

Some of the historical occurrences on the Plumas National Forest have not been relocated where the canopy has closed in and covered the ground with litter. Some of the plants on the Plumas 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 and only basal leaves are present. It appears that plants need some canopy openings to maintain viability.

Packera eurycephala var. lewisroseii (Cut-leaved ragwort)

Figure 3-20 Cut-leaved ragwort

Cut-leaved ragwort is specifically found in the Feather River drainage in eastern Butte County and western Plumas County, CA. There are 30 known occurrences, ranging in numbers from under five plants in a few square feet to thousands of individuals dispersed over hundreds of acres. Twenty six occurrences are on the Plumas National Forest with five on private land found in two different bands of serpentine. Also, three occurrences are known from adjacent Lassen National Forest, and one from BLM. Within the project area, there are 846 acres of the cut-leaved ragwort and approximately 13 percent of these plants are located within treatment areas.

Phaecollybia olivacea

Based on a potential habitat model for this rare fungi, there are approximately 1,140 acres of medium to medium-high quality habitat within the project area. There are no areas of high quality habitat. Of these 1,140 acres of habitat, less than one acre would be treated with this project. It is believed that *P. olivacea* is associated with older mature stands with a hardwood tree component.

Special Interest Species.

There are eight known Special Interest species within the Project Area (table 3-18).

Table 3-18 Plumas National Forest Special Interest plant species located within the Concow Planning Area

Species	Common Name	Acres in Analysis Area	Acres in Treatment Unit
Anomobryum julaceum	Slender silver moss	0.01	0
Cardamine pachystigma v. *dissectifolia*	Stout-beaked toothwort	6.6	4.6
Clarkia mildrediae ssp. *lutenscens*	Golden-anthered clarkia	0.1	0
Cupressus macnabiana	McNab cypress	25.5	12.6
Cypripedium californicum	California Lady's slipper	0.01	0
Erigeron petrophilus v. sierrensis	Sierra rayless daisy	68.3	50.0
Lilium humboldtii ssp. *humboldtii*	Humboldt lily	0.1	0
Mimulus glaucescens	Shield-bracted monkey flower	1.6	0

Noxious Weeds

The Plumas National Forest is dedicated to the use of integrated management control tactics to control and eradicate noxious infestations in this project area. Floristic Botanical Surveys were conducted in proposed treatment areas in 2005 and 2006. Additional noxious weed surveys were conducted in 2009 in areas of high disturbance, associated with fire suppression activities conducted in the summer of 2008. Areas surveyed included: dozer lines, roads, landings, and suppression related safety zones. All noxious weed surveys were conducted by Forest Service Botanists. Noxious weed data were collected with Trimble GPS units. These spatial data were then included in our Forest Noxious Weed Geographic Information System (GIS).

The California Department of Food and Agriculture rated weeds were found within proposed treatment areas, as indicated in table 3-19. The California Department of Food and Agriculture's noxious weed list divides noxious weeds into categories A, B, and C. A-listed weeds are those for which eradication or containment is required at the state or county level. With B-listed weeds, eradication or containment is at the discretion of the County Agricultural Commissioner. C-listed weeds require eradication or containment only when found in a nursery or at the discretion of the County Agricultural Commissioner. The noxious weeds found within treatment areas include one B-rated (barb goatgrass), and three C-rated weeds, (French broom, yellow star thistle, and Klamathweed).

Table 3-19 Known Noxious Weeds within Proposed Treatment Areas

Common Name and CDFA* rating	Species	Total Infestation Area	Infestation Area in Treatment Units
		(acres)	
Barb goatgrass (B)	*Aegilops triuncialis*	0.01	0.01
French broom (C)	*Genista monspessulana*	1.4	1.0
Klamathweed (C)	*Hypericum perforatum*	Common	Common
Yellow starthistle (C)	*Centaurea solstitialis*	7.0	1.7
Spanish broom (none)	*Spartium junceum*	0.040	0.03
Bull thistle (none)	*Cirsium vulgare*	Common	Common

*CDFA, California Department of Food and Agriculture.

Barb goatgrass (*Aegilops triuncialis*)—an annual grass that grows in rangelands, grasslands, and oak woodlands. It is becoming a dominant grass in foothill grasslands of central California. This weed can directly injure livestock by lodging in their eyes or mouths, and is unpalatable to cattle. Barb goatgrass was identified in unit 1017 at a proposed landing.

French broom (*Genista monspessulana*)—a perennial shrub found in the Coast Ranges, Sierra Nevada foothills, Transverse Ranges, Channel Islands and San Francisco Bay area. French broom was introduced as a landscape ornamental, along with Scotch and Spanish broom. French broom is an aggressive invader, forming dense stands that exclude native plants and wildlife. Broom is unpalatable to most livestock except goats, so it decreases rangeland value while increasing fire hazards. According to CAL-IPC these leguminous plants produce copious amounts of seed, and may resprout from the root crown if cut or grazed

French broom has been identified along roadsides and in newly constructed dozer lines. It is found in and adjacent to the following units: 1027, 1052, 1061,1069,1070,1082, and 1086. The total infested area is 1.4 acres with approximately 1.0 acres located within and adjacent to treatment units.

Yellow starthistle (*Centaurea solstitialis*)—a winter annual that invades 12 million acres in California. Yellow starthistle inhabits open hills, grasslands, open woodlands, fields, roadsides, and rangelands, and it is considered one of the most serious rangeland weeds in the state. It propagates rapidly by seed, and a large plant can produce nearly 75,000 seeds. Several insects from the Mediterranean region, including weevils and flies, have been employed as biocontrol agents for yellow starthistle with minor success.

Yellow star thistle is the most common noxious weed in the project area. It is located in the following units: 1007, 1017, 1025, 1027, 1028, and 1044 treatment areas. However, the level of infestation on the district is relatively low when compared to the Sacramento Valley located a mere 10 miles to the west.

Spanish broom (*Spartium junceum*)—is a deciduous shrub found throughout the western part of California. Spanish broom was introduced as a landscape ornamental and was planted along highways to prevent soil erosion. It may grow into monoculture stands, excluding native species. Broom is unpalatable to most livestock except goats, so it decreases rangeland value, while increasing fire hazards. These leguminous plants produce copious amounts of seed, and may resprout from the root crown, if cut or grazed.

Two common weeds found within the Project Area are Klamathweed (*Hypericum perforatum*) and bull thistle (*Cirsium vulgare*).

Klamathweed (*Hypericum perforatum*)—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 to 4,000 feet), with plants becoming less common at the higher elevations. The Klamathweed beetle (*Chrysolina quadrigemina*) is a very effective biocontrol agent, which keeps overall Klamathweed populations low (Borror 1992).

Bull thistle (*Cirsium vulgare*)—was probably introduced in North America during colonial times. It is naturalized and widespread throughout North America and is found on every continent except Antarctica (Bossard 2000). It is most common in disturbed areas with little to no canopy and, like Klamathweed, is often found along roads with little shade cover. It is common along most Forest Service roads on the Plumas National Forest, although on the Feather River Ranger District it does not normally form dense thickets.

Although not native, bull thistle plants provide forage for many native insect species. Butterflies and bees are frequently observed on these plants. Furthermore, bull thistle does not spread by rhizomes or other creeping roots and does not produce allelopathic chemicals like some other A and B rated noxious weeds (Bossard 2000). Two biocontrol insects (*Urophora stylata* and *Rhinocyllus conicus*) have been released and help reduce population levels.

3.3.4 Wildlife Species and Habitats

The proposed Project combines two diverse areas for treatment; they are Concow (burned) and Unburned (green). The areas are distinct in that the Concow area was impacted by high severity wildfire, while the unburned area was not affected by the fire. The following is a brief description of the Existing Environment as it relates to Wildlife. For a full account see the Concow Wildlife Biological Evaluation/Biological Assessment (BE/BA 2009). The wildlife analysis of the existing condition provides the appropriate context for reasonable documentation of the baseline condition. The analysis area for each species was selected based on their home range, proximity to project, treatment locations, private land, urban development and the natural topography.

Unburned and Burned Areas

Terrestrial Wildlife Habitat (Birds and Mammals) The Concow Analysis Area is highly checker-boarded by private land. Forest Service isolated parcels account for 23 percent of the Analysis Area, BLM accounts for 3 percent and private land accounts for 74 percent. The habitat consists primarily of small diameter trees (0 to 6 inches) with few large trees greater than 30 inches.

Wildlife habitat is evaluated using the California Wildlife-Habitat Relationships System (CWHR). The CWHR is linked to vegetative mapping and collected forest inventory data. Across the landscape, the high and moderate severity burn areas within the Butte Lightning Complex Wildfire contain a patchy mosaic of dead conifers, hardwoods, and brush patches. Tree size and the number of trees per acre vary widely. The highest loss of trees was in the CWHR size class 4 stands, followed by CWHR size class 5 (Welles 2009). The CWHR for wildlife as a valued habitat component is size classes 4-6 (medium to large trees and densities M and D (moderate to dense canopy). Prior to the 2008 fires, nearly all conifer types found within the Planning Area consisted of a dominant conifer overstory, with a hardwood understory component. Montane hardwood, montane hardwood-conifer and Douglas-fir CWHR types dominated public land within the Planning Area. Other conifer types, including ponderosa pine and Sierran mixed conifer were represented, as well as the mixed chaparral type.

Montane hardwood and Montane Hardwood-Conifer (Mule Deer). Montane hardwood (MHW) and montane hardwood-conifer (MHC) within all ownerships of the Concow Project analysis area make up approximately 40 percent of the vegetative component pre-fire and 52 percent post-fire. Montane hardwood and montane hardwood-conifer within Forest Service and BLM lands of the Concow Project analysis area make up approximately 46 percent of the vegetative component pre-fire and 60 percent post-fire. Refer to appendix A and appendix B of the Concow MIS Report 2009. Based on CWHR, the Forest Service and BLM lands within the Concow Project analysis area supported 3,674 acres of MHW and MHC before the Butte Lightning Complex Wildfire. Post–fire the MHW and MHC increased to 4,796 acres. Terestrial Habitat (Birds and Mammals)

Prior to the Butte Lightning Complex fire, hardwoods such as black oak and tanoak were represented well throughout the range of diameter classes. Though most oaks in the Concow burned area were killed in areas affected by severe fire, vigorous basal sprouting is occurring creating a new age class of these hardwood species on the landscape. New tanoak and black oak sprouts are estimated, by Forest Vegetation Simulator, to range from several hundred to one thousand per acre, depending on their distribution prior to the Butte Lightning Complex fire. Sprouts of both black oak and tanoak are 4 to 5 feet tall in a little over a year following the fire.

The Concow area is within the Bucks Mountain Deer Herd range. The average number of black oak in the project area is 257 trees per acre. The majority of black oak found in the project area is less than 1 inch. Approximately 8 percent of the stands proposed for treatment have oak. In the burned area sprouting hardwoods number in the thousands per acre in some areas, and include tanoak, canyon live oak, and black oak. These hardwoods along with a variety of brush species are expected to achieve high density and stocking levels within a relatively short period of time following fire.

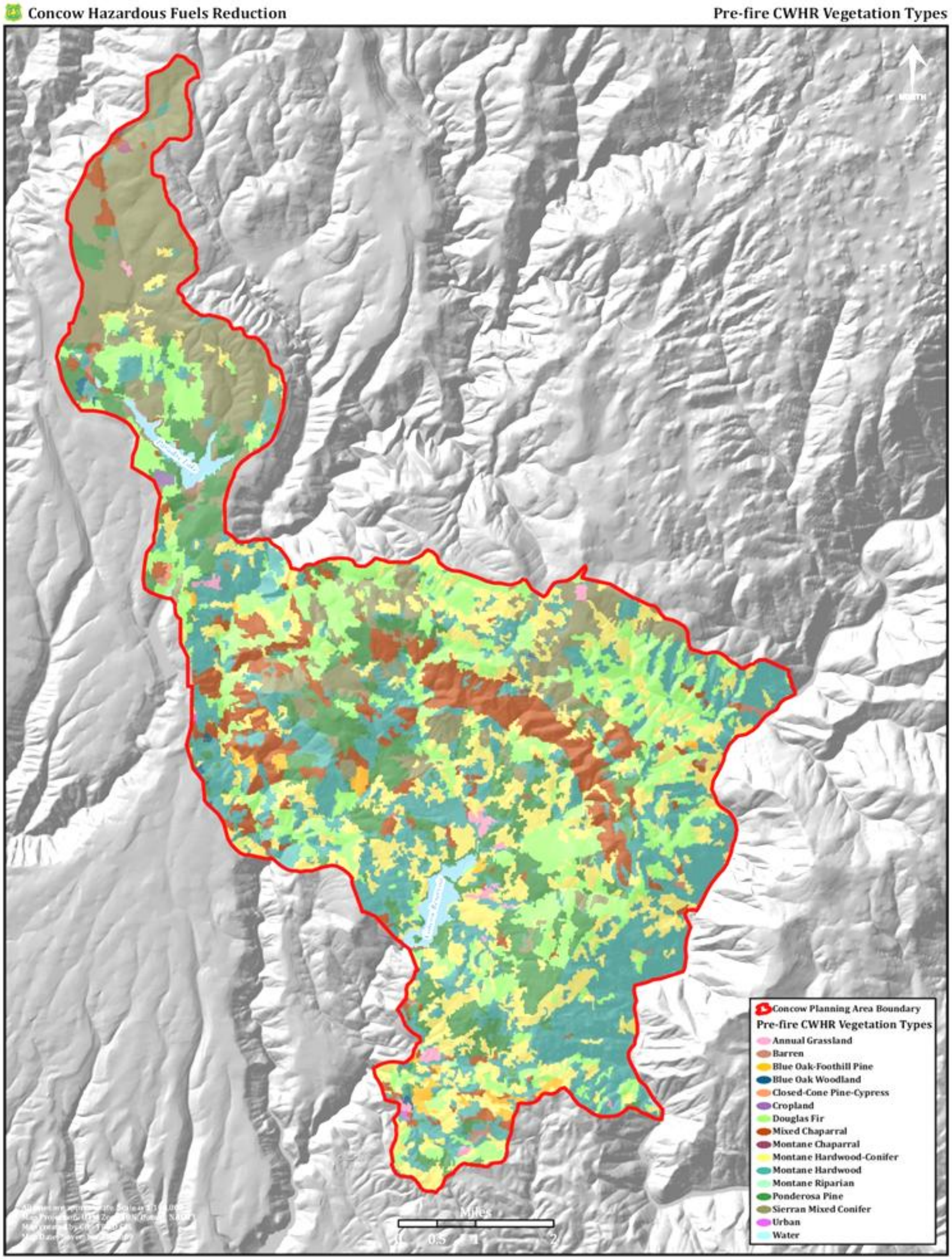
Growth projections utilizing the FVS on stands in the Concow area indicate moderate to high early growth rates. Ten year growth projections following BTU fire was 2–9 feet for black oak and 4–13 feet for tanoak. Both tanoak and black oak are capable of outgrowing and out-competing any conifer seedlings that may become established post-fire.

Studies in other conifer-hardwood types have shown that, with fire, forests may eventually become more heavily dominated by fire-adapted hardwoods and shrubs or a conifer-hardwood mixture (Fryer 2008). Hardwoods, particularly tanoak may dominate burned areas in early post-disturbance years (McDonald and Tappeiner 1987). Conifers eventually overtop hardwoods decades later, with tanoak often becoming dominant in the sub-canopy.

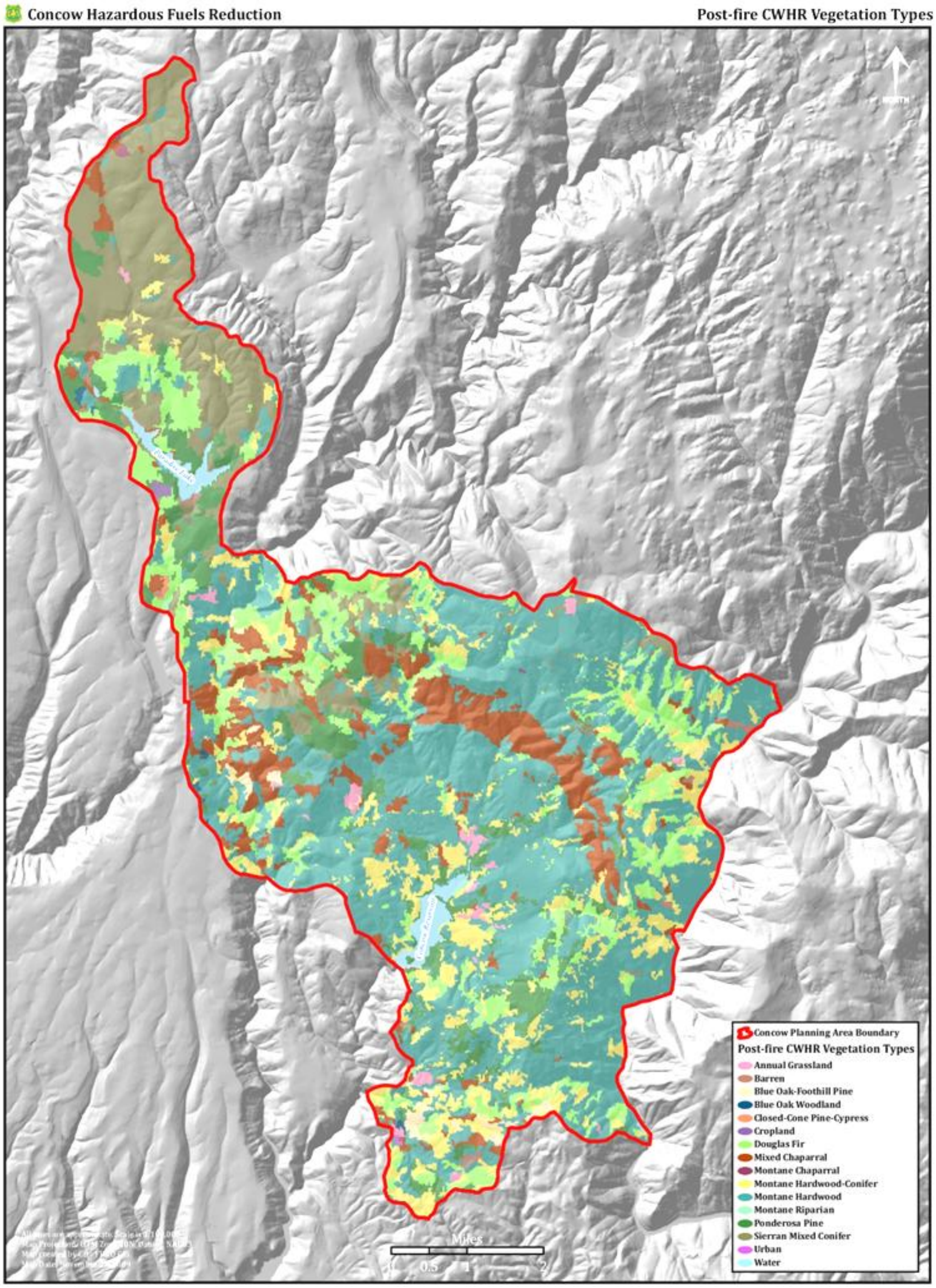
As a result of the wildfire, for all lands within the Planning Area, on average 15 percent of the Conifer and MHC habitat was consumed by wildfire creating a 15 percent average increase in MHW. For Forest Service and BLM lands within the Project Area, an average 16 percent of the Conifer and MHC habitat was consumed by wildfire creating a 16 percent average increase in MHW.

Extensive field reconnaissance following fire containment was completed to verify the extent and severity of mortality and residual canopy cover in areas that were subject to low and moderate severity (Welles 2009). Following the fire, much of the conifer overstory component has been consumed; in some areas, all potential seed trees have been killed. Consequently, in these areas, vegetation has shifted from a conifer-dominated habitat to one dominated by hardwoods (Welles 2009).

As is revealed by comparing map 3-7 and map 3-8, vegetative and associated wildlife habitat patterns changed radically due to the 2008 wildfires. Prior to the 2008 fires, habitat patterns were highly complex, similar to puzzle pieces (maps 3-7 and 3-8). These puzzle pieces were composed of unique CHWRs; ranging from drier south slope Mixed Chaparral to the more moist northern facing slope Sierra mixed conifer. Conifer vegetation types were nearly equally affected by the fire and experienced a 4 to 6 percent decrease in representation. In contrast, the montane hardwood vegetation type increased by 20 percent.



Map 3-7 Pre-fire CWHR Vegetative Types



Map 3-8 Post-fire CWHR Vegetative Types

Burned Areas

Black Oak Habitat. Prior to the Butte Lightning Complex fire, important hardwoods such as black oak and tanoak were represented well throughout the range of diameter classes. Though most oaks were killed in areas affected by severe fire, vigorous sprouting is occurring creating a new age class of these hardwood species on the landscape. New tanoak and black oak sprouts are estimated to range from several hundred to one thousand per acre, depending on species distribution prior to the Butte Lightning Complex fire (FVS 2009).

The existing vegetation in burned areas has shifted from a conifer dominated landscape to one more completely dominated by hardwoods. This is beneficial for wildlife, as oaks (*Quercus spp.)* provide food and cover. As a food source, acorns function as important diet for squirrels, a prey species for spotted owls and goshawks. Other bird and animal prey species characteristic of the Montane Hardwood habitat include wild turkey, mountain quail, band-tailed pigeon, and dusky-footed woodrat. Wildlife use oaks as places to hide, shade, and escape from predators and from fires (Pavlik et al. 1991).

The average number of black oak in the Project Area is 257 trees per acre. The majority of black oak natural re-growth found in the Project Area are less than 1 inch in diameter as of 2009. Approximately 8 percent of the stands proposed for treatment have oak. In the burned area sprouting hardwoods number in the thousands per acre in some areas, and include tanoak, canyon live oak, and black oak. These hardwoods along with a variety of brush species are expected to achieve high density and stocking levels within a relatively short period of time following fire.

Growth projections utilizing the FVS (FVS 2009) on stands in the Concow area indicate moderate to high early growth rates. Ten year growth projections (FVS) following Butte Lightning Complex fire were 2 to 9 feet for black oak and 4 to 13 feet for tanoak. Both tanoak and black oak are capable of outgrowing and out-competing any conifer seedlings that may become established post-fire.

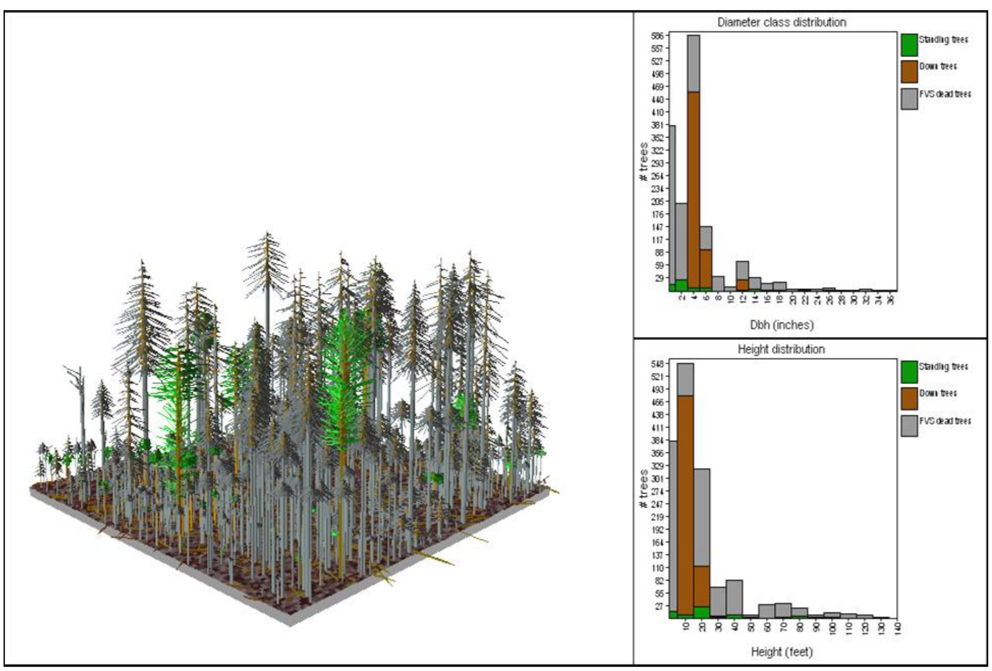


Figure 3-21 Profile FVS Simulation

Wildlife and Snag Relationship. Numerous species use different parts of dead or declining trees, such as the ones created during the 2008 fire. These standing, decomposing trees are known as snags and provide critical habitat for wildlife. Nearly every part of the dead tree is utilized in every stage of decay. Hollow cavities in standing dead wood make excellent nests for woodpeckers, while insects in the bark provide a ready food source. Other animals use the bark, too, but for a different purpose. Bats, tree frogs and beetles all make their homes in the crevasses between the bark and the trunk.

Snags provide foraging, roosting and nesting sites for numerous species of birds such as goshawks (Thomas et al. 1979, Bull at al. 1997) and mammals such as bats. Higher branches are excellent look-outs from which raptors spot potential food sources and where they may safely clean and eat their prey. The existing condition of the project area post fire provides a diverse mosaic of numerous trees in different stages of decomposition, ultimately contributing to suitable potential habitat.

Large Down Wood. The existing condition of the project area post fire provides numerous large down tress in different stages of decomposition, providing an important home for many species. These decaying trees provide an important supply of habitat for insect populations and other species, ultimately playing a critical role in the local ecosystem. 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. 1978).

Unburned Areas - Existing Hardwoods

The existing component of large black oak is decreasing in some stands, being shaded out by overtopping conifer tree canopies. While present in high numbers in the lower diameter classes, without exposure to sunlight, black oak seedlings and saplings will linger and die in the shade of conifers. When averaged across the proposed green treatment areas, the number of black oak trees is highest in the seedling and sapling size classes and low in the larger tree size classes. This situation is due to lack of fire disturbance that would normally remove conifer in growth and stimulate black oak regeneration, leaving different age classes through sprouting. Without fire disturbance to clear out the conifers very few oak trees survive to reach larger sizes, which contribute to wildlife mast and habitat. Pressure from woodcutting surrounding local areas also contributes to the loss of larger oaks near urban areas. Ultimately the larger size classes of existing black oaks in the unburned project areas play an important role in the suitability of potential habitat for wildlife.

3.3.5 Aquatic/Riparian Species and Habitats

There is an array of diverse aquatic habitats within the Concow Project Area, many of which have been altered by human activities. Naturally occurring aquatic habitats include streams, swales, ponds, springs, and seeps. Other aquatic habitats include constructed ditches, pits, and reservoirs. Streams and associated swales are the most abundant aquatic habitats.

The Plumas National Forest GIS shows a total of 263 miles of streams (ephemeral, intermittent, and perennial) in the Concow Project aquatic analysis area. This total includes stream reaches through private land within the Plumas National Forest boundaries. Of this total, the majority consists of fishless intermittent and perennial streams (128 miles, 49 percent).

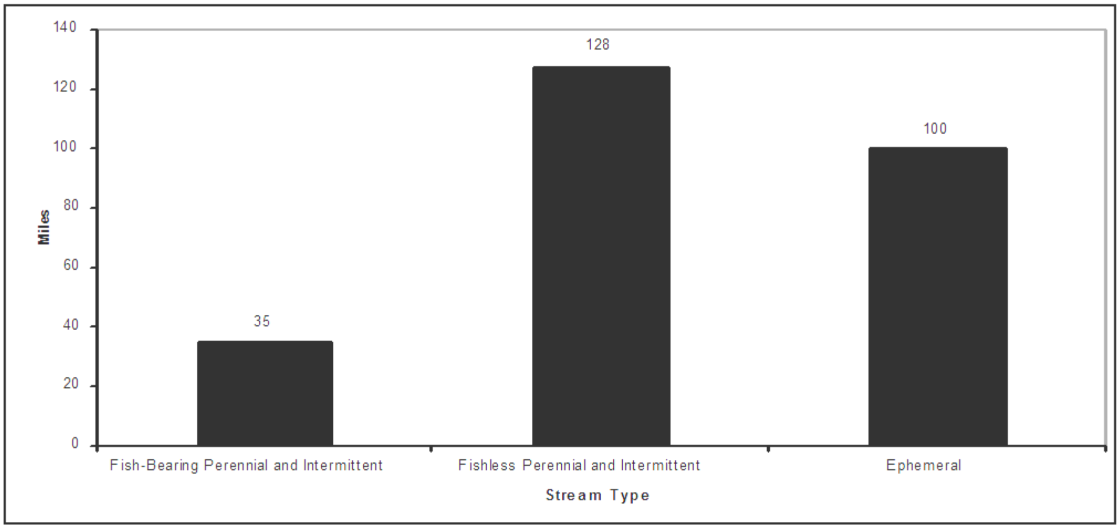


Figure 3-22 Concow Project Aquatic Analysis Area 263 Stream Miles by Stream Type

Fish are known or suspected to inhabit 35 miles of streams (13 percent). Ephemeral channels that generally do not exhibit annual scour comprise the remainder (100 miles, 38 percent) (figure 3-22). Fish-bearing waters are generally perennial, although a small fraction of intermittent waters contain fish at least seasonally or within pools that remain in deeper parts of the channel when flows discontinue.

Perennial streams that do not contain fish generally are either too steep to provide suitable habitat, or there are barriers that prevent fish from using otherwise suitable habitat. Barriers can be either man-made (culverts and dams) or natural (cascades or large woody debris jams). Springs and seeps occur infrequently throughout the aquatic analysis area. There are several reservoirs and associated canals in the aquatic analysis area.

The majority of the fish habitat in the aquatic analysis area supports coldwater species including rainbow trout, speckled dace, and riffle sculpin. Transitional species (Sacramento pikeminnow, hardhead, and Sacramento sucker) have been documented in the North Fork Feather River and West Branch of the North Fork Feather River. Warmwater species (catfish, bass, and sunfish) occur in the reservoirs and river reaches upstream of reservoirs where suitable habitat exists.

In addition to fish, aquatic analysis area streams also provide habitat for amphibians and reptiles. Foothill yellow-legged frogs, Sierra newts, and Pacific tree frogs have been documented in many streams in the aquatic analysis area. Breeding populations of foothill yellow-legged frogs have been found in Concow Creek, unnamed tributaries to Concow Creek and Concow Reservoir, North Fork Feather River, and the West Branch of the North Fork Feather River.

Land modifying activities conducted by people over the past 155 years have had a significant, evident impact on aquatic analysis area streams. Since the 1950s, logging, dam and canal construction, and road construction have been the major land modifying activities affecting streams in the aquatic analysis area. Logging in riparian areas destabilized stream banks and deprived channels of large woody debris, resulting in reduced stream habitat complexity and compromised fishery production. Continuous erosion from gravel and dirt roads, cuts, and drainage ditches continues to provide a steady supply of fine sediment to stream crossings, while the occasional washout or landslide from poorly placed or engineered roads sporadically adds larger sediment inputs. Fine sediment supply and resultant degraded riparian habitats are the most notable biological impacts from the varied land uses in the aquatic analysis area.

Wildfire creates a natural disturbance regime across the western United States (Beschta et al. 1995, Burton 2005, Keane et al. 2008). Ecological diversity of aquatic and riparian habitats is maintained by natural disturbances, including fire and fire-related flooding, debris flows, and landslides (Burton 2005, Dwire and Kauffman 2003, Keane et al. 2008). Native species have adapted to survive and thrive following natural disturbances, including wildfire (Keane et al. 2008). Riparian plant species exhibit a range of adaptations (i.e., sprouting, thick bark, and wind/water seed dispersal) that contributes to rapid recovery of streamside habitats following fires (Dwire and Kaufffman 2003). Aquatic and riparian habitat in the Concow area is already demonstrating rapid recovery from the Butte Complex Fire as of 2009. Widespread sprouting and re-growth of riparian plant species has been noted during field visits.

Although pre-fire data are not available, data were collected from a post-fire Stream Condition Inventory (SCI) in an unnamed tributary to Concow Creek. The SCI found that shade ranged from 22 to 97 percent (average 38 percent), and there was a high percentage of pool tail fines. The high percentage of tail pool fines is to be expected as sediment from the fire is flushed downstream. In riffles, gravels and fines less than 11 mm in size comprised 26 percent of the substrate on average, and gravels and cobbles from 11 to 256 mm comprised 70 percent of the substrate on average. Effects to aquatic and riparian habitat from the Butte Complex Fire appear to be within the range of natural variability. For a description of the specific effects of the Butte Complex Fire on watersheds and surrounding landscape.

Species Occurrences and Habitat Potential

Macroinvertebrates (Management Indicator Species [MIS])

All of the aquatic features in the Concow Project aquatic analysis area are potentially suitable habitat for benthic macroinvertebrates.

Amphibians

California red-legged frog – Threatened. U.S. Fish and Wildlife Service (USFWS) has designated two Critical Habitat units within the Plumas National Forest. The Concow Project is not within currently designated Critical Habitat or Recovery core areas. The Concow Analysis Area is approximately 3 miles west of a USFWS Recovery Plan (USFWS 2002) core area and also of a designated Critical Habitat unit (Federal Register 2010). A known California red-legged frog population is located approximately 5 miles beyond the analysis area boundary. Although all of the Concow Project aquatic analysis area is below 4,500 feet and within suitable elevational habitat range for California red-legged frog, many of the ponds and reservoirs are unsuitable habitat for California red-legged frog due to the presence of predatory species (bass species, trout, and bullfrogs).

Foothill Yellow-legged Frog – Sensitive. All of the Concow Project aquatic analysis area is below 6,000 feet and within suitable elevational habitat range for foothill yellow-legged frog (FYLF). There are numerous historic and contemporary records of FYLF throughout the Concow Project aquatic analysis area.

Reptiles

Western Pond Turtle – Sensitive. The proposed project is within the elevational range for western pond turtle and suitable habitat exists in the reservoirs within and surrounding the Concow Project aquatic analysis area.

Fish

Hardhead Minnow – Sensitive. The suspected distribution of hardhead in the analysis area is West Branch North Fork Feather River from Lake Oroville to the Miocene Diversion and from the Miocene Diversion to Hendricks Head Dam. It is also possible that tributaries to the West Branch and North Fork Feather River are utilized by hardhead for spawning.

Birds

Bald Eagle – Sensitive. Presently, there are no Bald Eagles nesting on Forest Service Lands in the Concow Project Analysis Area. Within the wildlife analysis area there are, however, three bodies of water; Paradise Lake, Magalia Reservoir and Concow Reservoir.

The Magalia Reservoir, over 150 acres, is situated just north of Magalia and south of Paradise Lake. The reservoir is managed by the Paradise Irrigation District for public water supply and irrigation.

As part of the analysis area boundary, Paradise Reservoir, 244 acres, is situated between Magalia and Stirling City, just north of Magalia Reservoir. The reservoir is managed by the Paradise Irrigation District for public water supply, irrigation and recreational purposes. Historically an eagle pair have nested at this reservoir periodically. The nest was active in 2009 and the pair fledged at least one young. Currently the pair has been actively utilizing the lake for foraging and roosting. The Concow Reservoir is not on Forest Service land; it is approximately one mile southwest of the nearest proposed treatment unit. The Concow Reservoir is 280 acres and is owned by Thermalito Irrigation District. Currently the reservoir is used for public water supply, recreational and irrigation purposes. Historically and currently, no eagles are or have been known to nest at the Concow Reservoir.

As part of the analysis area boundary, Paradise Reservoir, 244 acres, is situated between Magalia and Stirling City, just north of Magalia Reservoir. The reservoir is managed by the Paradise Irrigation District for public water supply, irrigation and recreational purposes. Historically an eagle pair have nested at this reservoir periodically. The nest was active in 2009 and the pair fledged at least one young. Currently the pair has been actively utilizing the lake for foraging and roosting. The Concow Reservoir is not on Forest Service land; it is approximately one mile southwest of the nearest proposed treatment unit. The Concow Reservoir is 280 acres and is owned by Thermalito Irrigation District. Currently the reservoir is used for public water supply, recreational and irrigation purposes. Historically and currently, no eagles are or have been known to nest at the Concow Reservoir.

California Spotted Owl – Sensitive/MIS. The sprawl of homes and roads creates an undesirable habitat for California spotted owls. There were no spotted owls detected within the project boundary and owls are not expected to nest in the area post-fire.
Spotted owls were not detected during surveys. Probable reasons for the spotted owl's absence prior to the wildfire include the low habitat quality [see description of habitat below], and/or the area's high concentration of activity from communities, roads and private timber companies. Post-fire the habitat does not support nesting habitat within treatment units.

Within the 30,917 acre Concow Project Area on Forest Service and Private lands:

- **Pre-fire** – there were approximately 16,720 acres (11,938 + 3,695 + 1,087) classified as suitable California spotted owl habitat (see tables 9a, 9b and 9c of the Concow Biological Assessment/Biological Evaluation [BA/BE] 2009).

  – 3,552 acres (1,895 + 1,389 + 268) classified as suitable CSO <u>nesting</u> habitat (5M,5D).

  – 13,168 acres (10,043 + 2,306 + 819) classified as suitable CSO <u>foraging</u> habitat (4M,4D).

- **Post-fire** – there are approximately 10,612 acres (7,253 + 2,747 + 612) classified as suitable CSO habitat (see tables 9a, 9b and 9c of the Concow BA/BE 2009).

  – 2,356 acres (1,004+1,149+203) classified as suitable CSO <u>nesting</u> habitat (5M,5D).

  – 8,256 acres (6,249+1,598+409) classified as suitable CSO <u>foraging</u> habitat (4M,4D).

Within the 30,917 acre Concow Project Area on Forest Service lands:

- **Pre-fire** – there were approximately 4,782 acres (3,695 + 1,087) classified as suitable CSO habitat (see tables 9b and 9c of the Concow BA/BE 2009).
  - 1,657 acres (1,389 + 268) classified as suitable CSO nesting habitat (5M,5D).
  - 3,125 acres 2,306 + 819) classified as suitable CSO foraging habitat (4M,4D).
- **Post-fire** – there are approximately 3,359 acres (2,747 + 612) classified as suitable CSO habitat (see tables 9b and 9c of the Concow BA/BE 2009).
  - 1,352 acres (1,149 + 203) classified as suitable CSO nesting habitat (5M,5D).
  - 2,007 acres (1,598 + 409) classified as suitable CSO foraging habitat (4M,4D).

The designated owl Protected Activity Center (PAC) BU026 (404 acres) was unaffected by the wildfire and the majority of the home range core area associated with PAC BU026 was unaffected by the wildfire. Suitable habitat on Forest Service and BLM land (32 acres) is 3,359 acres (2,747 + 612). Of these acres approximately 131 acres are in PAC BU026; 11 acres of nesting, and 124 acres of suitable foraging. The remaining 273 acres within the PAC consist predominately of Montane hardwood (1S, 3P, 3D, 3M). Another 843 acres of habitat (of mixed suitability) are within the home range core area.

Although owls were not detected during the 2005–2006 surveys there is a potential for owls to re-establish nesting and use the area for foraging. The spotted owl, like other species, innately selects areas that are optimal for its survival and successful reproduction. However, a species will occupy low quality habitat, such as this area, if it must. Owls will utilize low quality habitat for several reasons such as limited habitat availability and/or dispersal for young and/or interspecies competition for prey in areas. Although habitat suitability is low and the area is vastly impacted by timber harvest areas, following the wildfire, it is still possible that an owl pair could utilize the area within the existing PAC and home range core area.

Northern Goshawk – Sensitive. Prior to the Butte Lightning Complex wildfire there were no goshawks detected. The probable reasons for the goshawks absence could include lack of habitat and/or the area's high concentration of activity from communities, roads and private forest management. Typically, goshawks are sensitive to human activity and prefer large stretches of undisturbed, mature woodland for nesting and hunting (Kenward 2006). There is limited information about goshawks nesting in areas other than indicated as typical habitat. Data indicates at least possible foraging potential amongst the highly disturbed area.

The Project Area prior to the wildfire was characterized as brush with highly open canopy, early seral-stage stands with dense understory and patchy private land, with areas dominated by shrub and manzanita understory. The trees were comprised of Sierran mixed conifer, Douglas-fir, Ponderosa pine, montane hardwood-conifer, montane hardwood and shrub. Inclusions of closed-cone pine-cypress habitat type (McNabb Cypress) are found on serpentine soils within the analysis area.

Post-fire few live trees remain; the majority of vegetation is recent growth found close to the ground. In the green areas the sprawl of homes and roads creates an undesirable habitat for northern goshawks. The habitat consists primarily of small diameter trees (0–6 inch) with few large trees greater than 30 inches.

Nesting pairs typically use habitat consisting of CWHR classes 4M, 4D, 5M, and 5D mature to old growth forest, mixed conifer, with well developed under story and a moderate number of snags and large logs (see tables 10a, 10b and 10c). Suitable foraging habitat consists of CWHR classes 3M, 3D, 4P, 5P and 6 (see tables 10d, 9e and 10f) and typically requires an open understory. There are no designated goshawk PACs within the Concow Project area.

Within the 30,917 acre Concow Project Area on Forest Service and Private lands:

- **Pre-fire** – there was 21,300 acres (16,720 + 4580) classified as suitable NOGO habitat.
    - 16,720 acres (11,938 + 3,695 + 1,087) classified as suitable NOGO nesting habitat (see tables 10a, 10b and 10c of the Concow BABE 2009).
    - 4,580 acres (2,794 + 1,581 + 205) classified as suitable NOGO foraging habitat (see tables 9d, 9e and 9f of the Concow BA/BE 2009).
- **Post-fire** – there are 14, 321 acres (10,612 + 3,709) classified as suitable NOGO habitat.
    - 10,612 acres (7,253 + 2,747 + 612) classified as suitable NOGO nesting habitat (see tables 10a, 10b and 10c of the Concow BA/BE 2009).
    - 3,709 acres (2,144+1,334+231) classified as suitable NOGO foraging habitat (see tables 10d, 10e and 10f of the Concow BA/BE 2009).

Within the 30,917 acre Concow Project Area on Forest Service lands:

- **Pre-fire** – there was 6,568 acres (4,782 + 1,786) classified as suitable NOGO habitat.
    - 4,782 acres (3,695 + 1,087) classified as suitable NOGO nesting habitat (see tables 10b and 10c of the Concow BA/BE 2009).
    - 1,786 acres (1,581 + 205) classified as suitable NOGO foraging habitat (see tables 10e and 10f of the Concow BA/BE 2009).
- **Post-fire** – there are 4,924 acres (3,359 + 1,565) classified as suitable NOGO habitat.
    - 3,359 acres (2,747 + 612) classified as suitable nesting NOGO habitat (see tables 10b and 10c of the Concow BA/BE 2009).
    - 1,565 acres (1,334 + 231) classified as suitable NOGO foraging habitat (see tables 10e and 10f of the Concow BA/BE 2009).

This estimate is based on the most recent vegetation data available for Concow, which is from aerial photo interpretation and Plumas National Forest "e-veg" timber type coverages (based on 1997 aerial photographs) in the GIS. Photographs were used to determine timber strata, CWHR size, and densities. The GIS coverage was also used to determine land classifications and allocation.

Management Indicator Species (MIS) habitat for the selected project-level MIS.

The following section documents the analysis for the following 'Category 3' species: mule deer, mountain quail, California spotted owl, northern flying squirrel, hairy woodpecker and the black-backed woodpecker. The analysis of the effects of the Concow Project on these Management Indicator Species is conducted at the project scale. The analysis uses the following habitat data: Forest wide vegetation typing into CWHR habitat classifications was done for the Plumas-Lassen Administrative Study in 2002 (Vestra 2002). This vegetation layer was updated after the Butte Lightning Complex wildfire using vegetation burn severity maps and 2005 aerial photos. Detailed information on the MIS is documented in the Sierra Nevada Forest Bioregional MIS Report (USDA 2008b), which is hereby incorporated by reference.

Mule Deer – MIS. The mule deer was selected as the MIS for oak-associated hardwood and harwood/conifer in the Sierra Nevada, comprised of montane hardwood (MHW) and montane hardwood-conifer (MHC) as defined by he California Wildlife Habitat Relationship System (CWHR; CDFG 2005). Mule deer range and habitat includes coniferous forest, foothill woodland, shrubland, grassland, agriculture fields, and suburban environments (CDFG 2005). Mule deer migrate seasonally between higher elevation summer range and low elevation winter range, and on the west slope of the Sierra Nevada, oak-associated hardwood and hardwood/conifer areas are an important winter habitat.

Oak-Associated Hardwoods and Hardwood/Conifer Habitat (Mule Deer)

Habitat Factor(s) for the Analysis:

- Acres of oak-associated hardwood and hardwood/conifer habitat [CWHR montane hardwood (MHW), montane hardwood-conifer (MHC)];
- Acres with changes in hardwood canopy cover (Sparse = 10–24 percent; Open = 25–39 percent; Moderate = 40–59 percent; Dense = 60–100);
- Acres with changes in CWHR size class of hardwoods (**Note:** all classes described can be lumped if needed):
  - CWHR size classes 1 and 2 (Seedling/Sapling (less than 6 inches dbh));
  - CWHR size class 3 (Pole (6–10.9 inches dbh));
  - CWHR size class 4 (Small tree (11 inch to 23.9 inch dbh));
  - CWHR size class 5 (Medium/Large tree ($\geq$24 inches dbh)).

Hairy woodpecker – MIS. The Hairy woodpecker was selected as the MIS for the ecosystem component of snags in Green Forests Ecosystem Component. Medium (diameter breast height between 15 to 30 inches) and large (diameter breast height greater than 30 inches) snags are most important. The hairy woodpecker uses stands of large, mature trees and snags of sparse to intermediate density; cover is also provided by tree cavities (CDFG 2005). Mature timber and dead snags or trees of moderate to large size are apparently more important than tree species (Siegel and DeSante 1999).

Black-backed Woodpecker – MIS. The existing condition of the Concow burned area typically would be considered potential suitable habitat for the Black-backed Woodpecker (BBWO), however due to the projects areas low elevation range it is unlikely this species is currently occupying lands in and around the project area. Site visits in 2009-2010 have not detected BBWO.

The association between the BBWO and the fire-affected areas is the wood boring beetles which are drawn to trees that have been damaged or stressed. The BBWO diet is largely dependant on the beetle larvae. The BBWO use of forest fire areas appears to be restricted to the first several years following the fire, as long as the wood boring insects are present and abundant. This can vary from 1-3 years up to 8 years post fire (Nature Conservancy 1999, Hoyt and Hannon 2002).

The BBWO was selected as the MIS for the ecosystem component of the medium to large fire-affected trees in stand replacing fires. The birds may utilize all types of burned areas, small or large acreages, and may occupy these areas early or beyond 7 years depending on many site specific factors.

Mammals

Pallid Bat. Bat species are known to utilize a variety of habitats that include conifer and hardwood stands (under the bark of trees, live and dead), and may roost in rocky areas, tree hollows, leaf litter, or mine/cave openings as well as structures such as buildings. The project area is within the elevation range of the Pallid Bat (<6,000ft.).

Pallid bats roost in rock crevices, tree hollows, mines, caves, and a variety of anthropogenic structures, including vacant and occupied buildings. Tree roosting has been documented in large conifer snags (e.g., ponderosa pine) inside basal hollows of redwoods and giant sequoias, and bole cavities in oaks. Whether they will roost in large burned areas is unknown. Results of recent surveys (2006–2007) observed bats primarily in areas with open habitat with grass.

Western Red Bat. The project area is within the normal elevation range of the Western Red Bat (<3,000ft.). Surveys found western red bats in a variety of habitat settings along creeks, at seeps, and in forest settings with mixed hardwood and conifer trees. To a great extent the habitat around Concow prior to the fire with its mixed hardwoods and conifer trees was moderate or good habitat for the red bat. Post-fire the habitat is considered non-suitable as the red bat is sometime referred to as “tree bat” because they roost only in the foliage of trees. They prefer trees with cover above and that are open below, not the snag component that is left after the fire.

Potentially, the bats could be found foraging along the creeks especially as the vegetation begins to returns along the banks. They are also known for foraging along forest edges, in clearings and under street lights as they prefer to eat moths. If Western red bats are found at a later date, appropriate management requirements will be applied before implementation of DFPZ treatments or group selection.

Northern Flying Squirrel – MIS. The northern flying squirrel was selected as an MIS for late seral closed canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir and red fir) habitat in the Sierra Nevada. This habitat (in the unburned areas) is comprised primarily of medium/large trees (equal to or greater than 24 inches dbh) with canopy closures above 40%. The Northern Flying Squirrel occurs primarily in mature, dense conifer habitats intermixed with various riparian habitats, using cavities in mature trees, snags, or logs for cover (CDFG 2005).

Riverine and Lacustrine Habitat (Aquatic Macroinvertebrates)

Habitat Factor(s) for the Analysis:

Watershed Condition. Eleven of 15 Project Area subwatersheds are approaching or over thresholds set by the Forest for management impacts that affect runoff. Effects from the fire, emergency timber operations on private land, and timber harvest plans on private land are the three primary sources of landscape disturbance. Eight of the subwatersheds are more than 30 percent over Threshold of Concern (TOC) (Concow MIS Report 2009, table 2), and it is reasonable to expect that under conditions of intense precipitation significant increases in runoff could occur (Soil and Water Resources Report, Whitsett 2009).

Stream Channel Conditions. There are 263 miles of channel in the project area, including 100 miles of ephemeral, 128 miles of fishless perennial and intermittent, and 35 miles of fish-bearing perennial according to Forest GIS records. Paradise Lake and Concow Lake are located in the project area. Magalia Reservoir is adjacent to the project area.

Stream Channel Inventory (SCI) metrics taken in an unnamed tributary to Concow Creek were evaluated to qualify the stream as good, moderate or poor. SCI metrics for this tributary show an overall rating of poor. The following SCI metrics were taken after the fire: percent fines, substrate size, residual pool depth, temperature, and water surface shade. The percentages of unstable banks and sediment in pool tails were very high. The percentage of water shade was low.

In the burned area, fire burned out the large woody debris (LWD) in many channels, particularly in first and second order streams. In the larger channels, LWD was only partially consumed. Burned trees on the banks have fallen into streams post-fire, creating channel diversity. Post-fire SCI counts of large woody debris within the channel of the unnamed tributary to Concow Creek were higher than pre-fire SCI counts of large woody debris in nearby Dogwood Creek.

Measurements of SCI metrics have not been taken in any streams in the unburned area. However, field visits to these streams and visual estimates of water surface shade, pool depth, and substrate composition indicate the streams are in moderate condition.

Analysis of SCI data from the tributary to Concow Creek, field visits to other area streams, and SCI data from Dogwood Creek outside the project area show perennial streams within or near the analysis area are in moderate to poor condition. The poor conditions in the Concow Creek tributary are likely due to effects from the moderate to high severity wildfire, steep slopes, loss of riparian vegetation, and post-fire timber harvested on private land.

Unburned (unburned/green): The unburned area is not within the Bucks Mountain Deer Herd range. The component of large black, tan and live oaks is decreasing in stands, being shaded out by overtopping conifer tree canopies. While present in high numbers in the lower diameter classes, without exposure to sunlight, black oak seedlings and saplings will linger and die in the shade of conifers. When averaged across the proposed green treatment units, the number of black oak trees is highest in the seedling and sapling sizes class and low in the larger tree size classes. Lacking disturbance that would normally remove conifer in growth and stimulate black oak regeneration and different age classes through sprouting, very few oak trees survive to reach larger trees sizes to contribute to wildlife mast and habitat. Pressure from woodcutting surrounding local areas also contributes to the loss of larger oaks near urban areas.

Late Seral Closed Canopy Coniferous Forest Habitat (California Spotted Owl and Northern Flying Squirrel)

Habitat Factor(s) for the Analysis:

- Acres of late seral closed canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat (CWHR ponderosa pine [PPN], Sierran mixed conifer [SMC], white fir [WFR], red fir [RFR], tree size 5 [canopy closures M and D], and tree size 6).
- Acres with changes in canopy closure (D to M);
- Acres with changes in large down logs per acre or large snags per acre.

Current Condition (Affected Environment) of the Habitat Factor(s) in the Analysis Area—Refer to the analysis for the California spotted owl within the Biological Evaluation and MIS Report 2009 for the Concow Hazardous Fuels Reduction Project.

Snags in Green Forest Ecosystem Component (Hairy Woodpecker)

Habitat Factor(s) for the Analysis:

- Medium (15–30 inches dbh) snags per acre, and Large (greater than 30 inch dbh) snags per acre.

Current Condition (Affected Environment) of the Habitat Factor(s) in the Analysis Area: The wildlife analysis provides the appropriate context for reasonable determination of the effects related to treatments, as treatments relate to species and their habitat. The analyses area for each species was selected based on their home range, proximity to project, treatment locations, private land, urban development and the natural topography.

The *analysis area for determining cumulative effects on wildlife* includes 7,154 acres of (34 percent) National Forest System land, 806 acres (2 percent) BLM land and 22,940 acres of (74 percent) private land, for a total of 30,917 acres. The *terrestrial wildlife analysis area for determining direct and* *indirect effects on wildlife* includes the 1,510 acres of proposed treatment areas on the 7,960 acres of Forest Service and BLM lands. Of the 1,510 treatments, 1,136 acres are in burned forest and 374 acres in green forests.

Unburned (green)—The following discussion applies to the unburned unburned area of the Concow Project and not the Concow (burned) area.

The importance of retaining snags is that the extractions of dead trees can affect bird communities since snags are the dominant structure after a wildfire (Morrisette et al. 2002). Research results on the ecological effects of a complete harvest recover are consistently and overwhelmingly negative (McIver and Starr 2000).

Table 8 of the Concow MIS Report 2009 shows how the unburned unburned area of the Concow Project Area presently supports the Habitat Factor(s) for the "Snags in Green Forest Ecosystem Component." Table 8 is based on data derived from common stand exam plots within the unburned area:

- Medium (15–30 inches dbh) snags per acre: six snags per acre, at 12–30 inches dbh, fewer at 15–30 inches dbh;
- Large (greater than 30 inch dbh) snags per acre: zero snags per acre 30 inches dbh and larger.

Snags in Burned Forest Ecosystem Component (Black-backed Woodpecker)

The following discussion applies to the burned area of the Concow Project and not the unburned (green) area.

Habitat Factor(s) for the Analysis:

- Medium (15–30 inches dbh) snags per acre within burned forest created by stand-replacing fire, and Large (greater than 30 inches dbh) snags per acre within burned forest created by stand-replacing fire.

Current Condition (Affected Environment) of the Habitat Factor(s) in the Analysis Area:

Table 11 of the Concow MIS Report 2009 shows that the high number of standing dead stems per acre will create a fuel loading issue as snags fall to the ground within the Concow (burned) area. Snags within the burned area average 400 snags per acre. As table 11 shows, this number is predominately from small size trees between 0–11 inches. As dead trees continue to fall, they will become "jack-strawed" in amongst re-sprouting hardwoods. As the size class increases the number of large dead trees/snags decreases considerably. The amount of standing dead material and potential for high down woody fuel loading will pose a future vegetation management dilemma for recovering young stands of hardwoods (black oaks) and conifers.

Snags are fairly evenly distributed across the analysis area; pre-fire conditions within the analysis area show the burned areas were dominated by size class 4s and 5s in various canopy closures (see tables 2a, 2b, 2c, and appendices A and B of the Concow MIS Report 2009).

Road Density

The Concow Hazardous Fuels Reduction Project cumulative watershed effects (CWE) analysis area (similar to Project Area boundary) has a high road density and a high stream crossing density under the existing condition. Road development has occurred for the following reasons: timber harvesting activities on public and private lands, urban development, mining, and OHV recreation. Roads modify drainage networks and accelerate erosion processes, resulting in the alteration of physical processes in streams. These changes can be dramatic and long lasting and can degrade water quality and aquatic habitat (Hagans et al. 1986). Roads can directly affect water quality and aquatic habitat by altering flow, sediment loading, sediment transport and deposition, channel morphology, channel stability, substrate composition, stream temperatures, and riparian conditions in watersheds (Gucinski et al. 2001; Trombulak and Frissell 2000).

Studies have indicated that as road and stream crossing densities increase, so do negative effects on aquatic habitat parameters and fish populations (Eaglin and Hubert 1993). The road density of a majority of subwatersheds in the CWE analysis area exceeds the desired density for minimizing road impacts on aquatic and riparian environments and associated terrestrial wildlife. Refer to Concow Project, Hydrology Report 2009 for text and references. For the Bucks Mountain Deer Herd Unit the desired road density is 2 miles per square mile (Bucks Mountain/Mooretown Deer Herd Management Plan 1984). Refer to the Concow Project Hydrology Report, 2009 for a list of miles of road and road densities for the near-stream sensitive areas (all Riparian Habitat Conservation Areas [RHCAs] identified in the CWE analysis area) and for subwatersheds as a whole.

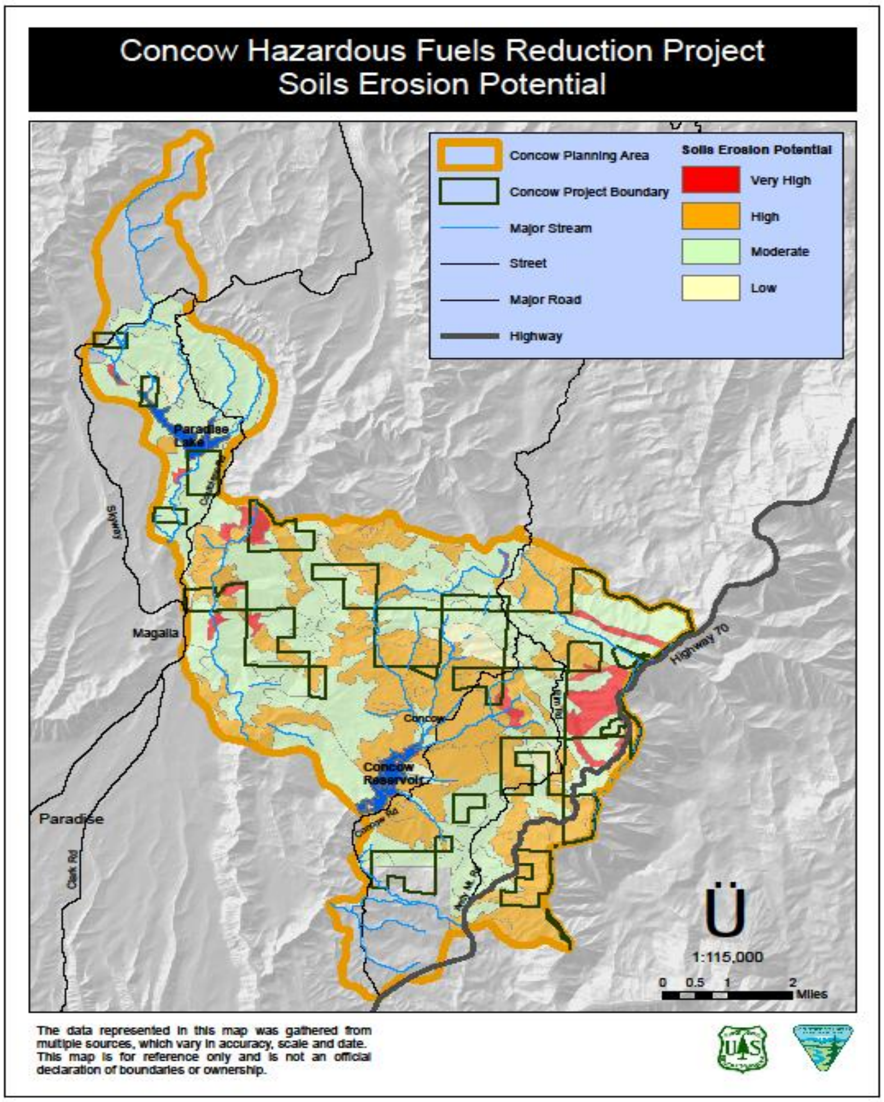
There are 230 miles of roads, including classified National Forest system roads, county and private roads and unclassified roads in the CWE analysis area, and 60 miles of roads within sensitive areas. The road densities for near-stream sensitive areas range from 0.1 to 2.6 miles per square mile, with an average of 1.3 miles per square mile. The road densities of the subwatersheds as a whole range from 2.2 to 8.7 miles per square mile, with an average road density of 5.3 miles per square mile. Refer to Concow Project, Hydrology Report 2009. The Concow Key area has an approximate road density of 5 miles of road per square mile of land.

3.4 Physical Environment

3.4.1 Soil

The Plumas National Forest Soil Survey method (Forest Service and Soil Conservation Service 1988) was used to determine probable soil types, referred to as soil map units, likely to occur within the proposed treatment areas. This information was used by the Forest Service during the development of the soil field transect survey sampling design for the Concow Draft EIS (FEIS); supported by GIS based analysis tools and best available information.

The majority of proposed treatment areas are composed of the Holland family soil type (44 percent). The typical soil types in this map unit are a gravelly loam or clay loam and are highly prone to slope instability, as depicted in map 3-9.



Map 3-9 Soil Erosion Potential

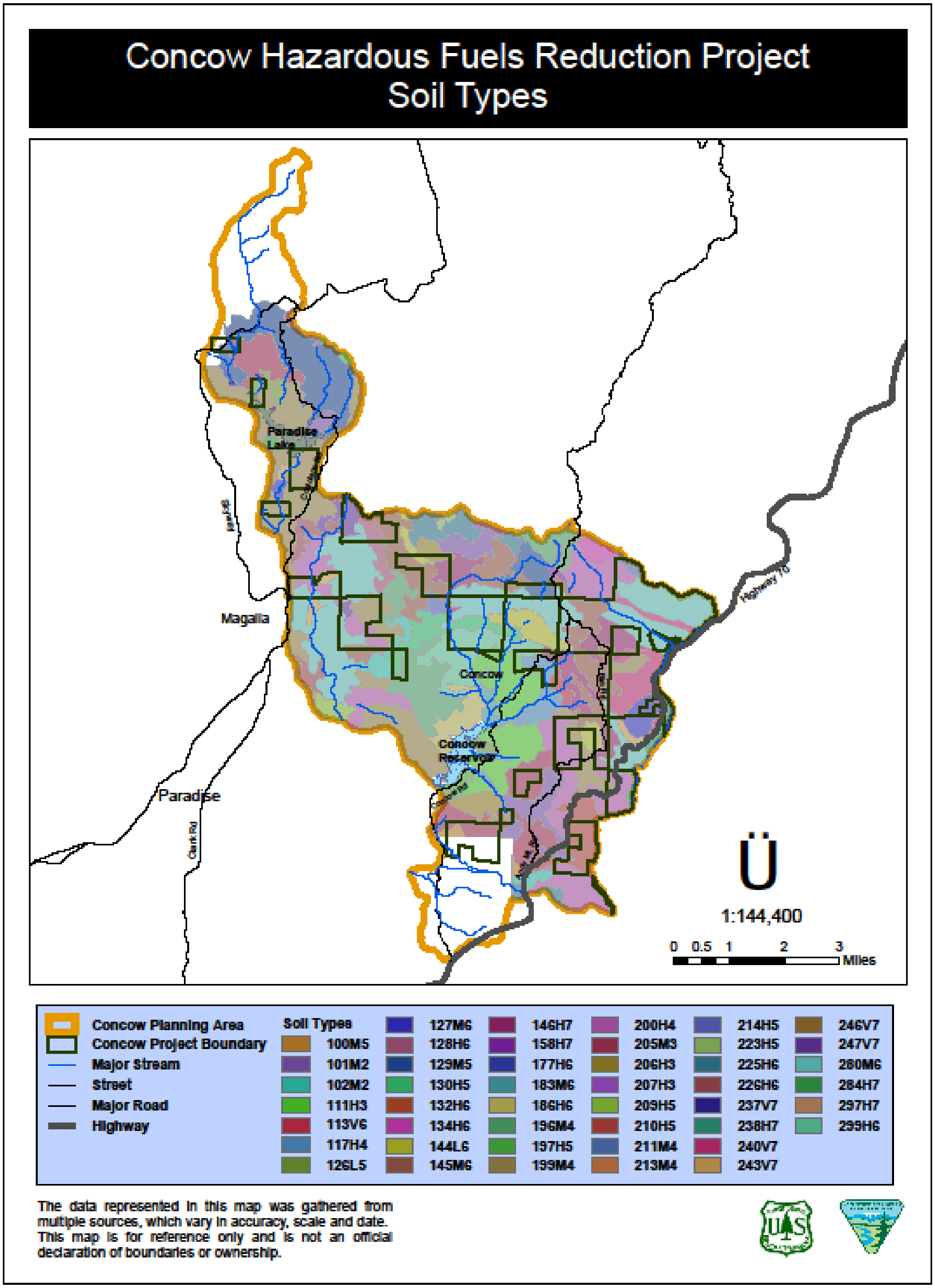
Thirteen percent of the Analysis Area is located within the Holland basic and Aiken family complex soil map unit. The soils in this map unit are typically a gravelly loam and are moderately susceptible to compaction and deformation. Another thirteen percent of the treatment areas lie within the Dubakella family, which typically has a soil type of gravely or cobbly loam or clay. These soil types are susceptible to compaction. Additionally, slope instability is commonplace and vegetative growth potential is limited.

Minor amounts of other soil types compose the remaining areas proposed for treatments:

- 8 percent consists of the Wapi family and Chaix family complex including sandy loam, loamy sand, or gravelly loam soil types prone to surface erosion and mass erosion;
- 6 percent consists of Typic Haploxerults-Mollic Haploxeralfs complex including loam or gravelly loam prone to mass instability and low fertility;
- 6 percent consists of the Chaix family and Hurlbut family complex including sandy loam or gravelly loam prone to mass instability. There are minor amounts of several other soil types, described in detail in Table 3-20 on the following pages.

The photo below illustrates major gullying and streambank erosion of a ephemeral stream channel caused by an adjacent legacy road. Photo was taken February 25, 2009 in Section 34, Township 23N, Range 4E on Forest Service administered land.

Figure 3-3 Ephemeral Stream Channel



Map 3-10 Soil Types

Table 3-20 Soil Map Units within the Soil Resource Effects Analysis Area (Forest Service and Soil Conservation Service 1988)

Soil Map Unit Number	Percent of Soil Effects Analysis Area	Soil Map Unit Name	Management Concerns
111	2	Chaix family	Moderate to highly erosive on all slope groups. Maintain ground cover and low road densities. Spring burns and low intensity tractor piling are the standards that should be applied.
126	2	Clallam family	Can be somewhat unstable in relation to road construction. Perched water tables can also be observed.
144	2	Dubakella family	Instability is commonplace and vegetative growth potential is limited. Susceptible to compaction. Avoid or severely restricted mechanical operations when soils are wet (at or near the plastic limit).
129	3	Clallam (60%) and Holland, basic family (25%)	*Clallam*: Can be somewhat unstable in relation to road construction. Perched water tables can also be observed. *Holland*: Prone to mass instability and compaction. Because of its high productivity potential, mechanical operation should be curtailed or extremely limited during wet periods in order to avoid soil compaction and deformation.
146	5	Dubakella family	Instability is commonplace and vegetative growth potential is limited. Susceptible to compaction. Avoid or severely restricted mechanical operations when soils are wet (at or near the plastic limit).
117	6	Chaix family (50%) and Hurlbut family (35%)	Mass instability is extensive. Ground cover retention is critical on slopes > 35%. Maintaining minimum 60% ground cover is recommended.
280	6	Typic Haploxerults (45%) and Mollic Haploxeralfs (40%)	Mass instability is common and fertility is quite low. The sensitive plant Constance Rock Crest (Arabis Constancei) can be found in this map unit.
145	8	Dubakella family	Instability is commonplace and vegetative growth potential is limited. Susceptible to compaction. Avoid or severely restricted mechanical operations when soils are wet (at or near the plastic limit).
299	8	Wapi family (50%) and Chaix family (35%)	Mass instability is common place but surface erosion is the main concern. Maintain minimum ground cover of 40–60 percent.
200	12	Holland family	Prone to mass instability and compaction. Because of its high productivity potential, mechanical operation should be curtailed or extremely limited during wet periods in order to avoid soil compaction and deformation.
205	13	Holland, basic (55%) and Aiken family (30%)	Both soils are moderately susceptible to compaction and deformation. Avoid or severely limit mechanical operations (i.e., restricted to designated skid trails) when soils are wet (at or near the plastic limit). Delay site preparation in particular until the soils dry out.
199	32	Holland family	Prone to mass instability and compaction. Because of its high productivity potential, mechanical operation should be curtailed or extremely limited during wet periods in order to avoid soil compaction and deformation.
100	<1	Agua Dulce family	This unit is of limited distribution.
101	<1	Aiken family	Highly susceptible to deformation and compaction by heavy equipment. Compaction can be long lasting and detrimental to site productivity. Avoid mechanical operations during wet periods until sufficient drying has taken place.
102	<1	Aiken family	Highly susceptible to deformation and compaction by heavy equipment. Compaction can be long lasting and detrimental to site productivity. Avoid mechanical operations during wet periods until sufficient drying has taken place
113	<1	Chaix family	Moderate to highly erosive on all slope groups. Maintain ground cover and low road densities. Spring burns and low intensity tractor piling are the standards that should be applied.
128	<1	Clallam family, Micaceous (85%)	Road surfacing is critical to controlling high dust production and resulting sedimentation.

Soil Map Unit Number	Percent of Soil Effects Analysis Area	Soil Map Unit Name	Management Concerns
196	<1	Holland family	One of the most productive timber producing soils on the forest and also one of the most unstable. Mass instability is common and sheet and gully erosion is severe on steeper slopes. Compaction is also a problem. Avoid or limit mechanical operations during wet periods. Ground cover maintenance is critical, with 40–60% being the standard.
206	<1	Holland, basic (55%) and Aiken family (30%)	Both soils are moderately susceptible to compaction and deformation. Avoid or severely limit mechanical operations (i.e., restricted to designated skid trails) when soils are wet (at or near the plastic limit). Delay site preparation in particular until the soils dry out.
243	<1	Rock outcrop - Rubble land complex	Productivity is minimal and access is limited. Some soils exist throughout but comprise <10% of the map unit.
247	<1	Rubble land	Many areas of isolated seeps and bogs exist throughout the unit and are responsible for considerable mass instability. Riparian areas scattered throughout. Productivity is sparse and limited.

3.4.2 Soil Cover

Figure 3-4 Microscopic Soil Movement

Seasonal needle cast, fallen woody debris, and growth or sprouting of forest vegetation play an important role in stabilizing soils, which would otherwise be exposed to natural erosive disturbances. For instance, the physical impact of rain drops and movement of running surface water can cause microscopic soil movement, as shown in Figure 3-4; or more visibly evident soil displacement as illustrated in Figure 3-5. Evidence of microscopic soil movement. Location: Section 34, Township 23N, Range 4E. Date: March 4, 2009.

Figure 3-5 Soil Displacement and Gullying

Microscopic soil movement occurred as a result of overland flow in the burn areas without effective soil cover. Evidence is visible on the hillslopes in areas were tree litter partially covered the soil in the high intensity burn areas, as illustrated in this photograph. Tree litter held soil on the up slope side, but did not hold soil on the down slope side. Unsurfaced roads tend to channel water after heavy rains, sometimes resulting in prominent soil movement and gullying.

Overall, field surveys indicate in unburned areas, soil cover presently exceeds 40 percent. Table 3-21 summarizes soil conditions information for proposed treatment areas, and Table 3-22 presents soil cover.

Table 3-21 Unburned Area: Soil Condition Assessment of Proposed Treatment Areas

Proposed Treatment Area Number	Soil Condition Survey 2009	Proposed Treatment Areas Surveyed With Similar Conditions	Survey Date	Total Number of Data Points (2005)	Past Management Activities Within the Last 25 Years	Soil Map Unit	Average Slope (percent)
1059	Yes		August 5, 2005	40		199 (100%)	24
1060	No					199 (100%)	
1061	No					199 (100%)	
1064	Yes		August 3, 2005	40		199 (100%)	14
1066	No					199 (100%)	
1067	No	1059				199 (100%)	
1068	Yes		August 8, 2005	38		199 (100%)	10
1069	Yes		August 2, 2005	40		199 (100%)	8
1070	Yes		August 2, 2005	38		199 (100%)	23
1071	No	1069, 1070, 1076, and 1078				199 (98%) and 243 (2%)	
1072	No					199 (84%) and 243 (16%)	
1073	No	1069, 1070, 1076, and 1078				199 (100%)	
1076	Yes		August 3, 2005	37		199 (100%)	11
1078	Yes		August 2, 2005	40	1995, Clearcut Experimental Forest (3% of unit)	199 (100%)	10
1080	No	1082				126 (2%) and 199 (98%)	
1082	Yes		August 8, 2005	40		126 (33%) and 199 (67%)	9
1083	Yes		August 8, 2005	39		126 (98%) and 205 (2%)	17
1086	No	1087				126 (73%) and 205 (27%)	
1087	Yes		August 2, 2005	40		129 (55%), 205 (26%), and No Data (19%)	12
1088	Yes		August 2, 2005	39		129 (13%) and No Data (87%)	11
1089	No					199 (100%)	

Table 3-22 Burned Area: Soil Cover Assessment of Proposed Treatment Areas

Proposed Treatment Area Number	Original Survey Date	Existing Condition Soil Cover (2009)	Burn Severity	Information Gathered During Field Assessments July 13, 15, and 17 2009
1001	April 8, 2009	38	M (1%), H (99%), and Total (100%)	There is a significant amount of oak sprouting and numerous grasses, flowers, and other ground vegetation growing. The ground looks like 100% vegetation.
1002	April 7, 2009	48	H (100%)	There is a significant amount of oak sprouting and numerous grasses, flowers, and other ground vegetation growing. The ground looks like 100% vegetation.
1004			M (12%), H (88%), and Total (100%)	There is a significant amount of oak sprouting and numerous grasses, flowers, and other ground vegetation growing. The ground looks like 100% vegetation.
1006	February 2 and 19, 2009	12	M (1%), H (99%), and Total (100%)	There is a significant amount of oak re-sprouting, sparse, patchy grasses growing; not much increase in effective soil cover.
1007	February 25, 2009	50	M (22%), H (78%), and Total (100%)	Abundance of new vegetation provides a significant increase in effective soil cover since the unit was last surveyed. Many oaks are re-sprouting.
1016	March 18, 2009	60	M (75%), H (25%), and Total (100%)	Oak re-sprouting, shrubs and annuals growing; previous survey noted decent effective soil cover from needle cast.
1017	March 19, 2009	45	M (22%), H (78%), and Total (100%)	Lots of oak re-sprouting, sparse annual plants. Significant growth of new plants (annuals, shrubs) is providing an increase in effective soil cover.
1021	March 11. 2009	53	L (2), M (78), H (17), and Total (97%)	Abundance of shrubs, annuals, some hardwoods re-sprouting has caused a significant increase in; effective soil cover in parts of proposed treatment area. This proposed treatment area was mulched.
1023	March 18, 2009	50	M (7%), H (93%), and Total (100%)	Abundant new growth in hardwood re-sprout, shrubs, annuals provides a significant increase in effective soil cover; conditions are similar to unit 1025 (adjacent proposed treatment area). This proposed treatment area was mulched.
1025	March 12, 2009	42	M (15%), H(85%), and Total (100%)	Many hardwoods, shrubs have re-sprouted; abundant new growth in annual plants, shrubs; significant increase in effective soil cover from new plant growth. This proposed treatment area was mulched.
1027	March 17, 2009	76	L (27%), M (71%), and Total (98%)	Sparse, patchy new growth in shrubs, annuals; some hardwood re-sprouting.
1029	March 16. 2009	26	H (100%)	There is a significant amount of oak sprouting and numerous grasses, flowers, and other ground vegetation growing. The ground looks like 100% vegetation.
1033	March 12, 2009	84	L (61%), M (39%), and Total (100%)	Some hardwoods re-sprouting, sparse shrubs; otherwise little change in soil cover; previous survey noted good effective soil cover.
1034	March 17, 2009	90	L (22%), M (78%), and Total (100%)	Many hardwoods have re-sprouted; sparse to moderately dense growth of annual plants
1038	March 11, 2009	84	M (31%), H (69%), Total (100%)	Many hardwoods have re-sprouted; sparse, patchy annual plants growing. Modest increase in effective soil cover from new plant growth
1041	February 25, 2009	75	L (3%), M (75%), H (22%), and Total (100%)	Some shrubs are re-sprouting; patchy grasses (already dead, dry), other annuals have grown. Effective soil cover has not increased greatly as a result of new plant growth
1042	March 4, 2009	40	L (4%), M (73%), H (23%), and Total (100%)	Much oak re-sprouting, sparse annual plants. New vegetation growth provides fairly good effective soil cover in vicinity of ephemeral channel.

Proposed Treatment Area Number	Original Survey Date	Existing Condition Soil Cover (2009)	Burn Severity	Information Gathered During Field Assessments July 13, 15, and 17 2009
1044	February 26 and 27, 2009	68	L (5%), M (52%), H (44%), and Total (100%)	Abundance of grasses, other annuals have grown but are now dry. Effective soil cover was not lacking in previous survey. Proposed treatment area is very rocky.
1048	March 24, 2009	45	L (13%), M (60%), H (27%), and Total (100%)	Plantation unit- relatively little manzanita is re-sprouting. Parts of the proposed treatment area have almost no new vegetation, where present, new vegetation is very sparse and provides very little increase in effective soil cover.
1051	March 25, 2009	76	VL (2%), Low (21%), M (12%), and Total (35%)	Annual plants and grasses, shrubs re-vegetating wet areas along dozer line. There is little change in effective soil cover since unit was surveyed. Sparse shrubs, annuals growing; proposed treatment area already had fairly good effective soil cover (as noted in survey) from needle cast.
1052	March 25, 2009	85	VL (7%), Low (16%), M (8%), and Total (31%)	Patchy shrubs, ferns growing; not much change in effective soil cover since survey. The previous survey noted fairly good effective soil cover, mainly from needle cast.

Table 3-23 Burned Area: Soil Condition Assessment of Proposed Treatment Areas

Proposed Treatment Area Number	Soil Condition Survey 2009	Survey Date	Total Number of Data Points (2005)	Total Number of Data Points (2009)	Burn Severity*	Past Management Activities within the Last 25 Years	Soil Map Unit	Average Slope (percent)
1001	Yes	April 8, 2009		40	M (1%), H (99%), and Total (100%)		299 (100%)	37
1002	Yes	April 7, 2009		40	H (100%)		111 (8%) and 299 (100%)	35
1003	Yes	April 6, 2009		40	H (100%)		111 (46%) and 299 (54%)	25
1004	No				M (12%), H (88%), and Total (100%)		299 (100%)	
1005	Yes	April 4, 2009		41	H (100%)		299 (100%)	18
1006	Yes	February 2 and 19, 2009	39	42	M (1%), H (99%), and Total (100%)		111 (38%) and 117 (62%)	22
1006			25					
1006			25					
1007	Yes	February 25, 2009	39	32	M (22%), H (78%), and Total (100%)		117 (100%)	24
1008	Soil Cover Only	July 28, 2009		30	M (22%), H (78%), and Total (100%)		117 (100%)	44
1011	No				H (100%)		299 (100%)	
1013	Site Visit	July 28, 2009			L (83%), M (17%), and Total (100%)	1995, ITS (8% of unit) Cluster EA	200 (100%)	
1014	No				L (5%), M (83%), H (12), and Total (100%)		113 (5%) and 117 (24%)	
1015	Soil Cover Only	July 28, 2009	25	25	L (79%), M (21%), and Total (100%)		144 (53%), 145 (20%), and 146 (27%)	22
1016	Yes	March 18, 2009		30	M (75%), H (25%), and Total (100%)		199 (100%)	23
1017	Yes	March 19, 2009		40	M (22%), H (78%), and Total (100%)		145 (6%), 199 (20%), and 200 (74%)	32
1018	No				M (99%), H (1%), and Total (100%)		200 (100%)	
1019	Site Visit	July 28, 2009			L (52%), M (48%), and Total (100%)		199 (11%) and 200 (89%)	
1020	Soil Cover Only	July 28, 2009		30	L (3%), M (36%), H (61%), and Total (100%)	1995, ITS (98% of unit) Cluster EA	199 (1%) and 200 (99%)	36
1021	Yes	March 11. 2009	39	40	L (2), M (78), H (17), and Total (97%)	1995, ITS (5% of unit) Cluster EA	199 (5%), 200 (72%), and 205 (23%)	30

Burned Area: Soil condition assessment of proposed Treatment Areas (continued).

Proposed Treatment Area Number	Soil Condition Survey 2009	Survey Date	Total Number of Data Points (2005)	Total Number of Data Points (2009)	Burn Severity*	Past Management Activities within the Last 25 Years	Soil Map Unit	Average Slope (percent)
1022	Soil Cover Only	July 29, 2009	40	30	L (43%), M (36%), H (22%) and Total (100%)	1996, ITS (17% of unit) Black Timber Sale	205 (100%)	23
1023	Yes	March 18, 2009		38	M (7%), H (93%), and Total (100%)	1996, ITS (49% of unit) Black Timber Sale	205 (100%)	30
1025	Yes	March 12, 2009		36	M (15%), H(85%), and Total (100%)	1996, ITS (84% of unit) Black Timber Sale	205 (100%)	41
1026	Site Visit	July 28, 2009			L (59%), M (41%), and Total (100%)		101 (21%), 205 (41%), and 206 (38%)	
1027	Yes	March 17, 2009		33	L (27%), M (71%), and Total (98%)		205 (100%)	29
1028	Site Visit	July 28, 2009			L (11%), M (89%), Total (100%)		205 (100%)	
1029	Yes	March 16. 2009	25	38	H (100%)		111 (6%), 299 (94%)	17
1030	No				L (1%), M (71%), H (28%), and Total (100%)		100 (12%), 205 (16%), and No Data (73%)	
1031	No				M (69%), H (30%), and Total (99%)		No Data	
1032	Site Visit	July 28, 2009			L (1%), M (95%), H (4%), and Total (100%)	ITS, 1995 (94% of unit), Cluster EA	200 (84%) and 205 (16%)	
1033	Yes	March 12, 2009	39	25	L (61%), M (39%), and Total (100%)	ITS, 1995 (13% of unit), Cluster EA	101 (3%) and 205 (97%)	23
1034	Yes	March 17, 2009		30	L (22%), M (78%), and Total (100%)		199 (41%) and 200(59%)	50
1035	Yes	July 28, 2009		30	M (44%), H (56%), and Total (100%)		117 (72%) and 146 (27%)	37
1036	Yes	July 29, 2009		30	M (6%), H (94%), and Total (100%)	1985, Clearcut - Skyline (99% of unit), Big Valley EA	145 (92%) and 280 (8%)	47
1037	Site Visit	July 28, 2009	39		L (45%), M (54%), H (1%), and Total (100%)	1985, Clearcut - Skyline and Overstory Removal - Skyline (9% of unit), Big Valley EA	145 (69%), 146 (30%), and 280 (1%)	
1038	Yes	March 11, 2009	37	38	M (31%), H (69%), Total (100%)		129 (86%), 145 (1%), and 280 (13%)	36
1039	Yes	July 28, 2009		30	M (34%), H (62%), and Total (95%)		145 (43%) and 280 (57%)	45

Table 3-26 Burned Area : Soil condition assessment of proposed treatment areas (continued).

Proposed Treatment Area Number	Soil Condition Survey 2009	Survey Date	Total Number of Data Points (2005)	Total Number of Data Points (2009)	Burn Severity*	Past Management Activities within the Last 25 Years	Soil Map Unit	Average Slope (percent)
1041	Yes	February 25, 2009		20	L (3%), M (75%), H (22%), and Total (100%)		144 (31%), 145 (23%), 146 (5%), and 280 (41%)	47
1042	Yes	March 4, 2009	39	40	L (4%), M (73%), H (23%), and Total (100%)		280 (100%)	32
1043	No				L (2%), M (84%), H (14%), and Total (100%)	1985, Clearcut - Skyline (1% of unit), Big Valley EA	280 (100%)	
1044	Yes	February 26 and 27, 2009		40	L (5%), M (52%), H (44%), and Total (100%)		144 (6%), 145 (60%), and 146 (86%)	32
1045	Site Visit	July 28, 2009			L (53%), M 47%), and Total (100%)		144 (1%), 145 (14%), 146 (86%)	
1048	Yes	March 24, 2009	40	40	L (13%), M (60%), H (27%), and Total (100%)	1994, ITS (75% of unit), Sawmill EA	102 (24%), 199 (74%), and 200 (2%)	23
1051	Yes	March 25, 2009			VL (2%), Low (21%), M (12%), and Total (35%)	1994, ITS (68% of unit), Sawmill EA	199 (100%)	22
1052	Yes	March 25, 2009	38	33	VL (7%), Low (16%), M (8%), and Total (31%)	1994, ITS (38% of unit), Sawmill EA	196 (8%), 199 (84%), 247 (4%), and 280 (3%)	21
1053	Soil Cover Only	July 28, 2009			VL (8%)		128 (1%) and 199 (99%)	12

*Burn Severity – VL = Very Low, L = Low, M = Moderate, and H = High.

The Burned Area Reflectance Classifications (BARC) maps/GIS layers are used to create soil burn severity maps. Soil burn severity maps are the most important component of a Burned Area Emergency Response assessment. The term soil burn severity is a qualitative classification of fire-induced changes to soil hydrologic function, as indicated by post-fire soil characteristics and surface fuel and duff consumption. Soil burn severity maps are used primarily to identify areas of impaired soil hydrologic function where there is an elevated risk of accelerated post-fire erosion and flooding. Soil burn severity maps may also be used as an input for modeling post-fire runoff response and soil erosion potential, or as an aid in mapping timber mortality or effects to wildlife habitat. Soil burn severity maps are not maps of vegetation or timber mortality, nor do they represent the effects of fire on all resources and overall ecological condition. BARC map soil burn severity class indicators are summarized in this table. All information in summary taken from: Annette Parsons. April 22, 2003. Burned Area Emergency Rehabilitation Soil Burn Severity Definitions and Mapping DRAFT. Unpublished internal technical report

Soil Erosion Hazard

The erosion hazard rating (EHR) is a risk assessment of specific soil factors associated with accelerated erosion (Forest Service 1990). The EHR method was used to describe the amount and distribution of effective soil cover and potential for detrimental soil compaction within proposed treatment areas. The EHR was computed using the California Soil Survey Committee (CSSC) Erosion Hazard Rating Computation Form (CSSC 1989). The form is based on the following calculations and includes 4 main components:

Soil Erodibility Factor Rating

The factors in this component are texture and aggregate stability adjustments. Soil textural classes and slope are used to identify relative soil erodibility factors. Soil texture class erodibility factors are based on calculations using Universal Soil Loss Equation (USLE) textural K-values. Slope is used to compensate for particle size class transport differences due to slope gradient. Soil texture and slope were measured during field surveys.

A. **Texture**: Table 3-27 is used to determine relative soil texture erodibility factors:

Table 3-24 Relative Soil Texture Erodibility Factors*

	Slope Steepness			
	0–15	16–30	31–45	46–60
Textural Class	(percent)			
Sand	1	1	2	3
Loamy Sand	1	2	3	3
Sandy Loam	2	2	3	3
Sandy Clay Loam	2	2	3	3
Sandy Clay	1	1	1	1
Clay	1	1	1	1
Clay Loam	2	2	2	2
Loam	3	3	3	3
Silty Clay	2	2	2	2
Silty Clay Loam	3	3	3	3
Silt Loam	4	4	4	4
Silt	4	4	4	4

* Soil Erodibility Factor Descriptions:

1 = Low
2 = Moderate
3 = High
4 = Very High

B. Aggregate stability adjustments are unique conditions in the soil, such as presence of excess sodium and iron. Aggregate stability adjustments are not needed for this project.

C. Soil Erodibility Rating = Sum of A + B

Runoff Production Factors

A. Climate: Determined by using the 2-year, 6-hour precipitation value maps included in the Precipitation-Frequency Atlas of the Western United States, Vol. XI-California (State of California 1973) and using Table 3-25.

Table 3-25 Climate rating

Inches (Precipitation)	<1.0	1.0–1.7	1.8–2.2	2.3–2.7	>2.7
Rating	1	2	3	4	5

On the Feather River Ranger District the 2-year, 6-hour precipitation value is greater than 2.7.

B. Water Movement in Soil: Infiltration, permeability, and depth to permeability reduction are inter-related factors that govern the rate of water movement into and through the soil. The result of some combinations of these factors is surface runoff. They are evaluated together to account for interactions among the factors, and Table 3-26 is used to determine the rating, while the soil survey data and the Plumas National Forest Soil Inventory (Forest Service and Soil Conservation Service 1983) are used to determine Water Movement in Soil.

Table 3-26 Water movement in soil rating

Infiltration	Rapid	Rapid	Rapid	Morate	Rapid or Moderate	Rapid or Moderate	Slow
Permeability	Any	Moderate	Moderate	Any	Slow	Slow	Any
Depth (inches)	>40	20–40	<20	>40	20–40	<20	Any
Rating	1	2	3	3	4	6	8

1. **Infiltration of the Surface Soil**—Infiltration is the rate of water movement into the soil. The following soil texture, porosity and consistency descriptions are a guide to rating existing condition:

    - **Rapid**—Sands, loamy sands, sandy loams, and porous fine sandy loams and loams: generally very porous (>2 inches/hour)
    - **Moderate**—Loams, silt loams, and friable clay loams; also includes the more porous soils of finer textures, and the less porous soils of coarser texture (0.6 to 2.0 inches/hour)
    - **Slow**—Clay loams and clays that are firm, sticky and plastic; generally with very few pores (<0.6 inches/hour)

Infiltration rates can be reduced by various management activities. This may be caused by compaction, puddling on wet soils, raindrop impact on bare soils with loam or finer textures and relatively low organic matter, or hydrophobic conditions caused by fire. Ratings should be adjusted to the next slower class depending upon the severity of reduced infiltration.

2. **Permeability of the subsoil**—Permeability is the rate at which water moves down through the soil. The permeability of rock or other kinds of layers within 40 inches of the soil surface is also evaluated. Subsoil and substrata permeability rates are compared to surface infiltration rates to evaluate the likelihood of water accumulating in the soil. Table 3-27 is used as a guide to determine permeability ratings.

Table 3-27 Permeability ratings

	Soil	Nonsoil Material
Rapid	Sands, loamy sands, sandy loams, and fine sandy loams; generally very porous (>2 inches/hour)	Highly fractured or loose material. Water movement is not impeded.
Moderate	Loams, silt loams, and friable clay loams; also includes the more porous soils of finer textures, and the less porous soils of coarser texture (0.6 to 2.0 inches/hour)	Fractured or weathered material that can be dug with a shovel.
Slow	Clay loams and clays that are firm, sticky and plastic; generally with very few pores (<0.6 inches/hour)	Very few widely spaced fractures. Unweathered or weathered materials.

3. **Depth to layer that restricts water movement**—The depth from the soil surface to the layer rated as restricting the downward movement of water. The depth refers to the layer that is rated subsoil/substrata permeability. Depth to layer that restricts water movement was determined for each soil map unit located in the Plumas National Forest Soil Survey.

C. **Runoff from adjacent and intermingled areas:** the amount of and proximity to impervious or nearly impervious surfaces can increase the production of surface runoff. Impervious or nearly impervious surfaces include rock outcrops, soil areas with water movement factors totaling 6 or more, and disturbed areas (e.g., compacted areas, roads, and developed areas). This factor allows for rating complex soil patterns and miscellaneous areas. The following guide determines rating:

- *Low:* Less than 15 percent of adjacent or intermingled areas contain impervious or nearly impervious surfaces.
- *Moderate:* Between 15 and 50 percent of adjacent or intermingled areas contain impervious or nearly impervious surfaces.
- *High:* More than 50 percent of adjacent or intermingled areas contain impervious or nearly impervious surfaces.

D. **Uniform Slope Length:** Slope length and surface variation are used to reflect the magnitude of slope gradient effects on surface runoff. The surface microrelief is evaluated by the distance that occurs before a significant change in water movement of flow direction may take place. For example, the distance between intercepting ground cover, benches, mounds, flats and other soil surface features is used. Uniform slope length is determined during field surveys and Table 3-28 contains the rating scheme.

Table 3-28 Uniform slope length rating

Length	<25	25–50	>50
Rating	1	3	6

E. **Runoff Production Factor** = Sum of A+B+C+D.

F. **Runoff Production Rating** = Runoff Production Factor ÷ 3.

Runoff energy

Slope gradient is used to represent the relative energy of surface runoff. Runoff Energy Rating = Slope percent dived by 100.

Soil Cover

A. **Quantity and Quality**—Ground (soil) cover is more effective than shrub or tree canopy in resisting the effects of raindrop impact and surface runoff. Table 3-29 is used to determine the quantity and quality rating, and compensates for the differences between effective soil cover and canopy. Effective soil cover and total vegetation canopy is determined through field surveys.

Table 3-29 Quantity and quality soil cover rating

Shrub and/ or Tree Canopy (Percent)	**Effective Soil Cover (percent)**					
	0–10	**11–30**	**31–50**	**51–70**	**71–90**	**>90**
0–10	5	4	3	2	1	0
11–30	4	4	3	2	1	0
31–50	4	3	3	2	1	0
51–70	3	3	3	2	1	0
71–90	3	3	2	2	1	0
>90	3	2	2	1	0	0

B. **Cover Distribution**—This rating compensates for variation in the continuity of soil cover. Soil cover is considered to be uniform if more than half of an area is consistently within some of the percent ranges listed in Table 3-30. The cover is considered patchy when more than half of an area falls outside a single percentage range. Distribution rating is: Uniform = 0 and Patchy = 1.

C. Soil Cover Rating = Sum of A+B.

D. EHR Rating Product = Product of Ratings I x II x III x IV

- The adjective rating is determined using Forest Plan Standards and Guides:
- Low EHR 4-5;
- Moderate EHR 6-8;
- High EHR 9-10, and;
- Very High EHR 11-13.

The Forest Plan states, "During project activities, minimize excessive loss of organic matter and limit soil disturbance according to the (EHR) as follows: EHR 4-8: conduct normal activities; EHR 9-10: minimize or modify use of soil-disturbing activities, and; EHR 11-13: severely limit soil-disturbing activities.

Unburned area

Proposed treatment areas have erosion hazard ratings (EHR) below 8, as current effective soil cover thickness levels well exceed minimum guidelines specified in the 2004 Forest Plan.

Table 3-30 Unburned Proposed Treatment Areas: Effective Soil Cover, Erosion Hazard Ratings, and Standards and Guidelines

Proposed Treatment Area Number	Existing Condition Soil Cover (percent)	Reason for Effective Soil Cover[1]	Erosion Hazard Rating		Plumas National Forest Standard and Guideline for Effective Soil Cover (percent)
			Numerical	Adjective	
1059	80	D&L 75% and Rock 5%	1	Low	40
1064	90	D&L 53%, WD 8%, LV 28%, and Rock 3%	1	Low	40
1068	68	D&L 42%, WD 8%, LV 16%, and Rock 3%	5	Low	40
1069	80	D&L 55%, WD 20%, and LV 5%	1	Low	40
1070	91	D&L 58%, WD 18%, LV 16%, and Rock 0%	0	Low	40
1076	92	D&L 73%, WD 11%, LV 5%, and Rock 3%	0	Low	40
1078	88	D&L 50%, WD 20%, LV 15%, and Rock 3%	0	Low	40
1082	98	D&L 43%, WD 33%, LV 18%, and Rock 5%	0	Low	40
1083	95	D&L 77% and LV 18%	0	Low	40
1087	93	D&L 90% and LV 3%	0	Low	40
1088	97	D&L 95% and WD 2%	0	Low	40

Burned Area

Some areas within proposed treatment areas, affected by high severity fire, have EHR ratings greater than 8. This reflects the full extent to which fire consumed litter and woody debris fuel concentrations, along with the forest canopy. Other areas affected by less intense low and moderate fire, tend to have EHR ratings less than 8, as a result of various factors including:

- not all litter and woody material was consumed by fire;
- canopy was not fully consumed, providing sources for new litter and woody debris;
- helicopter mulching applied to barren soils after the 2008 fires reestablished some soil cover (up to ½ thick), as part of the Burn Area Emergency Rehab (BEAR) efforts conducted by the US Forest Service;
- vegetative growth post-fire, and/or;
- rock content greater than ¾ inch.

Figure 3-6 Reduced erosion during overland flow in burn area

Figure 3-6 dpicts reduced erosion during overland flow in burn area, partially mulched in Section 34 Township 23N, Range 4E, on March 4, 2009. In the mulched areas, Forest Service field surveys indicate soil movement during periods of overland flow was greatly reduced or did not occur.

Figure 3-7 No evidence of soil erosion on fully mulched slopes

Figure 3-7 displays no evidence of soil erosion on slopes fully mulched with an ephemeral stream. Mulch within the stream channel moved in response to perception events. Photo taken in Section 34, Township 23N, Range 4E on March 4, 2009.

The Forest Service conducted follow up visits on July 13 and 17, 2009, to determine whether or not environmental conditions had stayed the same or changed since surveyed in February-April. Forest Service field surveys and observations indicate the environment within the proposed treatment areas is changing rapidly. Vegetative re-growth is occuring at a rapid rate, providing effective soil cover as presented in Table 3.10-8 In such areas, the EHR is 8 or less.

Soil Compaction

The US Forest Service determined the percent detrimental soil compaction (compaction of the soil at depth of 4–8 inches) within proposed treatment areas by conducting field surveys. The extent of current detrimental soil compaction for the proposed treatment areas surveyed is summarized in table 3-31 Areas exhibiting the highest detrimental compaction ratings were subject to past logging (land management) activities (more than 25 years prior). The locations of landings, skid trails, and temporary roads used in the past are still visible today, as compacted soils discourage reestablishment of forest vegetation.

Table 3-31 summarizes fine organic matter and large woody debris conditions within proposed treatment areas in the unburned area. All proposed treatment areas surveyed within the unburned area exceeded 50 percent fine organic matter.

Table 3-31 Burned Area Proposed Treatment Areas: Effective Soil Cover, Erosion Hazard Ratings and Soil Cover

Proposed Treatment Area Number	Existing Condition Numerical EHR 2005	Existing Condition Percent Soil Cover 2009	Existing Condition Numerical EHR 2009	Reason for Effective Soil Cover[a]	Helicopter Mulching Detected (Yes or No)	Forest Plan EHR Rating	Forest Plan Minimum Percent Effective Soil Cover	Burn Severity[b]	July 2009 Site Visit Determinations
1001	Not calculated	38	16	D&L 23%, WD 3%, LV %10, and Rock 3%	Yes	Very high	70	M (1%), H (99%), and Total (100%)	Significant increase in vegetation and effective soil cover
1002	Not calculated	48	9	D&L 25%, WD 8%, LV 5%, and Rock 10%	Yes	High	60	H (100%)	Significant increase in vegetation and effective soil cover
1003	Not calculated	37	10	WD 8%, LV 8%, and Rock 5%	No	High	60	H (100%)	Significant increase in vegetation and effective soil cover
1005	Not calculated	37	10	D&L 22%, WD 10%, and LV 5%	Yes	High	60	H (100%)	Significant increase in vegetation and effective soil cover
1006[c]	10, 5, and 0	12	8	D&L 10% and WD 2%	Yes	Moderate	50	M (1%), H (99%), and Total (100%)	Little to no change
1017	Not calculated	45	22	D&L 13%, WD 8%, LV 3%, and Rock 23%	Yes	Very high	70	M (22%), H (78%), and Total (100%)	Significant increase in vegetation and effective soil cover
1023	Not calculated	50	14	D&L 26%, WD 11%, LV 3%, and Rock 11%	Yes	Very high	70	M (7%), H (93%), and Total (100%)	Significant increase in vegetation and effective soil cover
1025	Not calculated	42	14	D&L 11%, WD 8%, LV 8%, and Rock 14%	Yes	Very high	70	M (15%), H(85%), and Total (100%)	Significant increase in vegetation and effective soil cover
1029	0	28	8	D&L 8%, WD 8%, and Rock 11%	Yes	Moderate	50	H (100%)	Significant increase in vegetation and effective soil cover
1035	Not calculated	43	13	D&L 30% and LV 13%	Yes	Very high	70	M (44%), H (56%), and Total (100%)	Effective soil cover survey performed in July 2009
1039	Not calculated	57	15	D&L 17%, WD 20%, LV 17% and Rock 3%	No	Very high	70	M (34%), H (62%), and Total (95%)	Effective soil cover survey performed in July 2009
1042	0	40	9	D&L 25%, WD 8%, and Rock 8%	Yes	High	60	L (4%), M (73%), H (23%), and Total (100%)	Little to no change

Proposed Treatment Area Number	Existing Condition Numerical EHR 2005	Existing Condition Percent Soil Cover 2009	Existing Condition Numerical EHR 2009	Reason for Effective Soil Cover[a]	Helicopter Mulching Detected (Yes or No)	Forest Plan EHR Rating	Forest Plan Minimum Percent Effective Soil Cover	Burn Severity[b]	July 2009 Site Visit Determinations
1044	Not calculated	68	15	D&L 33%, WD 3%, and Rock 33%	No	Very high	70	L (5%), M (52%), H (44%), and Total (100%)	Little to no change
1045									
1048	2	45	12	D&L 15%, WD 3%, LV 3%, and Rock 25%	No	Very high	70	L (13%), M (60%), H (27%), and Total (100%)	Little to no change
1090	—	—	—	—	—	—	—	—	—

a. Reason for Effective Soil Cover – D&L = Duff and Litter, WD = Woody Debris, LV = Live Vegetation, and Rock = rock greater than ¾ inch thick. See Appendix C for soil survey protocol and definition.

b. Burn Severity – VL = Very Low, L = Low, M = Moderate, and H = High. The Burned Area Reflectance Classifications (BARC) maps/GIS layers are used to create soil burn severity maps. Soil burn severity maps are the most important component of a Burned Area Emergency Response assessment. The term soil burn severity is a qualitative classification of fire-induced changes to soil hydrologic function, as indicated by post-fire soil characteristics and surface fuel and duff consumption. Soil burn severity maps are used primarily to identify areas of impaired soil hydrologic function where there is an elevated risk of accelerated post-fire erosion and flooding. Soil burn severity maps may also be used as an input for modeling post-fire runoff response and soil erosion potential, or as an aid in mapping timber mortality or effects to wildlife habitat. Soil burn severity maps are not maps of vegetation or timber mortality, nor do they represent the effects of fire on all resources and overall ecological condition. BARC map soil burn severity class indicators are summarized in this table. All information in summary taken from: Annette Parsons. April 22, 2003. Burned Area Emergency Rehabilitation Soil Burn Severity Definitions and Mapping DRAFT. Unpublished internal technical report

c. Proposed Treatment Unit 1006 included 3 proposed treatment areas Surveyed under the Flea Project.

Table 3-32 Soil Texture, Detrimental Compaction, and Detrimental Compaction Risk Rating of Proposed Treatment Areas Surveyed

Proposed Treatment Area Number	Soil Texture	Existing Condition Areal Extent of Detrimental Soil Compaction (percent)	Detrimental Compaction Risk Rating
1002	Sandy Loam and Loamy Sand	5	Moderate
1003	Sandy Loam and Loam	5	Moderate
1005	Loam, Sandy Loam, and Sandy Clay Loam	3	Moderate
1006	Loamy Sand, Sandy Loam, Loam	14	Low
1007	Sandy Loam	3	Moderate
1008	Clay Loam	Not surveyed, because proposed treatment activities do not cause detrimental soil compaction.	
1015	Silty Clay Loam	Not surveyed, because proposed treatment activities do not cause detrimental soil compaction.	
1016	Sandy Clay Loam, Sandy Clay, and Silty Clay Loam	13	High
1017	Sandy Clay Loam, Silty Clay Loam, and Loam	5	High
1020	Silty Clay Loam	Not surveyed, because proposed treatment activities do not cause detrimental soil compaction.	
1021	Sandy Clay Loam, Sandy Clay, and Silty Clay Loam	0	High
1022	Silty Clay Loam	Not surveyed, because proposed treatment activities do not cause detrimental soil compaction.	
1023	Sandy Clay Loam and Sandy Clay	3	High
1025	Sandy Clay Loam	8	High
1027	Sandy Clay Loam	3	High
1029	Loam, Sandy Loam, and Loamy Sand	8	Low
1033	Sandy Clay Loam and Sandy Clay	8	High
1034	Sandy Clay Loam	0	High
1035	Clay Loam and Silty Clay Loam	0	High
1036	Sandy Clay Loam and Sandy Clay	0	High
1038	Sandy Clay Loam and Sandy Clay	3	High
1039	Sandy Clay Loam and Silty Clay Loam	10	High
1041	Sandy Clay Loam and Silty Clay Loam	0	High
1042	Sandy Clay Loam and Silty Clay Loam	0	High
1044	Sandy Clay Loam and Silty Clay Loam	0	High
1048	Sandy Clay Loam	38	High
1051	Silty Clay Loam	18	High
1052	Sandy Clay Loam and Silty Clay Loam	8	High

Proposed Treatment Area Number	Soil Texture	Existing Condition Areal Extent of Detrimental Soil Compaction (percent)	Detrimental Compaction Risk Rating
1053	Sandy Clay	Not surveyed, because proposed treatment activities do not cause detrimental soil compaction.	
1059	Sandy Clay	13	
1064	Clay Loam	13	
1068	Loam	16	
1069	Silty Clay Loam	28	
1070	Silty Clay Loam	0	
1076	Silty Clay Loam	22	
1078	Silty Clay Loam	5	
1082	Loam	0	
1083	Clay Loam	10	
1087	Silty Clay	28	
1088	Silty Clay	51	

Table 3-33 Fine Organic Matter and Large Woody Debris in Proposed Treatment Areas in the Unburned Area

Proposed Treatment Area Number	2005 Existing Condition % Fine Organic Matter	2005 Existing Condition Amount of Large Woody Debris per Acre					
		Class 1	Class 2	Class 3	Class 4	Class 5	Total
1059	75	0	0	7	0	0	7
1061	Not Surveyed	10	2	0	2	10	24
1064	83	0	3	0	5	0	8
1068	61	0	0	3	0	0	3
1069	73	0	0	0	0	0	0
1070	87	0	2	0	0	0	2
1073	—	1,776	129	162	271	1,069	3,407
1076	84	0	5	3	0	0	8
1078	75	0	2	8	4	0	14
1082	78	0	0	4	0	0	4
1083	95	0	3	5	3	0	11
1087	93	0	2	0	0	0	2
1088	95	6	24	0	4	2	36

In the unburned area within proposed treatment areas, large down wood (LWD) exceeds 5 logs per acre, except for the 5 areas listed in Table 3-34.

Table 3-34 Unburned Area: Number of Down Logs per Proposed Treatment Area

Proposed Treatment Area Number	Number of Down Logs per Acre (2005)
1068	3
1069	0
1070	2
1082	4
1087	2

Burned Area

Table 3-35 summarizes fine organic matter and large woody debris conditions within proposed Treatment Areas in the Burned Area. Several of the areas within the burned area do not meet the 50 percent fine organic matter threshold, as all or most of the fine organic matter was consumed in 2008. Although some areas have effective soil cover, the majority of it is vegetative re-growth or rock content greater than ¾ inches. Fine soil organic matter will take many years to recover because the majority of the canopy was consumed during the fire. The Butte Lighting Complex fires combusted organic matter and caused the rapid acceleration of decomposition rates and nutrient cycling processes, essential for plant growth and soil organisms. The initial nitrogen release caused vegetation to sprout quickly post-fire. However the effects of the fire have short-term and long-term adverse effects (Neary et al. 2005).

Table 3-35 Fine organic matter and large woody debris in Proposed Treatment Areas in the Burned Area

Proposed Treatment Area Number	2005 Existing Condition Fine Organic Matter (Percent)	2009 Existing Condition Fine Organic Matter (percent)	2005 Existing Condition Amount of LWD per Acre						2009 Existing Condition Amount of LWD per Acre						Burn Severity
			Class 1	Class 2	Class 3	Class 4	Class 5	Total	Class 1	Class 2	Class 3	Class 4	Class 5	Total	
1001	Not surveyed	25	Not surveyed						3	9	0	0	0	12	M (1%), H (99%), and Total (100%)
1002	Not surveyed	30	0	0	0	2	2	4	0	3	0	0	0	3	H (100%)
1003	Not surveyed	5	0	0	0	2	2	4	0	12	0	0	0	12	H (100%)
1005	Not surveyed	29	0	0	0	2	2	4	4	14	0	0	0	19	H (100%)
1006	23	12	0	0	0	0	0	0	3	1	0	0	0	4	M (1%), H (99%), and Total (100%)
1006	25		0	4	0	0	0	4							
1006	100		0	2	4	0	0	6							
1007	23	44	0	0	0	0	0	0	0	2	0	0	0	2	M (22%), H (78%), and Total (100%)
1008	Not surveyed	40*	Not surveyed						7	0	0	0	0	7	M (22%), H (78%), and Total (100%)
1011	Not surveyed		0	0	0	2	2	4	Not surveyed						H (100%)
1015	20	8	3	3	0	3	0	8	0	3	0	2	0	5	L (79%), M (21%), and Total (100%)
1016	Not surveyed	43	Not surveyed						0	3	0	2	0	5	M (75%), H (25%), and Total (100%)
1017	Not surveyed	13	Not surveyed						0	11	0	0	0	11	M (22%), H (78%), and Total (100%)
1020	Not surveyed	87	Not surveyed						Not surveyed						L (3%), M (36%), H (61%), and Total (100%)
1021	90	53	1	1	0	0	0	3	3	1	0	0	0	4	L (2), M (78), H (17), and Total (97%)
1022	75	80	0	0	4	8	0	12	Not surveyed						L (43%), M (36%), H (22%) and Total (100%)
1023	Not surveyed	32	0	0	0	0	0	0	0	3	0	1	0	4	M (7%), H (93%), and Total (100%)
1025	Not surveyed	14	0	0	0	0	0	0	0	0	0	0	0	0	M (15%), H(85%), and Total (100%)
1027	Not surveyed	67	0	0	0	8	0	8	0	7	0	0	0	7	L (27%), M (71%), and Total (98%)
1029	50	8	0	0	0	3	0	3	5	2	0	0	0	7	H (100%)

Proposed Treatment Area Number	2005 Existing Condition Fine Organic Matter (Percent)	2009 Existing Condition Fine Organic Matter (percent)	2005 Existing Condition Amount of LWD per Acre						2009 Existing Condition Amount of LWD per Acre						Burn Severity
			Class 1	Class 2	Class 3	Class 4	Class 5	Total	Class 1	Class 2	Class 3	Class 4	Class 5	Total	
1033	90	80	1	1	0	0	0	3	5	5	0	0	0	10	L (61%), M (39%), and Total (100%)
1034	Not surveyed	37	2	2	0	0	0		2	2	0	0	0	4	L (22%), M (78%), and Total (100%)
1035	Not surveyed	30	0	4	0	0	0	4	0	0	0	0	0	0	M (44%), H (56%), and Total (100%)
1036	Not surveyed	10	0	0	0	7	0	7	Not surveyed						M (6%), H (94%), and Total (100%)
1038	97	50	0	0	0	0	0	0	46	0	0	0	0	46	M (31%), H (69%), Total (100%)
1039	Not surveyed	27	Not surveyed						0	0	0	0	0	0	M (34%), H (62%), and Total (95%)
1041	Not surveyed	50	0	0	0	0	0	0	0	0	0	0	0	0	L (3%), M (75%), H (22%), and Total (100%)
1042	64	28	1	3	0	0	0	4	0	4	0	0	0	4	L (4%), M (73%), H (23%), and Total (100%)
1044	Not surveyed	33	1	3	0	0	0	4	0	0	0	0	0	0	L (5%), M (52%), H (44%), and Total (100%)
1048	70	18	0	1	5	6	0	13	0	3	0	0	0	3	L (13%), M (60%), H (27%), and Total (100%)
1051	Not surveyed	58	Not surveyed						0	3	0	0	0	3	VL (2%), Low (21%), M (12%), and Total (35%)
1052	87	73	0	0	1	0	0	1	0	4	0	0	0	4	VL (7%), Low (16%), M (8%), and Total (31%)
1053	Not surveyed	50	Not surveyed						Not surveyed						VL (8%)

When organic matter burns in a fire, essential nutrient loss can occur in the following ways: nutrients may be 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); or nutrients at a greater depth in the soil profile may be lost immediately due to leaching following a fire (Boener 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).

The Region 5 Soil Management Handbook recommends large woody material (LWM) or Large Woody Debris (LWD) be retained at a rate of at least 5 well distributed logs per acre. There are fewer than 5 logs per acre of LWD within proposed treatment areas in the burned area. Either the proposed treatment areas did not contain sufficient amount of large woody material prior to the fire, or LWD was consumed by the fire. In some case the LWD Class 1 and Class 2 increased post-fire as a result of the dead trees falling. It is expected that the amount of LWD will increase within the next 5–10 years as more dead trees fall over. All other proposed treatment areas in the burned area exceed 5 logs per acre of LWD.

Soil Hydrologic Function

The majority of soil map units in the Project Area have water movement in soil ratings (infiltration and permeability) less than six. Table 3-36 contains proposed treatment areas with rating above 6 or 8, along with the rationale for designations. These soil conditions indicate a higher level of risk of accelerated runoff, if sufficient levels of effective soil cover are not present.

Increased surface runoff and erosion did occur in the burned area. However, major rutting, rilling, or gullying did not occur as a result of 2009 precipitation events. As the vegetation recovers and soil cover increases, the erosion potential will decrease.

Table 3-36 Existing Condition Number of Down Logs per Acre in the Burned/Black Area

Proposed Treatment Area Number	Existing Condition Amount of LWD per Acre (2005)						Existing Condition Amount of LWD per Acre (2009)					
	Class 1	Class 2	Class 3	Class 4	Class 5	Total	Class 1	Class 2	Class 3	Class 4	Class 5	Total
1002	0	0	0	2	2	4	0	3	0	0	0	3
1006	0	0	0	0	0	0						
1006	0	4	0	0	0	4	3	1	0	0	0	4
1006	0	2	4	0	0	6						
1007	0	0	0	0	0	0	0	2	0	0	0	2
1016	Not Surveyed						0	3	0	2	0	5
1017	Not Surveyed						0	11	0	0	0	11
1021	1	1	0	0	0	3	3	1	0	0	0	4
1023	0	0	0	0	0	0	0	3	0	1	0	4
1025	0	0	0	0	0	0	0	0	0	0	0	0
1034	2	2	0	0	0	4	2	2	0	0	0	4
1035	0	4	0	0	0	4	0	0	0	0	0	0
1041	0	0	0	0	0	0	0	0	0	0	0	0
1042	1	3	0	0	0	4	0	4	0	0	0	4
1044	1	3	0	0	0	4	0	0	0	0	0	0
1048	0	1	5	6	0	13	0	3	0	0	0	3
1051	Not Surveyed						0	3	0			3
1052	0	0	1	0	0	1	0	4	0	0	0	4

Table 3-37 Soil Hydrologic Function and Proposed Treatment Areas Above and Below Recommended Thresholds, with Rationale

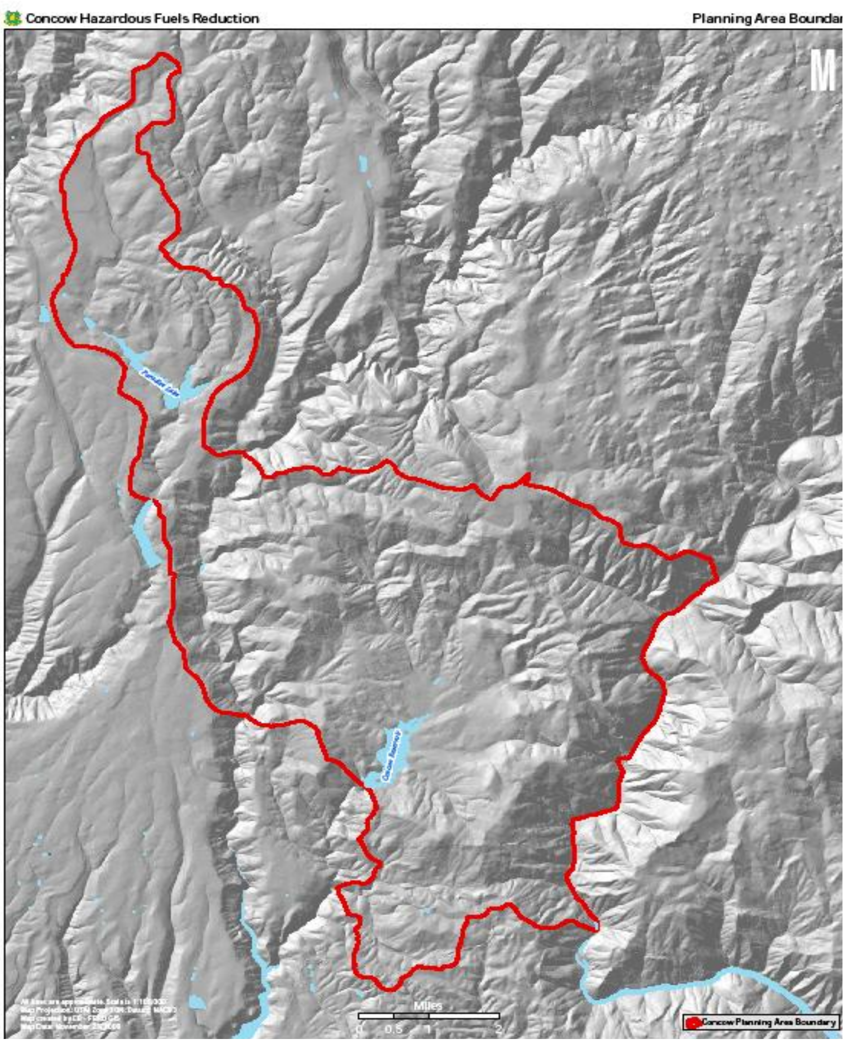
Proposed Treatment Area number	Reason Proposed Treatment Areas Exceeds Water Movement in Soil Ratings greater than 6	Existing Condition Effective Soil Cover
1016	Due to high percent of detrimental soil compaction (13%)	Exceeds Forest Plan Standards and Guides
1036	Soil map unit naturally exceeds a rating of 6	Exceeds Forest Plan Standards and Guides
1039	Soil map unit naturally exceeds a rating of 6	Less than Forest Plan Standards and Guides
1041	Soil map unit naturally exceeds a rating of 6	Less than Forest Plan Standards and Guides
1044	Soil map unit naturally exceeds a rating of 6	Less than Forest Plan Standards and Guides
1048	Due to high percent of detrimental soil compaction (38%)	Less than Forest Plan Standards and Guides
1051	Due to high percent of detrimental soil compaction (18%)	Exceeds Forest Plan Standards and Guides
1059	Soil map unit naturally exceeds a rating of 6	Exceeds Forest Plan Standards and Guides
1064	Soil map unit naturally exceeds a rating of 6	Exceeds Forest Plan Standards and Guides
1068	Soil map unit naturally exceeds a rating of 6	Exceeds Forest Plan Standards and Guides
1069	Soil map unit naturally exceeds a rating of 6	Exceeds Forest Plan Standards and Guides

Soil Buffering Capacity

Soil buffering capacity is a function of soil pH and cation exchange capacity. Changes in these properties could affect soil chemistry, reaction, and nutrient availability. It is possible that the Butte Lighting Complex caused a change in the soil buffering capacity due to the high burn intensity. Fire can produce pulse nitrogen inputs into the soil, which are short-lived and generally considered beneficial to nutrient supply for vegetation. Within the Project Area no known additionshave occurred to the soil of chemicals or materials that could significantly alter soil buffering capacity.

3.4.3 Geology, Soils, and Hillslope Characteristics

The Concow Hazardous Fuels Reduction Project area lies within the Sierra Nevada geologic and geomorphic province. 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. For the purpose of this FEIS, the major rivers within the CWE analysis area are the West Branch of the Feather River and the North Fork of the Feather River, as illustrated in Map 3-5.



Map 3-5 Major Rivers

The most extreme relief within the Concow Planning Area is present on the drop off canyon bottoms of the North Fork and West Branch of the Feather River. The highest peaks occur on the ridge between Cirby Creek and Flea Valley creek. The lowest elevations within the area occur near Magalia. The treatment areas of the proposed project lie within the mid- to upper elevations of the watershed area.

The geology of the Concow Planning Area consists of decomposing granite and soils having a high content of sand. Closer to Paradise and Magalia there are soils with a high clay content. Also within in the Analysis Area are serpentine belts. The geomorphology or terrain in the Concow area is a bowl shape (with the Concow Reservoir at the bottom of the bowl) and within the bowl the terrain is benchy (short pitches of steep slope, then a flat bench). Sandy soils typically have high to very high erosion hazard potentials because sand particles tend to be very mobile during overland flow. However, since the terrain is benchy, mass soil movement tends to only occur on the steeper pitches. The distance between benches tends to only be a few hundred feet. As a result gullies and ruts do not form because the velocity of overland flow (water movement) cannot be continuous; instead, the velocity of the water speeds up and slows down. The sand particles move on the steep slopes where a higher velocity of overland flow can occur – this process is sedimentation – then deposit on the benches because the velocity of the overland flow slows down –this is deposition. Rutting and rilling do occur within the burned area, but are caused by legacy roads, temporary roads and skid trails. Vegetation re-growth in most areas is 90–100 percent, as illustrated below. Thus, soil erosion as a result of overland flow is expected to decrease significantly during the 2010 winter.

Figure 3-28 Evidence of increased soil erosion as a result of burned slopes. Photo was taken February 25, 2009.

3.4.4 Hydrology

Watersheds

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 mountain range. The topographic features of the Plumas-Feather River region are relatively subdued in comparison to the higher, more rugged relief of the range further south.

Of the 15 subwatersheds within the CWE analysis area, only two subwatersheds contain a substantial amount of public land. Subwatershed 8 does not include any land administered by the Forest Service. This subwatershed includes Concow Reservoir (managed by Thermalito Irrigation District), private timber land, and residences. It is included in the CWE analysis, because Forest Service land management activities are located within subwatersheds draining into Concow Reservoir. Tables 3-38 and 3-39 contain detailed land ownership information. Map 3-6 illustrates cumulative watershed effects analysis area: subwatersheds in the Concow Planning Area.

Map 3-6 Concow Planning Area Subwatersheds

Table 3-38 Land ownership Acreage and Percentage for CWE analysis area

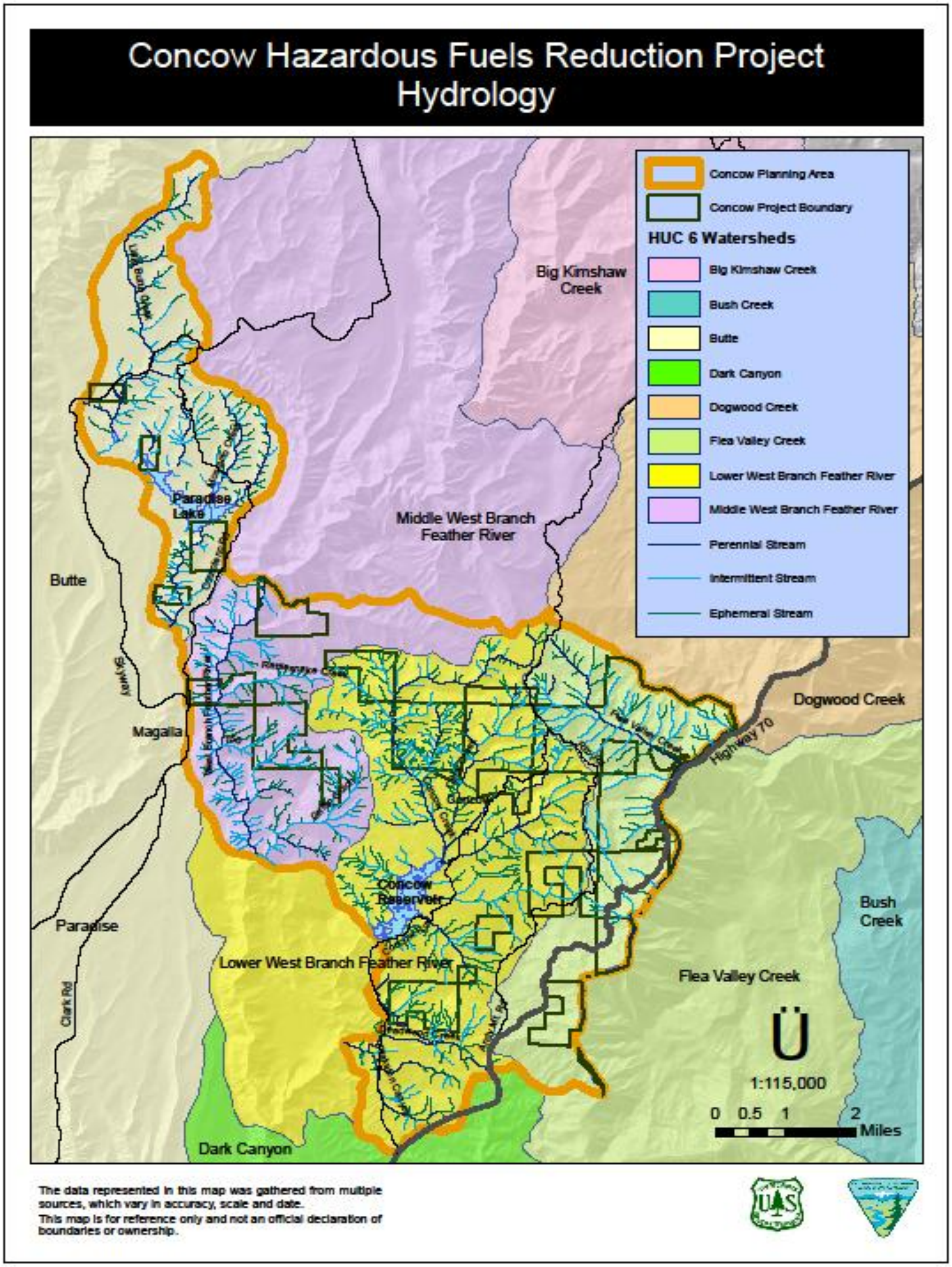
Ownership	Acreage	Percentage of CWE Area
Plumas National Forest	6,490	23.6
Bureau of Land Management	768	2.8
Paradise Irrigation District	501	1.8
Thermalito Irrigation District	465	1.7
Total from above	8,223	29.9
Private	19,291	70.1

Table 3-39 Land Ownership within the CWE Analysis Area by Subwatershed

Subwatershed Number	Percentage of Ownership				
	Paradise Irrigation District	Thermilito Irrigation District	Plumas and Lassen National Forest	Bureau of Land Management	Private Land
1	0	0	3	0	97
2	16	0	11	1	72
3	0	0	16	12	72
4	0	0	34	0	66
5	0	0	40	2	58
6	0	0	7	20	74
7	0	1	28	1	70
8	0	29	0	0	71
9	0	1	14	0	85
10	0	0	15	2	84
11	0	0	28	4	68
12	0	1	21	0	78
13	0	1	28	0	71
14	0	0	68	0	32
15	0	0	59	0	41

Stream Network and Riparian Habitat Conservation Areas

In the CWE analysis area, there are 35 miles of fish-bearing streams, 128 miles of perennial and intermittent non-fish-bearing streams, 100 miles of ephemeral streams, and 534 acres of ponds and lakes. Overall stream density for the CWE analysis area is 6.1 miles per square mile.



Map 3-7 Watersheds and Streams

Table 3-40 Miles of Stream and Stream Density by Subwatershed

Subwatershed Number	Acres of Lakes and Ponds	Fish-Bearing Streams (Miles)	Non-Fish Bearing Perennial and Intermittent Streams (Miles)	Ephemeral Streams (Miles)	Total Channel Network Length (Miles)	Stream Density (Miles/Square Miles)
1	19	4.9	9.9	5.4	20.1	4.3
2	238	1.9	15.4	8.4	25.7	5.3
3	0	5.1	17.3	6.7	29.1	7.5
4	0	0	3.4	3.2	6.6	7.8
5	0	0	3.5	3.3	6.7	6.8
6	0	0	8.2	6	14.2	6.7
7	10	7.1	17.7	17.6	42.4	8.4
8	251	0	4.1	7	11.1	4.9
9	4	1.2	2.8	5	9	6.8
10	2	4.4	8.8	9.6	22.9	5.7
11	1	1.8	7.7	5.9	15.5	7.1
12	2	3.1	5.7	5.7	14.5	6.5
13	7	0	5.4	3.9	9.2	4.8
14	0	3.4	11	8.7	23	6.1
15	0	1.7	6.9	3.4	12	4.3

In the CWE analysis area, there are 9,488 acres of RHCAs or sensitive areas (34 percent of the total CWE analysis area). Table 3-41 includes acres and percent of sensitive areas within each subwatershed. Sensitive areas include lakes, ponds, springs, meadows, streams, and designated RHCA or Stream Management Zone (SMZ) buffers.

Table 3-41 Total Acres and Percent of Sensitive Areas within each Subwatershed

Subwatershed Number	Total Acres of Sensitive Areas	Percent of Sensitive Areas within the Subwatershed
1	799	27
2	1,090	35
3	1,068	43
4	171	31
5	194	31
6	384	28
7	1,484	46
8	586	41
9	274	32
10	806	31
11	489	35
12	522	36
13	324	26
14	838	34
15	458	26

In proposed treatment areas, numerous site visits occurred to assess general stream condition, RHCA and Stream Management Zone land allocations were identified and mapped (see GIS data in the Project Record), and a general assessment of Riparian Management Objectives (RMOs) was performed. Land allocations were based on the HFQLG FRA and the Plumas NF LRMP.

Unburned Area

In the unburned areas intermittent and ephemeral channels are in good condition, except in some areas impacted by legacy roads.

Burned Area

Figure 3-29 Ephemeral Channeling

In the burned area intermittent and ephemeral streams act as sediment catches. The stream substrate is dominate (almost 100 percent) fine particles and the streams are a U shaped gully channel. This is expected in DG areas. No visible down cutting and scouring of the ephemeral and intermittent channels occurred post-fire because of the bench-like topography. Sediment did increase as a result of the fire, however it appears to be within the natural range of variability of the intermittent and ephemeral channels. Within the burned areas there are intermittent and ephemeral channels that have major gulling and streambank erosion as a result of legacy roads. Figure 3-29 shows an ephemeral channeling flowing in response to a precipitation event. There is no visible evidence of major gullying. This photo was taken February 25, 2009 in Section 34, T23N, R4E on Forest Service property

Field observations of the perennial streams in the burned area prior to any precipitation events show the stream banks to be in condition except where impacted by legacy roads and a dominate substrate of cobbles and boulders. Concow Creek, the unnamed tributary to Concow Creek, and Cirby Creek, all have a high degree of vegetative mortality with stream banks devoid of forest canopy and soil cover. Roots from the larger trees function to stabilize streambanks. Alongside the perennial unnamed tributary to Concow Reservoir, within Subwatershed 13, and Flea Valley Creek, fire burned at a low to moderate intensity. In these areas, live tree canopy cover and a high effective soil cover are still present, as tree morality was low and patchy on the hill slopes.

Figure 3-30 Unnamed Tributary

Concow Creek, and the unnamed tributary to Concow Creek, were areas of greatest concern for federal land managers. In these areas, the potential for adverse CWEs linked to potential adverse effects to aquatic species, is greatest; here fire burned hot. For this reason, the Forest Service conducted numerous site visits to assess stream conditions during and after large rain storm events.

Field observations of Concow Creek and the unnamed tributary during the February 25 and March 4, 2009 storm events, indicates major stream banks and slopes remain stable, despite overland water flows. During these storm events, flowing water remained mostly clear, indicating only small quantities of fines were being carried downstream.

Figure 3-31 Unnamed Tributary

Figure 3-30 depicts the unnamed tributary to Concow Creek on private timber land, Section 34, Township 23N, Range 4E. The photo was taken on February 25, 2009. There is some suspended fine sediment, but mostly clear water. Substrate still appears to be cobble/boulder, no visible evidence of increased fines.

Figures 3-31 and 3-32 shows Concow Creek in Section 34, Township 23N, Range 4E, on Forest Service Property. There is some suspended fine sediment, but mostly clear water. Substrate still appears to be cobble/boulder, no evidence of increased fines. On private land just above Concow Reservoir, Concow Creek's gradient flattens out. The suspended fine sediment during the February 25 and March 4 storms settled out in this section. The water was very cloudy, and the stream substrate consisted of a high percentage of fine particles, as shown at left. The increased fine sediment sources are suspected to be mostly the result of the burn on private land with no effective soil cover downstream of Forest Service land, private land logging, and residential activities post-fire.

Figure 3-32 Concow Creek

Figure 3-33 Concow Creek

Figure 3-34 shows there is some suspended fine sediment, but mostly clear water. Substrate still appears to be cobble/boulder, no evidence of increased fines

Figure 3-34 Concow Creek just above Concow Reservoir

Figure 3-34 shows Concow Creek just above Concow Reservoir on a stream crossing in the residential area. The photo was taken on March 4, 2009. This section of creek has a low gradient and more suspended fine sediment compared to the section of Concow Creek on Forest Service property.

A field visit to Concow Creek and the unnamed tributary occurred on July 15, 2009. Concow Creek had a cobble/boulder dominate substrate in the main channel during low flow. However, at the water's edge (within bankfull) was a large quantity of fine sediment (in some locations ankle deep). Stream bank forbs and grasses appeared to be providing soil cover, and oak trees were sprouting. The banks kept stable due to roots and dead standing trees. Overland flow during the 2009 water year did not yield increased visible down cutting. The hill slopes are 90–100 percent vegetative cover; as a result erosion and sedimentation are expected to be significantly decreased compared to the 2009 water year. Erosion and sedimentation are expected to return to normal levels with the next couple of years as vegetation re-growth increases. The fine material currently within the channel is expected to flush out of the channel and deposit into the Concow Reservoir during the first couple of storms in the 2010 water year.

SCI was conducted on the unnamed tributary July 15–16, 2009. This was the first year for the survey and it will be surveyed again in 2010 for post-fire monitoring effects. Survey length was 433 meters (0.3 mile) on Forest Service property. Streambanks were mostly rated as less than 75 percent effective soil cover; soil cover is expected to recover as vegetation re-growth occurs. Pool tail fines were mostly rated as high (i.e., high content of fines at the bottom of pools). In riffles the gravels and fines less than 11 millimeters account for 26 percent, while gravels and cobbles 11 to 256 millimeters comprise 70 percent of substrate. Fine material in decomposing granite areas is not unusual, but the quantities of fine material are above the desired condition for spawning habitat. The fine material currently within the channel is expected to flush out of the channel and deposit into the Concow Reservoir during the first couple of high precipitation rain events within the 2010 water year.

Road Network

The Concow Hazardous Fuels Reduction Project CWE analysis area has a high road density and a high stream crossing density under the existing condition. Road development has occurred for the following reasons: timber harvesting activities on public and private lands, urban development, mining, and OHV recreation. Roads modify drainage networks and accelerate erosion processes, resulting in the alteration of physical processes in streams. These changes can be dramatic and long lasting and can degrade water quality and aquatic habitat (Hagans et al. 1986). Roads can directly affect water quality and aquatic habitat by altering flow, sediment loading, sediment transport and deposition, channel morphology, channel stability, substrate composition, stream temperatures, and riparian conditions in watersheds (Gucinski et al. 2001; Trombulak and Frissell 2000). Common hydrologic problems originating at roads include: rutting and road surface erosion; poorly placed or inadequate stream crossings and surface drains that may fail, divert drainage from its natural course or block passage for fish and other aquatic organisms, and; over-steepened cut-and-fill slopes prone to erosion and mass wasting. Other hydrologic influences from roads identified in the watersheds include:

- Roads that cross areas with slope gradients greater than 60 percent, and roads that cross inner-gorge landslide-prone areas. Slope stability problems and excessive sediment production are associated with roads in these areas.

- 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 and/or culvert and fill failure, and channel instability. Inadequate culverts form barriers to fish migration (see Concow FEIS; Wildlife and Fish BA/BE 2009). Low-water crossings can affect hydrologic regimes and create fish barriers (Forest Service 1991a).

Studies have indicated that as road and stream crossing densities increases, so do negative effects on aquatic habitat parameters and fish populations (Eaglin and Hubert 1993). The road density of a majority of subwatersheds in the CWE analysis area exceeds the desired density for minimizing road impacts on aquatic and riparian environments, and associated terrestrial wildlife habitats. Desired condition is 2 miles of road per square mile, based on the deer summer and winter range (see MIS Report on file in the project record).

Table 3-42 lists miles of road and road densities for the near-stream sensitive areas (all RHCAs identified in the CWE analysis area) and for subwatersheds as a whole. There are 230 miles of roads, including classified National Forest system roads, county and private roads and unclassified roads in the CWE analysis area, and 60 miles of roads within sensitive areas. The road densities for near-stream sensitive areas range from 0.1 to 2.6 miles per square mile, with an average of 1.3 miles per square mile. The road densities of the subwatersheds as a whole range from 2.2 to 8.7 miles per square mile, with an average road density of 5.3 miles per square mile.

Table 3-42 Existing Condition Miles of Road and Road Density by Subwatershed

	Miles of Road		Road Density	
Subwatershed Number	Near-Stream Sensitive Areas	Subwatershed Area (miles/square miles)	Near-Stream Sensitive Areas	Subwatershed Area (miles/square miles)
1	11.1	40.9	2.4	8.7
2	6.5	28.8	1.3	5.9
3	3.0	10.9	0.8	2.8
4	0.5	4.5	0.6	5.3
5	0.1	2.2	0.1	2.2
6	2.2	11.8	1.1	5.6
7	8.6	24.3	1.7	4.8
8	3.5	16.3	1.6	7.3
9	3.5	10.3	2.6	7.8
10	6.7	23.9	1.7	6.0
11	2.7	8.7	1.2	4.0
12	4.5	13.6	2.0	6.1
13	2.3	13.2	1.2	6.8
14	2.0	9.7	0.5	2.5
15	2.5	10.8	0.9	3.9

Meadows

There are no meadows located in the Concow Hazardous Fuels Reduction Project Area. There are few meadows located within the CWE analysis area. These meadows are privately owned and condition is unknown.

Watershed History and Existing Condition of Beneficial Uses and CWEs

Timber harvesting and road construction have been the major recent land disturbing activities in the CWE analysis area. Historic gold mining, unmanaged timber harvesting, grazing of both cattle and sheep, and an increase in fire frequency and magnitude all effected changes on the landscape prior to federal land management.

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 CWE analysis area. Routine road location and logging practices of that time resulted in extensive watershed disturbances 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 CWE analysis area.

The Butte Lighting Complex Fires and subsequent logging on private land have significantly changed the condition of the subwatersheds. Table 3-43 includes the final results of each subwatershed, represented as percent of Threshold of Concern (TOC) for both near-stream sensitive areas (all RHCAs and SMZs within the analysis area) and the subwatershed as a whole, sources of the subwatershed disturbances, and if the subwatershed is approaching or already over the threshold of concern.

The majority of the subwatersheds are over (8) or approaching (4) the threshold of concern under the existing condition. The main reasons are: private land timber harvesting activities, roads, and the Butte Lighting Complex. Those subwatersheds over the threshold of concern due to the Butte Lighting Complex are expected to fall below TOC within 5 years. Typically in this landscape, full vegetation recovery (i.e., soil cover) returns within 5 years post-fire. Those near-stream sensitive areas in subwatersheds that are approaching or over the TOC are in such condition due to the following reasons: private land stream protection zones are smaller than the Forest Plan Standards and Guides, urban development, roads, and effects of the Butte Lighting Complex.

Table 3-43 Existing Condition: Percent of TOC by Subwatershed

Subwatershed Number	Percent of TOC		Under, Over, or Approaching TOC	Percent of the Land base Managed by the Forest Service	Cause of Watershed Disturbance
	Near-Stream	Total			
1	160%	103%	Over	3	Powerlines (>1%), Quarries (>1%), Roads and Landings (30%), Private Land Timber Harvesting (30%), Urban Development (14%), Future Foreseeable (25%)
2	93%	83%	Approaching	12	Roads and Landings (27%), Forest Service Timber Harvesting (>1%), Private Land Timber Harvesting (36%), Urban Development (35%), Future Foreseeable (2%)
3	21%	24%	Under	16	Roads and Landings (35%), Butte Lighting Complex (7%), Forest Service Timber Harvesting (>1%), Private Land Timber Harvesting (9%), Urban Development (48%)
4	55%	54%	Under	34	Roads and Landings (39%), Butte Lighting Complex (1%), Forest Service Timber Harvesting (>1%), Private Land Timber Harvesting (60%)
5	200%	87%	Approaching	40	Roads and Landings (8%), Butte Lighting Complex (39%), Forest Service Timber Harvesting (1%), Private Land Timber Harvesting (52%)
6	358%	167%	Over	7	Roads and Landings (11%), Butte Lighting Complex (29%), BLM Timber Harvesting (11%), Private Land Timber Harvesting (48%), Urban Development (1%)
7	292%	143%	Over	28	Roads and Landings (14%), Butte Lighting Complex (27%), BLM Timber Harvesting (>1%), Private Land Timber Harvesting (57%), Urban Development (2%)
8	234%	169%	Over	0	Roads and Landings (14%), Butte Lighting Complex (9%), Private Land Timber Harvesting (74%), Urban Development (3%)
9	310%	144%	Over	14	Powerlines (>1%), Roads and Landings (18%), Butte Lighting Complex (31%), Private Land Timber Harvesting (50%), Urban Development (1%)
10	181%	78%	Under	14	Powerlines (3%), Roads and Landings (24%), Butte Lighting Complex (27%), Private Land Timber Harvesting (16%), Urban Development (29%)
11	295%	112%	Over	28	Roads and Landings (13%), Butte Lighting Complex (60%), Private Land Timber Harvesting (24%), Urban Development (3%)
12	378%	164%	Over	21	Powerlines (2%), Roads and Landings (13%), Butte Lighting Complex (28%), Private Land Timber Harvesting (57%), Urban Development (1%)
13	332%	162%	Over	28	Powerlines (3%), Roads and Landings (14%), Butte Lighting Complex (18%), Private Land Timber Harvesting (62%), Urban Development (3%)
14	240%	97%	Approaching	68	Powerlines (10%), Quarries (>1%), Railroad (3%), Roads and Landings (9%), Butte Lighting Complex (65%), Private Land Timber Harvesting (13%)
15	172%	80%	Approaching	59	Powerlines (27), Railroad (2%), Roads and Landings (17%), Butte Lighting Complex (28%), Private Land Timber Harvesting (27%)

3.4.5 Air Quality

The project area lies entirely within the Sacramento Valley air basin, in Butte County (see figure 3-35). This air basin is administered by local Air Quality Management District with oversight regulation by the California Air Resources Board (CARB) (see Figure 3-36). Butte County is currently in federal nonattainment status for ozone (a product of volatile organic compounds or nitrogen oxides). The current allocation for volatile organic compounds or nitrogen oxides is 50 tons per year.

The communities of Paradise, Magalia, and Concow are within the project area vicinity. There are numerous smoke sensitive areas in the project vicinity including schools, hospitals, day care and elderly care facilities. The nearest air quality monitoring stations are in Paradise and Chico, California.

Air quality can be severely impacted by particulate matter and other pollutants. For instance, the 2007 Moon light fire on the Plumas National Forests affected air quality more than 100 miles away. Fugitive dust caused by construction and use of unpaved roads can produce PM10 in quantities great enough to impair the visual quality of the air. These effects are localized and can be mitigated by effective dust abatement methods. Dust generated by skidding, loading, and site preparation activities also contributes to fugitive dust. Butte County is currently in attainment for PM10, and efforts to reduce PM10 would be implemented to prevent future health threats.

Butte County is currently in federal nonattainment status for ozone, a product of volatile organic compounds or nitrogen oxides. There are no published emission factors that isolate ozone. Standards have been set, however, for the ozone precursors such as the volatile organic compounds and nitrogen oxides.

3.4.6 Climate

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

The Concow Hazardous Fuels Reduction Project is located on the west side of the Sierra Nevada Mountains, an area characterized by Mediterranean climate, including rainy, wet winters and hot, dry summers. Average annual precipitation from 1957 to 2010 in Paradise, California is 55 inches (Western Region Climate Center, 2010).

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

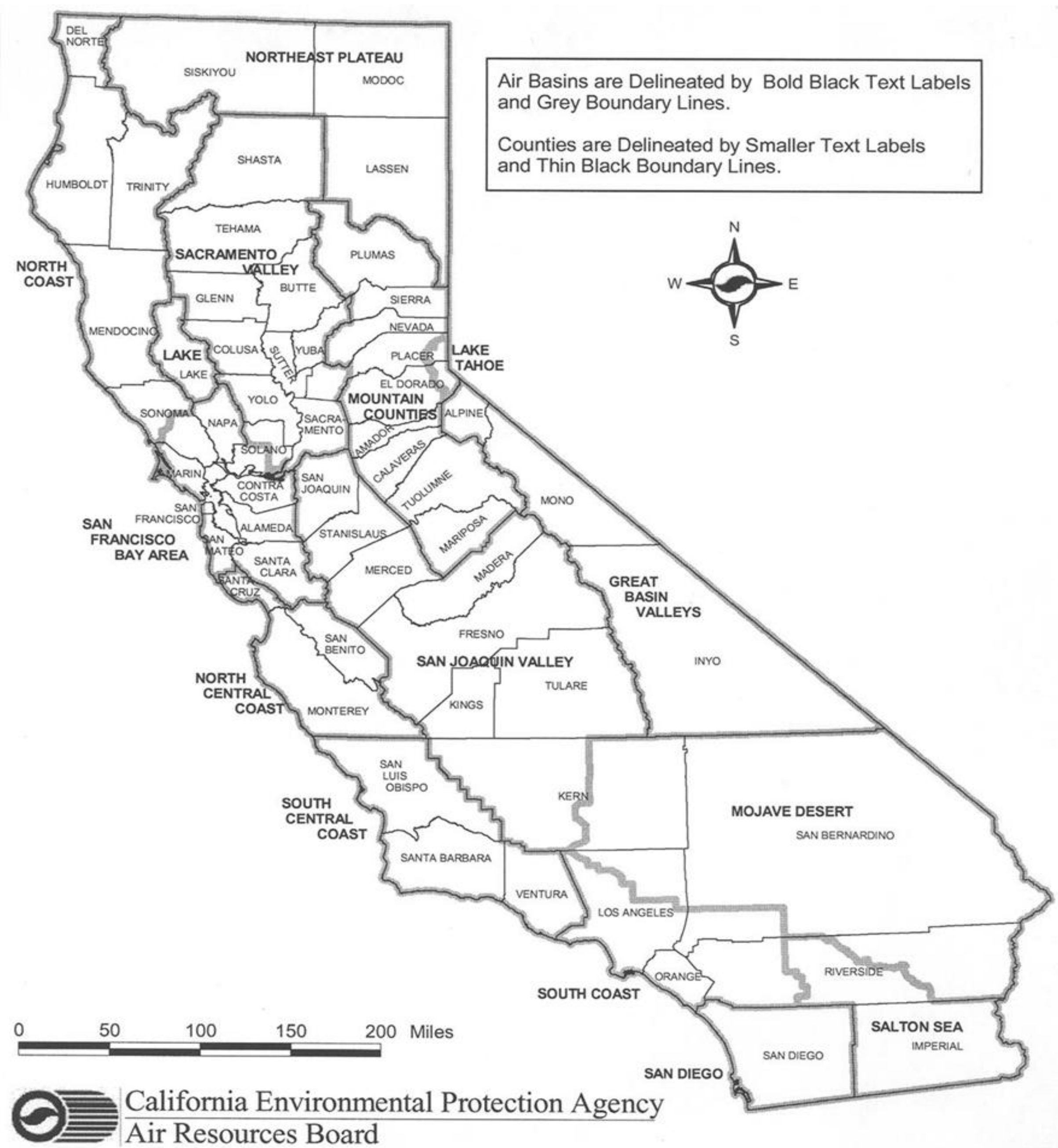


Figure 3-35 California Air Basins and Counties

Figure 3-36 California Air Quality Management Districts and Counties

Chapter 4. Environmental Consequences

4.1 Introduction

Chapter 4 describes the environmental consequences (a. k. a. “effects”) linked with implementing the Proposed Action (Alternative B), the non-commercial funding Alternative to the Proposed Action (Alternative C), and the No-Action (Alternative A), considered and analyzed in detail. The environmental consequences form the scientific and analytical basis for comparison of the alternatives displayed at the end of chapter 2, discussed comprehehensively in this chapter, through compliance with standards set forth in the 1988 Plumas National Forest Land and Resource Management Plan (PNF LRMP), as amended by the 1999 HFQLG final EIS ROD, and as amended by the 2004 SNFPA final supplemental EIS ROD. A summary of mitigation and monitoring required by the National Environmental Policy Act of 1969 (NEPA) and National Forest Management Act (NFMA) of 1976 is provided in appendix A of this FEIS.

The Forest Service Interdisciplinary Team, in cooperation with the Bureau of Land Management resource experts, accomplished the analysis and disclosure of predicted environmental consequences or “effects” for all alternatives considered for public lands under their administrative jurisdiction. The subsequent discussion of effects is based on pertinent background information on the affected environment presented in chapter 3, and supporting appendices to this FEIS.

The predicted effects are discussed primarily in context of the Purpose and Need, Significant Issues identified in chapter 1, and Other Relevant Issues (displayed in chapter 2, Table 2-6. Comparison of Alternatives - Other Relevant Issues). As the Concow Hazardous Fuels Reduction Project would occur within the wildland urban-interface (WUI) around the towns of Paradise, Magalia, Concow and Yankee Hill, this chapter begins by addressing potential social effects, followed by biological effects starting with fire and fuels, and then effects associated with physical environment attributes (i.e., hydrology, soils and air). The environmental consequences section begins by presenting the No-action Alternative, followed by the preferred Proposed Action (Alternative B), followed by the non-commerical funding Alternative to the Proposed Action (Alternative C); with the exception when effects of Alternatives B and C are discussed interchangeably (instances in which effects are identical), or comparatively.

4.2 Analysis Methods

The Healthy Forest Restoration Act (HFRA) directs courts to balance the impact of the short- and long-term effects of undertaking or not undertaking the Proposed Action when weighing the equities of any request for an injunction of an authorized hazardous-fuel-reduction project (Section106(c)(3)). Additionally, HFRA (Section 104(d)(1)) indicates agencies are expected to analyze the effects of failing to take action. The discussion of the No-action Alternative section under each resource topic describes the existing, or baseline condition, against which environmental effects were evaluated, and from which progress toward the desired condition can be measured.

For the purpose of this Final Environmental Impact Statement (FEIS), the analysis was focused at the scale of the Concow Project Area, that is, where actions are proposed on federally-administered public land and direct and indirect consequences are most likely to occur. The geographic spatial and temporal analysis scales described in the following sections is linked to the specific resource issue, typically unique to the alternative and treatment(s) being evaluated.

The depiction of effects varies, depending on the spatial and temporal context in which they are analyzed. For instance, direct effects to terrestrial wildlife may be relevant to nesting habitat at one spatial scale, while direct effects to foraging habitat relates to a larger spatial scale. In the short term, temporal direct effects may be linked to operational risks of injury to animals, whereas indirect effects to animals may be discussed in terms of long- term species viability. Therefore, if pertinent, some effects are discussed in context of multiple scales, over various timeframes.

Direct, indirect and cumulative effects are addressed as either being neutral, beneficial, or adverse. Adverse effects can be irreversible or irretrievable. Irreversible effect refers to a loss of non-renewable resources, such as mineral extraction, heritage (cultural) resources, or to those factors, which are renewable only over long time spans. Irretrievable effect refers to resource losses that are temporary, such as use of renewable natural resources. For example, the operation of removing overcrowded vegetation to reduce hazardous fuels under the action alternatives would be considered an irretrievable effect. However, forest vegetative conditions would return to the current conditions if left unmanaged in the long term. The "Other Required Disclosures" section at the end of chapter 4 includes a summary of effects and Forest Plan consistency; not necessarily identified as issues, and not always quantifiable.

Predictions of fire behavior and vegetative responses to proposed treatments are used to gain insight of complex systems, by estimating likely future effects of federally proposed alternatives considered in detail. However, the results from any modeling process are only approximations of what to expect, depending on whether land management is deferred, or some unique combination of treatment methods are implemented. A comparison of predicted, alternative-based effects can be made, even though the model may lack precision in describing specific ecosystem attributes. Since simulation models are simplifications of reality, and are based on numerous assumptions and variables, their results serve as only one source of information for subsequent decision making. Ultimately, locally-acquired, knowledge of micro-scale environmental conditions and trends provide a context for modeling outputs and expert findings to aid decision makers.

The key terms associated with spatial and temporal 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. A listing of public and private land activities within the Concow Planning Area considered to contribute to cumulative effects is contained in appendix A of this FEIS.

- **Short-term effects** address environmental consequences, which could occur during hazardous fuels treatments or wildland fire events, and/or that arise within two-years of initial Defensible Fuel Profile Zone (DFPZ) treatments.

- **Long-term effects** address environmental consequences, which are delayed, periodic, and/or arise more than two-years after hazardous fuels treatments or wildland fire event.

4.3 Cultural Resources

4.3.1 Introduction

The Feather River Ranger District, Plumas National Forest, is responsible for the stewardship of cultural resources, including a wide-variety of archaeological sites, buildings, structures, objects, and cultural landscapes. The District also manages natural resources which are critical to the continuation of the lifeways of indigenous peoples (these natural resources are referred to as traditional cultural properties).

Preserving for future generations the important cultural, educational and scientific values of these nonrenewable resources is a Forest Service priority. The Proposed Action and Alternatives were designed to ensure compliance with federal historic preservation laws, and management strategies developed to balance resource protection, cultural values and recreation opportunities.

The Congress in 1966 declared it to be our national policy that the federal government "administer federally owned, administered, or controlled prehistoric and historic resources in a spirit of stewardship for the inspiration and benefit of present and future generations" (*National Historic Preservation Act* [NHPA] (16 USC 470-1(3)). Section 106 of the NHPA compels federal agencies to take into account the effect of their undertakings on any site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places (NRHP) (36 Code of Federal Regulations [CFR] 60).

This need was made more explicit when the NHPA was amended in 1980, and Section 110 was added to expand and underscore federal agency responsibility for identifying and protecting historic properties and avoiding unnecessary damage to them. Many historic properties are fragile and once damaged or destroyed they cannot be repaired or replaced.

The following provides a description of potential effects of the Proposed Action (Alternative B) and alternatives to the Proposed Action (No-action Alternative A and action Alternative C) on cultural resources, as well as proposed mitigations measures, where needed.

4.3.2 Analysis Framework: Statute, Regulation, Forest Plan, and Other Direction

Direction relevant and specific to the Proposed Action and the Alternatives as they affect cultural resources includes:

***National Historic Preservation Act* (NHPA).** The Forest Service is directed to identify, evaluate, treat, protect, and manage historic properties by several laws.

The NHPA of 1966, as amended (16 U.S.C. 470 et seq.) provides comprehensive direction to federal agencies about their historic preservation responsibilities.

The NHPA of 1966 performs three actions: 1). It extends the policy in the *Historic Sites Act of 1935* (49 Stat. 666; 16 U.S.C. 461-467) to include resources that are of State and local significance; 2). It expands the NRHP, and; 3). It establishes the Advisory Council on Historic Preservation (ACHP) and State Historic Preservation Officers.

- NHPA Section 106 directs all federal agencies to take into account effects of their undertakings (actions, financial support, and authorizations) on properties included in or eligible for the National Register. The ACHP regulations (36 CFR 800) implement NHPA Section 106. NHPA Section 110 sets inventory, nomination, protection, and preservation responsibilities for federally-owned historic properties.

- Section 106 of the NHPA and the ACHP implementing regulations, *Protection of Historic Properties* (36 CFR Part 800), require that federal agencies take into account the effect of their undertakings on historic properties, and that agencies provide the ACHP with an opportunity to comment on those undertakings.

- Programmatic agreements (36 CFR 800.14(b)) provide alternative procedures for complying with 36 CFR 800; Region 5 has such an agreement. This agreement defines the Area of Potential Effects (36 CFR 800.4(a)(1)) and includes a strategy outlining the requirements for cultural resource inventory, evaluation of historic properties, and effect determinations; it also includes protection and resource management measures that may be used where effects may occur.

- Executive Order 11593: *Protection and Enhancement of the Cultural Environment*, issued May 13, 1971, directs federal agencies to inventory cultural resources under their jurisdiction, to nominate to the NRHP all federally owned properties that meet the criteria, to use due caution until the inventory and nomination processes are completed, and to assure that federal plans and programs contribute to preservation and enhancement of non-federally owned properties.

4.3.3 Effects Analysis Methodology

Geographic Scope of Analysis:

The analysis of potential effects to cultural resources associated is presented from the perspective of each alternative as a whole. The geographic analysis area for cultural resources includes the Concow Project Area (public lands only). The location of historic properties is the unit of spatial analysis used to consider direct, indirect and cumulative effects. To date, no sites have been identified which required analysis of the setting beyond the historic property's location (such as traditional cultural properties).

Assumptions specific to cultural resources analysis:

1. Existing log and biomass landings proposed to expedite operations, and roads proposed as haul routes, have already affected historic properties within route/area prisms.

2. The Proposed Action (Alternative B) allows for using an aerial (helicopter) tree removal system, in the event private land road access is denied, thereby making the preferred ground based (feller buncher) method infeasible. These two proposed activities are analyzed together, since the potential risk for adverse effects to cultural properties would be identical.

3. The four sites that were found not to be eligible for the *National Historic Preservation Act* (NRHP) were released from management, and as such would not be protected during this project.

4. The one site found eligible for the NRHP would be protected in perpetuity for its archaeological values, and as such protected from all project activities.

5. Sites that have not been evaluated for National Register eligibility shall be considered potentially eligible, and would therefore be protected until such time as an eligibility determination is made.

6. The greater the predicted flame length, the higher likelihood cultural resources would be displaced and damaged by scorching, heat and crushing.

Data Sources:

Several types of data were compiled to provide the basis for understanding the nature and extent of cultural resources within the Project Area, and the potential effects of proposed hazardous fuels reduction and vegetative forest health treatments on these resources:

- Archival and literature sources have been reviewed and data from Forest Service cultural resource records, maps and geographic information system (GIS) layers compiled to provide a prehistoric and historic overview of the geographic region, identify major historical themes and events, and provide information on previous archaeological inventories, known site locations, and the likelihood of unidentified resources within the project area.

- All areas which are both proposed for treatment under the action alternatives and for which there is no previous survey coverage, were inventoried. Data collection was focused on characterizing the type, nature and severity of effects. The project area was surveyed on eight occasions, beginning in 1980, with the most recent survey occurring in 2008. The combined coverage of these surveys covers all treatment areas and areas of potential ground disturbing effects (such as landings, water holes and logging systems) within the Project Area.

- The archaeological surveys located thirty-one sites, although not all of these sites are located in or near proposed treatment areas. Fifteen of the sites are historic, twelve are prehistoric and four are multi-component sites (multi-component sites contain both historic and prehistoric artifacts and or features.

Basis for Analysis/Cultural Resources Indicators:

All cultural resources identified within the Area of Potential Effects are considered historic properties, as defined by the *National Historic Preservation Act* (NHPA; 36 CFR 60), for purposes of this undertaking, unless they have already been determined not eligible in consultation with the State Historic Preservation Office or through other agreed upon procedures (36 CFR 60.4; 36 CFR 800). Site characteristics identified in the NHPA and the following NRHP eligibility criteria form the basis for effects analysis:

- Criterion (c) includes resources that embody distinctive characteristics of a type, period, or method of construction, that represent the work of a master, and that possess high artistic values, that represent a significant and distinguishable entity whose components may lack individual distinction (e.g., historic structures), and;

- Criterion (d) includes resources that have yielded, or may be likely to yield, information important in prehistory or history (e.g., prehistoric and historic archaeological sites) (36 CFR 60.4(a-d).

Integrity measures are based on effects to important site characteristics, including location, design, setting, materials, workmanship, feeling and/or association (36 CFR 800.5(a) (1).

The following cultural resources indicators were used to assess effects:

Degree to which the integrity of historic property values are diminished.

Number of historic properties within proposed treatment areas.

For purposes of this analysis, cultural resources effects are defined as follows:

Direct Effect is or could be caused by proposed hazardous fuels reduction and vegetative treatments or the consequences of such action, including physical damage resulting from tree felling and use of heavy equipment (crushing and/or displacement) and prescribed burning (scorching and cracking caused by excessive heat).

Indirect Effect to sensitive cultural resources could occur, particularly where artifacts lie in proximity to proposed treatment areas.

Cultural Resources Methodology by Action

1. **Direct/indirect effects of proposed DFPZ hazardous fuels reduction and vegetative forest health treatments to cultural resources.**

Considerations: The establishment and maintenance of proposed Defensible Fuel Profile Zones (DFPZ) in the project area has the potential for both adverse and beneficial effects to cultural resources in both the short term and long term.

Short-term timeframe: 1 year.

Spatial boundary: Concow Project Area.

Indicator(s): Number of historic properties within proposed treatment areas at risk from fuels reduction and vegetative treatments, and; number of historic properties in proximity to proposed treatment areas.

Long-term timeframe: 20 years.

Spatial boundary: Concow Project Area.

Indicator: Potential risk for adverse effects to cultural sites and artifacts; particularly from wildfire disturbance.

Methodology: Predicted modeled fire behavior as described in this FEIS (chapter 4: Fire and Fuels) is used as a relative index of wildfire risk to artifacts in relationship to spatially overlapping archaeological sites in the Project area.

Rationale: The *National Environmental Policy Act* (NEPA) requires the federal government to preserve important historic and cultural aspects of our national heritage. To accomplish this, federal agencies utilize the Section 106 process associated with the NHPA. The NHPA sets forth a framework for identifying and evaluating historic properties, and assessing effects to these properties. This process has been codified in 36 CFR 800. In order to help streamline the above mentioned regulatory framework the Forest Service in California has developed a Programmatic Agreement between the California State Historic Preservation Office and the ACHP (USFS 2001).

2. **Cumulative effects of proposed DFPZ hazardous fuels reduction and vegetative forest health treatments to cultural resources.**

Considerations: The establishment and maintenance of proposed Defensible Fuel Profile Zones (DFPZ) in the project area has the potential for adverse effects on cultural resources in the long term.

Short-term timeframe: not applicable; cumulative effects analysis would be done only for the long-term time frame.

Long-term timeframe: 20 years.

Spatial boundary: Concow Project Area.

Indicator(s): Degree to which the integrity of historic property values are diminished, related to: location, design, setting, materials, workmanship, feeling, or association.

Methodology: Use existing data from cultural resource site atlas, historic archives, maps, site record files, and GIS spatial layers, and information obtained from archaeological inventories of the project area.

Rationale: Section 106 process associated with the *National Historic Preservation Act* (NHPA), codified in 36 CFR 800, and compliance with the Programmatic Agreement between the California State Historic Preservation Office and the ACHP (USFS 2001).

4.3.4 Environmental Consequences

The three alternatives are discussed below. This discussion will take into account all direct, indirect and cumulative impacts to cultural resources.

Alternative A – No-action

Direct, Indirect and Cumulative Effects to Cultural Resources

The archaeological surveys within the project area have recorded thirty-one sites, although not all these sites are located in or near project units. Fifteen of the sites are historic, twelve are prehistoric and four are multi-component sites (multi-component sites contain both historic and prehistoric artifacts and or features). Five of these sites have been evaluated for the National Register of Historic Places (NRHP). Sites FS 05115400514, 05115400515, 05115400517 and 05115400519 were assessed to be Not Eligible for NRHP (Nilsson, E. et. al.1999). One site FS 05115400518 was assessed to be Eligible for NRHP (Nilsson, E. et. al.1999).

This alternative will not change any of the existing conditions as they occur today. There would be no direct impacts or indirect impacts to cultural resources under this alternative. This is due to the fact that that there would be no ground disturbing activity. The cumulative effect of this alternative would be one of a slightly increased risk of a wildfire due to fuel build up in the project area. Wildfires can have multiple effects to cultural resources. They can lead to erosion problems due to reduced vegetation and loose burned soils. Cultural features made from combustible materials can burn, while features made from material such as rock, can crack and even explode due to the extreme heat that wildfires are capable of producing. Artifacts at sites can also be affected by fire, obsidian artifacts can loose hydration rings and can even melt, bone and wood artifacts burn, glass and ceramic artifacts explode or melt. Some metal artifacts will melt or fall apart (Solomon 2000 and 2002). While there are no direct and indirect impacts of this alternative, the cumulative impact of a slightly increased fir risk can be seen as a negative impact to cultural resources.

Alternative B and C

Direct, Indirect and Cumulative Effects to Cultural Resources

The Alternative B has two options in one unit, one option would be logging using helicopters the other using ground based equipment. These two are being analyzed together since the risk is the same to cultural properties in this project. There are a variety of risks associated with the proposed timber harvest, mastication, hand cutting of trees, shrubs, pile burning and finally underburning.

The direct and indirect effects of using equipment for timber harvest and mastication is that the cultural resources can be damage if equipment is used within the boundaries of these sites. The burning of piles can also damage cultural resources if the piles are created and burned on sites. Underburing can do the same amount of damage as a wildfire if allowed to be more than a low intensity burn (Solomon 2000 and 2002). These direct and indirect effects can be mitigated by the standard resource protection measures (USDA 2001). If these mitigation measures are followed there would be no direct or indirect effects to cultural resources.

The cumulative effect of Alternative B would be a slightly reduced wildfire risk. This would be considered positive since it is decreasing to chances of a wildfire and the damage that they do to sites.

Alternative C would have similar direct, indirect and cumulative effects as Alternative B, with the exception Alternative C would reduce wildfire hazards to a lesser degree.

Under these action alternatives, cultural resources would be protected from all project activities using the standard resource protection measures set forward in the Regional 106 Compliance Programmatic Agreement, (USDA 2001). Although the four sites that were found not to be eligible for the National Register of Historic Places (NRHP) were released from management, and as such, would not be protected during this project. The one site found eligible for the NRHP will be protected in perpetuity for its archaeological values and as such protected from all project activities. Sites that have not been evaluated for National Register eligibility shall be considered potentially eligible and therefore would be protected until such time as an eligibility determination is made. This leaves twenty-seven eligible and potentially eligible sites would be afforded protection using the standard resource measures.

Sites within the area of potential effect (see table 4-1) will be afforded protection using the following standard resource protection measures set forward in the Regional 106 Compliance Programmatic Agreement, (USDA 2001).

- Flag and avoidance of sites.
- A map showing the location of all sites in the project area will be provided to the Forest Service project manager.
- Sites will be monitored during and after the project.
- If additional heritage resources are identified during project activities, all work shall stop in that area until the District Archaeologist assesses the situation.
- Historic sites within burn units must have fire lines placed around them so they are not burnt over.

Table 4-1 Treatment areas with known cultural resources within or near them

Treatment Area Number	Number of Archaeological Sites within or near the treatment area
1001	1
1007	4
1016	1
1027	1
1028	1
1035	4
1036	1
1037	1
1042	1
1043	1
1044	1
1052	1
1064	1
1069	2
1076	1
1078	1
1086	1
1087	1

4.3.5 Summary of Effects Analysis Across All Alternatives

The overall effects of the two alternatives are about the same. For alternative A, there would be no direct or indirect effects but a slightly negative cumulative effect due to a slightly increased probability of a wildfire occurring in the project area. For alternative B there is a greater risk of direct and indirect effects due to the possibility that cultural resources might be damaged. This probability of damaged can be eliminated by the use of standard resource protection measures (USDA 2001). The cumulative effect under Alternative B is a slightly reduced likely hood of the cultural resources being damaged by wildfire.

4.4 Recreation, Visuals, Non-federal Land Uses (Minerals & Other Special Uses)

4.4.1 Introduction

This section discusses the extent to which alternatives respond to social land use management direction described in the amended 1988 Plumas National Forest Land and Resource Management Plan (PNF LRMP), and the implementing regulations of the National Forest Management Act (NFMA).

The NFMA requires the provision of a broad spectrum of forest and rangeland-related outdoor recreation opportunities that respond to current and anticipated user demands. The PNF LRMP satisfies this requirement to provide opportunities through its use of a variety of planning tools including but not limited to the Recreation Opportunity Spectrum (ROS), the Recreation Facility Analysis (RFA) where facilities were compared to the forest's recreation niche, and trends data supplied by National Visitor Use Monitoring Surveys (NVUM) conducted every 5 years.

Scenery management direction is provided by Visual Quality Objectives (VQOs), classification systems and the more recently developed Scenery Management System (SMS). Scenic quality is a major contributor to a community and forest sense of place or identity. According to the publication, Landscape Aesthetics: Scenery Management, "SMS is a tool for integrating the benefits, values, desires and preferences regarding aesthetics and scenery for all levels of land management planning." The goal of SMS is to create and maintain landscapes that have high scenic diversity, harmony and unity for the benefit of society. The use of SMS aids in the establishment of overall resource objectives and goals to ensure high quality scenery for future generations.

Direction is also provided for land use authorizations in Forest Service 2700 Series Manuals and Handbooks. Land use authorizations may be granted to private parties, commercial entities, or governmental agencies for the use of National Forest Lands. Such uses include communications sites, water lines, hydropower generation sites, roads and driveways, electrical and communications transmission and distribution lines, etc.

The ROS system is the basic inventory that was used to create recreation-opportunity "zoning" in the PNF LRMP to meet NFMA requirements. The Scenic Management System (SMS), which replaced Visual Quality Objectives (VQOs), provides a systematic approach for determining the relative value and importance of scenery, associated outdoor recreation opportunities and ecosystem management activities on National Forest System (NFS) land.

Prior to the 2008 Butte Lightning Complex fires, the land managed by the Forest Service and Bureau of Land Management within the analysis area contained a full spectrum of hardwoods, conifers, shrubs and forbes including small and medium to large trees, with a subordinate diversity of seedlings, saplings and pole size trees. High intensity wildfires drastically altered the forest condition and thus the long term scenic character, integrity and stability, as well as dispersed recreation opportunities on those lands immediately adjacent the private properties and communities affected by the wildfire.

4.4.2 Analysis Framework: Statute, Regulation, Forest Plan, and Other Direction

The 1988 LRMP established objectives, goals, and policies for the management of the Forest (p. 4-3 through 4-11 and 4-13 through 4-20). However, due to the degree of landscape disturbance caused by the wildfire, the scenic direction is in effect null and void.

Relevant standard and guideline in the Concow Project Area is:

- Provide for a variety of forest related recreation, and coordinate recreation with other resource use through the ROS system.

4.4.3 Effects Analysis Methodology

Geographic Scope of Analysis

The analysis area for analyzing direct, indirect and cumulative effects to recreation opportunities and facilities, scenery, lands special uses and mineral resource authorizations is the boundary of the Concow Project Area; the DFPZ treatment areas and those areas outside the project area that are immediately affected by project area work, for example special land use authorizations that span the boundary between inside and outside the treatment area..

The analysis addresses potential effects to social values, community dependencies and land use activities:

- Changes to the scenic character, scenic integrity and scenic stability from the loss of intact forest vegetation due to the wildfires,
- Changes in dispersed recreation opportunities due to the loss of this intact forest as well as the short term management activities proposed in the three alternatives;
- Changes in localized quality of life considerations for adjacent property owners and communities (i.e., noise from management operation activities, congestion from shared roads),
- Potential for user conflicts and increased safety risks primarily associated with road access, management activities, increased road traffic and Danger Treedanger trees
- Impacts to land use authorizations (i.e. infrastructure, communications, driveways, etc.); and
- Impacts to minerals under authorized mining claims.

Assumptions specific to recreation, scenery, lands, and mineral resources analysis:

- There are no system trails within or adjacent the project boundary.
- There are no proposed OHV routes within or adjacent the project area.
- No developed recreation facilities exist within the project area. Only dispersed recreation opportunities are considered in the analysis.

- No active minerals claims, notices of intent or plans of operation within the project boundary.
- There is an authorized communication site located on Flea Mountain within the project area.
- There are numerous electrical transmission and distribution lines throughout the project area.
- There are numerous road rights of way that provide access to private parcels through public lands within the project area.
- There are no public water systems within the project area.
- The scenic character has been highly modified, and new desired characteristics will need to be articulated. Scenic integrity has been lost and the scenic stability is still unstable.

Data Sources

Several types of data were compiled to provide the basis for understanding the human environment and land uses within the Concow Project Area, and the potential effects of establishing and maintaining Defensible Fuel Profile Zones (DFPZs) on natural resource-dependent social features:

PNF LRMP for distribution of ROS and SMS (VQO) classes.

Data from Forest Service special use requests and Feather River Ranger District resource records and permits, trails and dispersed recreation site topographic maps.

BLM and Forest Service records for active mining claims, notices of intent and plans of operation.

Spatial geographic information system (GIS) data layers including CWHR (vegetative types), Basal Area Mortality, Burn Severity, National Forest System (NFS) land motorized and non-motorized trails overlaid with alternatives proposed under the PNF Travel Management (Subpart B) FEIS, transportation system, and Butte County tax lot records.

Basis for Analysis/Land Use Resource Indicators:

The establishment and maintenance of proposed Defensible Fuel Profile Zones (DFPZs) in the project area has the potential for both adverse and beneficial effects on scenic, recreation and special use resources in both the short term and long term. Direct effects to dispersed recreational use, quality of life, shifts in special forest uses and user conflicts were evaluated in relationship to spatially overlapping proposed DFPZs and PNF LRMP land allocations in the short term.

Indirect effects, as defined by the Council of Environmental Quality (CEQ) regulations, are those impacts which occur later in time or are farther removed in distance, but are still reasonable foreseeable (40 CFR 1508.8). The evaluation of indirect effects address potential long term shifts in scenic quality, as establishing and maintaining proposed DFPZs would shift vegetative species and forest stand structure trends.

A listing of past, present, and foreseeable future action considered in the cumulative effects analysis has been provided. 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, scenery, lands, and minerals in the project area. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected visual quality and recreational opportunities and might contribute to cumulative effects.

The cumulative effects analysis considered combined past, present, and reasonably foreseeable future land uses, large (> 50 acre) wildfire events, the capacity of natural resources to provide social amenities, and trends in visitor and non-federal special uses. From a spatial perspective, cumulative effects are primarily linked to wildland urban-interface population dynamics and trends in user movements (habits).

Management decisions related to establishment and maintenance of Defensible Fuel Profile Zones (DFPZs) can further affect:

- Scenic character (burned and unburned) by the reduction of percent of large trees remaining, the reduction in canopy and ladder fuels, number of remaining dead snags, relative openness of the forest and ability to see into the middleground, obvious modifications to the foreground, visible fire scars;
- Scenic integrity and preservation of desired scenic characteristics;
- Scenic stability and potential for additional wildfires;
- Changes in dispersed recreation opportunity and increased use conflicts due to shared access routes, management activities, including use of prescribed fire, and modified recreation settings;
- Frequency of incidents of unmanaged, dispersed recreation activity due to changes in the physical landscape and reduction of natural barriers;
- Increases in incidents of illegal trash dumping, vandalism or trespass and;
- Perceived loss of quality of life due to loss of quality forest scenic background, increased dust, noise and road congestion from management activities, smoke from prescribed fire operations.

The following land use resources indicators were used to assess effects:

- Recreation Opportunity Spectrum (ROS) settings and development scale;
- Scenic quality as defined by the Scenic Management System (SMS) that replaced the VQO system as adopted by the 1988 LRMP;
- Impacts to other recreation opportunities such as access to roads, streams, lakes and the general forest
- Presence of special uses of public land natural resources by private parties, individuals or commercial entities spatially overlapping proposed DFPZ treatment areas.

Land Use Resources Methodology by Action

1. **Direct/indirect and cumulative effects of proposed DFPZ hazardous fuels reduction and vegetative forest health treatments to the human environment and non-federal land uses.**

Considerations: The establishment and maintenance of proposed Defensible Fuel Profile Zones (DFPZ) in the project area has the potential for both adverse and beneficial effects on the human environment and non-federal land uses in both the short term and long term.

Short-term timeframe: 1-5 years.

Spatial boundary: Proposed DFPZ treatment areas, Concow Project Area including burned (32 acres BLM administered lands) and unburned areas.

Indicator(s): (1) ROS settings and development scale, (2) Scenic Character, (3) Scenic Integrity, (4) Scenic stability, (5) Changes in forest access, , and (6) Spatial overlap of DFPZ treatment areas and known natural resource uses, i.e. special use authorizations.

Long-term timeframe: 5 years, 100 years.

Spatial boundary: Proposed DFPZ treatment areas, Concow Project Area including burned (32 acres BLM administered lands) and unburned areas.

Indicator(s): ROS settings and development scale, (2) Scenic Character, (3) Scenic Integrity, (4) Scenic stability, (5) Changes in forest access, , and (6) Spatial overlap of DFPZ treatment areas and known natural resource uses, i.e. special use authorizations.

Methodology: The methodology used for analysis purposes evaluates the known uses and indicators as compared to the potential for change over time and space, thus the analysis is both temporal and spatial. The methodology further analyzes these indicators against the length of the temporal effects (ie. Short term).

Rationale: The ROS classes for the project area are defined and mapped in the PNF LRMP as: 1). Approximately 50% as Roaded Modified, a subclass of Roaded Natural; 2). approximately 40% as Rural, and; 3). approximately 10% as Roaded Natural (refer to Tables 5, 6, and 7 from USDA, Forest Service ROS Users Guide for definitions linked to evidence of Humans Criteria, Social Setting Criteria, and Managerial Setting Criteria).

The VQOs describe different degrees of acceptable alteration of the natural landscape. The VQO classes have been designated for the project area and are defined and mapped in the PNF LRMP: 1). Approximately 30% is classified as Partial Retention; 2). Approximately 70% is classified as Modification. Activities should appear as a natural occurrence when viewed in the foreground or middleground.

4.4.4 Environmental Consequences

Alternative A – No-action

Direct, Indirect and Cumulative Effects to the Human Environmental and Land Use Resources

The PNF LRMP characterized the ecological and social conditions in the Concow Project Area and provided a context for future forest management decisions in the area. The natural evolution of the vegetative component, including the potential for large and intense wildfire across the landscape, would continue to change the scenic qualities of the area; inherent natural processes influencing shifts in visual character, quality of life, recreational and special uses.

Since the No-action alternative (Alternative A) would not initiate human-caused changes linked to the establishment and maintenance of DFPZs, there would be no potential for contributing to direct, indirect or cumulative effects to the existing social amenities associated with public land natural resources.

Alternatives B and C

Direct, Indirect and Cumulative Effects to the Human Environmental and Land Use Resources

Scenic Resources

Proposed treatments are consistent with the Partial Retention, and Modification VQOs assigned to the treatment areas, as designated in the PNF LRMP. Following implementation of action alternatives there would be some improvement to VQOs from the fire affected existing conditions. In unburned areas, 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.

Within DFPZs in the burned areas, the Proposed Action (Alternative B) would provide for a quicker visual recovery due to: 1). Removal of dead standing debris; 2). Surface fuels reduction that would act to diversify vegetative structure, and; 3). Oak pruning or release and spot planting of Douglas-fir, ponderosa and sugar pine that would contribute to visual complexity (unique shape and color) in oak dominated woodlands. Alternative C would provide a minor improvement to scenic quality, due to removal of less than 11 inch at DBH dead standing debris, roadside pruning of ladder fuels and surface fuels reduction.

Cumulative effects of the action alternatives B or C on the ROS and VQOs in the project area are expected to be negligible because establishing and maintaining DFPZs would be:

- Consistent with and would provide for a more rapid recovery of scenic amenities desired under the designated VQO s in the PNF LRMP, and;
- Beneficial to the human environment, particularly where moderate and high severity fire behavior in 2008 drastically altered visual quality for the long term; leaving recreation, scenery, lands, and minerals opportunities and use of the Concow Project Area in a highly disturbed state.

Recreational Uses (Roads, Trails, Picnic Areas)

As neither action alternative would add to the National Forest System (NFS) land or Bureau of Land Management (BLM) transportation system, the number of miles of access roads available to the public would not be affected. The greatest impact to dispersed recreational use would be short term increases in traffic-related disturbances (dust, noise, delays) during operations.

There are no NFS land or BLM trails within the Concow Project Area; therefore there would no effect to dispersed non-motorized or OHV motorized recreational use. There are no additional, new miles of motorized trails identified in Alternative A of the PNF OHV Travel Management FEIS overlapping several proposed DFPZs dominated by fields of shrubs.

Proposed Defensible Fuel Profile Zone (DFPZ) treatments under action alternatives B and C may temporarily restrict access to dispersed hiking, or temporarily affect the visual character of the roads and roadside scenic views. Since there would be no direct effects to these resources, and indirect effects would be minor and associated with short term increases in traffic, cumulative effects of the action alternatives B or C on road or trail systems within the Concow Project Area are expected to be negligible on dispersed hiking, picnicking and recreational driving.

Non-Federal Land Uses (SUAs): Mineral Operations (Notices of Intents and Plan of Operations)

Action alternatives B and C would have little impact to mineral operations in the area. The treatment types proposed by the Concow project do not conflict with the known mineral claims within the Concow Project Area. There are no present or foreseeable future land and mineral use projects on public land within the Concow Project Area to potentially contribute to cumulative effects.

4.4.5 Summary of Effects Analysis Across All Alternatives

Past vegetation management activities throughout the project area are in varying stages of recovery. Activities that occurred near sensitive travel routes, while often still evident, have recovered to a point where they dominate the landscape to a lesser degree than in the past. There are few cumulative effects associated with alternative A beyond the modest increase in use anticipated by the LRMP, especially recreation for the Concow area. There are few expected cumulative effects on visual resources, recreational, minerals or lands opportunities under action alternatives B or C.

Past, present, and foreseeable future actions either have not contributed or are not expected to contribute to the adverse impacts on these resources in the project area that could add to effects of the Concow proposed alternatives. All ROS and VQOs currently assigned to the project area would be met following vegetation and transportation management treatments. Action alternatives B and C would not exclude any of the existing recreational uses. Contractual provisions would be in place to mitigate impacts by protecting land use improvements. Known minerals operations are not anticipated to be affected by the DFPZ treatment types proposed within the Concow Project Area.

4.5 Socioeconomics

4.5.1 Introduction

Economic stability and community wellbeing are affected by local and regional social and economic factors, and by national and global conditions. Employment, worker income, and wood product sales resulting from federal land management activities interact to influence socioeconomics. The *Herger-Feinstein Quincy Library Group* (HFQLG) *Forest Recovery Act* pilot project is designed to test and demonstrate the effectiveness of certain fuels and vegetation management activities, such as Defensible Fuel Profile Zones (DFPZs) as proposed under Alternatives B and C, to achieve economic, ecologic and fuels reduction objectives.

One of the most direct impacts the Forest Service and Bureau of Land Management have on economic stability is a result of harvesting timber from Federally-administered land, as one tool to accomplish legislated management objectives. The harvest of timber not only contributes a flow of products needed to sustain the wood products and the biomass energy industries, it provides employment opportunities in sawmilling and wood processing, trucking, logging and roadwork sectors for skilled, semi-skilled and unskilled workers.

Dollars spent on employment income and sales in the wood products industry within the HFQLG Pilot Project can affect regional economies, as businesses and employees spend the money they receive at other regional businesses or to purchase final goods. Although some economic effects are dispersed over a broad area, this analysis focuses on where there is the greatest potential for impacts, considering Butte, Plumas, Lassen, Sierra, and Yuba Counties. For the purpose of the FEIS, the economic analysis analyzes those revenues and operational costs associated with implementing integrated DFPZ and vegetative forest health treatments within the Concow Project Area is focused in Butte County, relative to differences in financial efficiency (i.e., relevant revenues and costs) between the proposed alternatives.

4.5.2 Analysis Framework: Statute, Regulation, Forest Plan, and Other Direction

Direction relevant and specific to the Proposed Action and the Alternatives as they affect socioeconomics includes:

The 2004 Sierra Nevada Forest Plan Amendment, Final Supplemental Environmental Impact Statement (SNFPA FSEIS). The Forest Service is directed to achieve the goal of commodity production associated with the *HFQLG Forest Recovery Act*, to address the need to retain industry infrastructure by allowing wood by-products to be generated from integrated fuels and vegetation treatments. It acknowledges that the Forest Service has a role to play in providing a wood supply for local manufacturers and sustaining a part of the employment base in rural communities, and to offset the cost of Defensible Fuel Profile Zones (DFPZ) treatments when feasible. The removal of Forest by-products (dead trees) may be conducted to recover economic value of this biomass material and to support objectives for reducing hazardous fuels, improving forest health, re-introducing fire, and re-establishing forested conditions (FSEIS ROD pages 52 - 53).

- Design projects to recover the value of timber killed by a wildfire disturbance including minimizing costs within site-specific constraints and remove material that local managers determine is not needed for long-term resource recovery needs (Standard and Guideline 13).

- Design projects to manage the development of fuel profiles over time, so activities: 1). Remove sufficient standing and activity generate material to balance short-term and long term surface fuel loading, and; 2) Protect remnant old forest structure (surviving large trees, snags, and large logs) from high severity re-burns or other severe disturbance events in the future (Standard and Guideline 13).

- Design projects to protect and maintain critical wildlife habitat, so activities: 1). Avoid areas where forest vegetation is still largely intact; 2). Provide for sufficient quantities of large snags; 3). Maintain existing large woody material as needed; 4) Provide for additional large woody material and ground cover as needed; 5) Accelerate development of mature forest habitat through reforestation and other cultural means, and; 6) Provide for a mix of seral stages over time (Standard and Guideline 13).

- Design projects to reduce potential soil erosion and the loss of soil productivity caused by loss of vegetation and ground cover, so activities: 1). Provide for adequate soil cover in the short term; 2). Accelerate the dispersal of coarse woody debris; 3). Reduce the potential impacts of the fire on water quality, and; 4). Carefully plan restoration/salvage activities to minimize additional short term effects (Standard and Guideline 13).

- In post fire restoration projects for large catastrophic fires (contiguous blocks of moderate to high fire lethality of 1,000 acres or more), generally do not conduct salvage harvest in at least 10 percent of the total area affected by fire (Standard and Guideline 14). Use the best available information for identifying dead trees for salvage purposes as developed by the Pacific Southwest Region Forest Health Protection Staff (Standard and Guideline 15).

4.5.3 Effects Analysis Methodology

Geographic Scope of Analysis

The analysis of potential effects to community stability is presented from the perspective of each alternative as a whole. 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). The economic goals for the project as a whole across the Pilot Project area are discussed in the HFQLG FEIS. 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 Concow Project is part of the HFQLG Pilot Project and this economic analysis will be based on the incremental effect of the Concow Project within the HFQLG Pilot Project region.

Assumptions specific to socioeconomic resources analysis:

- Most products from HFQLG projects will be processed locally due to high hauling costs of products and equipment. Likewise, it is also assumed most forestry-related employment would be derived from Butte County.
- The commercial sale of forest by-products (biomass and timber sale revenues) and service contract employment would complement all other HFQLG-funded projects across the forest.
- The Proposed Action (Alternative B) permits using an aerial (helicopter) tree removal system, in the event private land road access is denied and required permits are not secured.
- The two employment sectors most related to forest planning processes are the timber industry and tourism.
- In computing the costs of ground-based alternative, it was assumed a whole-tree logging method would be used. The reasoning for this method is derived from the goal of the project to reduce on-site hazardous fuel levels.

Data Sources:

Several types of data were compiled to provide the basis for understanding the nature and extent of potential socioeconomic effects linked to proposed hazardous fuels reduction and vegetative forest health treatments. 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:

Timber harvest values used in this assessment were based on the California State Board of Equalization, Timber Harvest Values, beginning January 1, 2010 through June 30, 2010.
Harvest costs and road improvement costs were developed from the latest timber sale appraisals values.

Surface fuels treatment (mastication, 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.

Basis for Analysis/Socioeconomic Indicators:

The basis for this analysis is to estimate government expenditures and revenues, as well as monetary impacts on local communities. In addition to the direct employment that would result from forestry related operations under Alternative B, there would be some additional benefits to the local economy as wages earned by those employees are spent on living expenses.

Employment opportunities would be created from proposed thinning of live trees and biomass removal of standing dead trees, surface fuels reduction and Defensible Fuel Profile Zone (DFPZ) maintenance 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. Relative to the local economy, Butte and Plumas County 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.

The following socioeconomic indicators were used to assess effects:

Employment. Employment opportunities can have direct, indirect, or induced effects on the local economy. The sum of direct, indirect, and induced effects is the total economic impact in terms of jobs, typically ranging from 10 to 15 jobs per million board feet (mmbf) of timber volume harvested and 1 job per 200-300 acres of surface fuels reduction treatments.

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 and biomass.

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. 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 area.

For purposes of this analysis, socioeconomic effects are defined as follows:

- Direct Effect is or could be caused by proposed hazardous fuels reduction and vegetative treatments or the consequences of such action, including effects associated with the primary producer and forestry related employment opportunities.

- Indirect Effect account for employment in service industries that serve the lumber manufacturer. These industries may include logging, trucking, fuel supplies, etc.

Socioeconomic Resources Methodology by Action:

1. **Direct/indirect effects of proposed DFPZ hazardous fuels reduction and vegetative forest health treatment operations to socioeconomics.**

Considerations: The establishment and maintenance of proposed Defensible Fuel Profile Zones (DFPZ) in the project area has the potential for beneficial effects on socioeconomics in both the short term and long term.

Short-term timeframe: 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 proposed DFPZ treatments. The time frame for completing the timber harvest operations to establish Defensible Fuel Profile Zones (DFPZs) would take approximately 1 to 2 years.

Spatial boundary: HFQLG Pilot region and the Concow Project Area.

Indicators: Gross revenue from biomass measured in tons per acre and timber volume measured in million board feet, operational costs, number of direct and indirect jobs and employee related income.

Long-term timeframe: 10 years.

Spatial boundary: HFQLG Pilot region and the Concow Project Area.

Indicators: Gross revenue from biomass measured in tons per acre and timber volume measured in million board feet, operational costs, number of direct and indirect jobs and employee related income.

Methodology: 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 4-2.

Table 4-2 Percentage of Plumas National Forest System Lands by County

County	County Acres	Beckworth Ranger District (ac)	Feather River Ranger District (ac)	Mount Hough Ranger District (ac)	Total Plumas NF Land in County (ac)	Plumas NF 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

Note: Based on Geographic Information System (GIS) data.

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. For example, timber industry resides within two industries, (1) Farm and (2) Manufacturing. According to the Bureau of Economic Farm and Manufacturing earnings in Plumas County represent 11.73% of the earnings of the major industries in Plumas County. Earnings in these two industries have gone down and are experiencing negative growth. Due to the lack of national demand for lumber the mill has temporarily closed the small log mill and plans to assess viability and continuation of the small log mill towards the end of 2009.

Employment in farm and manufacturing represents 7.87% of the jobs in Plumas County. The per capita personal income in 2006 was $33,800 for all industries. The total employee income for all major industries is $11,435,000. Output for all industries in Plumas County is $1,189,734,000. Plumas County labor statistics reflects a seasonal labor force with employment up during the warmer months. In the winter unemployment rises as the timber harvesting season stops, which contributes to the unemployment rate. 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 are administered by the Bureau of Land Management and apply to many different types of federally-owned land, including National Forest System lands. Payments in Lieu of Taxes 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 3-27). 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. 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 were 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 4-3. Funds were collected during Forest Service fiscal year 2007.

On October 3, 2008, the Secure Rural Schools and Community Self-Determination Act of 2000 was reauthorized as part of Public Law 110-343. The new Secure Rural Schools Act has some significant changes. To implement the new law, the Forest Service requested states and counties to elect either to receive a share of the 25-percent rolling average payment or to receive a share of the Secure Rural Schools State (formula) payment.

A county electing to receive a share of the State payment that is greater than $100,000 annually was required to allocate 15 to 20-percent of its share for one or more of the following purposes: projects under Title II of the Act; projects under Title III; or return the funds to the Treasury of the United States. The Act will terminate in 2011, and the development of Forest Reserve Revenues (FRR's or 25 percent receipts) for county schools and roads will return to the original 25 percent receipts formula that is determined from the stumpage values generated from each project on the forest.

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 4-3.

Table 4-3 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**	

Rationale: 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.

2. Cumulative effects of proposed DFPZ hazardous fuels reduction and vegetative forest health treatments to socioeconomics.

Considerations: The establishment and maintenance of proposed Defensible Fuel Profile Zones (DFPZ) in the project area has the potential for beneficial effects on socioeconomics in the short and long term.

Short-term timeframe: 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 proposed DFPZ treatments. The time frame for completing the timber harvest to establish Defensible Fuel Profile Zones (DFPZs) would take approximately 1 to 2 years.

Spatial boundary: HFQLG Pilot region and the Concow Project Area.

Indicators: Gross revenue from biomass measured in tons per acre and timber volume measured in million board feet, operational costs, number of direct and indirect jobs and employee related income.

Long-term timeframe: 10 years.

Spatial boundary: HFQLG Pilot region and the Concow Project Area.

Indicators: Gross revenue from biomass measured in tons per acre and timber volume measured in million board feet, operational costs, number of direct and indirect jobs and employee related income.

Methodology: The sum of direct, indirect and induced effects is the total economic impact in terms of jobs. 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.

This economic analysis is not designed to model all the economic factors used in an intensive and highly complex timber sale appraisal process. The analysis does not include costs and values for those items that cannot be estimated in dollar terms, referred to as non-priced costs and benefits. For instance, the economic analysis does not take into account non-priced benefits such as improved long-term wildlife habitat, improved watershed conditions, and reduced fire hazard or 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.

Rationale: 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. In addition, the Secretary shall use the most cost-effective means in conducting the pilot project.

4.5.4 Environmental Consequences

Alternative A - No-action

Direct and Indirect Effects to Socioeconomic Resources

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.

The No-action Alternative would have a negative cumulative impact on local industries dependent on federal 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 establishing and maintaining Defensible Fuel Profile Zones (DFPZs) associated with Alternatives B and the non-commercial funding Alternative C. The local economy also would not benefit from associated employment linked to food services, lodging, and transportation businesses.

Under the No-action Alternative, fuel reduction and forest health activities would not take place. In addition, dense standing trees and high fuel loading in the Concow Project Area would continue to pose a high fire hazard within the wildland urban-interface (WUI); likely to contribute to future high suppression costs associated with high intensity fire behavior. If the No-action Alternative is selected, operational costs associated with future fuels reduction treatments would likely be more expensive, as fuel loading is predicted to be high (refer to the “Fire and Fuels” section to follow).

Alternative A – No-action

Cumulative Effects to Socioeconomic Resources

The No-action Alternative would have a negative impact on local industries dependent on service contracts, production of biomass or a steady supply of timber, as well as counties that use timber yield taxes to fund county programs. 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.

In the local area of Plumas County, there are two co generation plants and two biomass power plants operating within a reasonable haul distance. The Wendell facility is 35 megawatt plant and to operate at full capacity would need 550 b.d. (Bone dry) tons/ day or 37 truck loads. The Wendell facility sells to PG&E approximately 30 megawatts a day when they can produce at full capacity. Presently they cannot produce full capacity due to the lack of biomass material. Westwood facility is a 10 megawatt that employs 10 to 19 people, requiring 200 b.d. tons/day to operate at full capacity.

Under the No-action Alternative, these local industries would have reduced opportunities related to fuels reduction and forest health management activities, including the removal and utilization of timber and biomass forest by-products. 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.

The local economy would not receive indirect benefits from associated employment linked to food services, lodging, and transportation businesses. 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. In addition, the effects of moderate and high intensity fire associated with the 2008 Butte Lightning Complex reduced the amount of available commercial forest by-products for the long-term. The income loss to families would ripple throughout the local economy contributing to the decline of local industries and community economic stability.

Alternatives B and C

Direct and Indirect Effects to Socioeconomic Resources

The Proposed Action (Alternative B) would generate 30 direct and indirect jobs. Service industries related to the timber industry would benefit (such as logging supply companies, trucking companies, and fuel suppliers). The local economy, driven by wages would improve stability for the communities throughout the county. Wages paid to workers would circulate through the local economy for food, housing, transportation, and other living expenses. Some of the other industries to benefit from activities associated with Alternatives B and C are retail, newspaper, data processing, banks, real estate, waste management, college, doctors, hospitals, child care services, lodging, electric power, and gas distribution.

Under the Proposed Action (Alternative B), the key contributors to Forest by-product utilization costs would be associated with a minor bridge improvement, temporary road construction, reconstruction, and maintenance totaling a maximum $518,823. Although timber (sawlog) and biomass utilization would potentially generate more than $1,157,460, key contributors to high Defensible Fuel Profile Zone (DFPZ) treatment costs would be associated with removing or rearranging pre-existing surface fuel concentrations, particularly in areas burned at low to moderate fire intensity, as summarized in table 4.4 below. Table 4-4 provides a summary of potential forest by-product outputs (timber and biomass), operational expenditures and revenues by alternative.

Table 4-4 Socioeconomic Effects by Alternative

Revenue/Cost/Employment	Alternative A (No-Action)	(Preferred) Alternative B			Alternative C (Non-commercial funding)
		Initial Entry	**Maintenance 5–7 years after initial entry**	**Maintenance 8–10 years after initial entry**	
Green Volume	$0	2.0 mmbf	$0	$0	$0
Biomass	$0	3750 tons	$0	$0	$0
Total Saw-log Value	$0	+$1,044,960	$0	$0	$0
Total Biomass Value	$0	+$112,500	$0	$0	$0
Total Saw-log and Biomass Utilization Costs	$0	-$1,386,185	$0	$0	$0
Total Surface and Ladder Fuel Treatment Costs	$0	-$1,405,650	-$1,063,550	-$1,063,550	-$1,087,300
Total Costs	$0	-$4,918,935			-$1,087,300
Total Revenue	$0	+$1,157,460			$0
Total direct and indirect jobs	0	30 jobs			15 jobs
Total employee-related income	$0	+$924,500			$0

Under the non-commercial funding Alternative C, there would be no commercial utilization of small ladder live or dead fuels. All woody material would be treated on site, with the exception of personal firewood cutting allowances alongside public roads. Alternative C would provide 15 forestry related job opportunities.

Alternatives B and C

Cumulative Effects to Socioeconomic Resources

Forest by-products provide commercial and noncommercial wood products, such as timber (sawlogs) and biomass to the local economy. Figure 4-1 displays the volume of timber harvested on the PNF since 1974. Local sawmills have processed most of this volume, although mills as far away as Weaverville have bid or purchased timber from the forest.

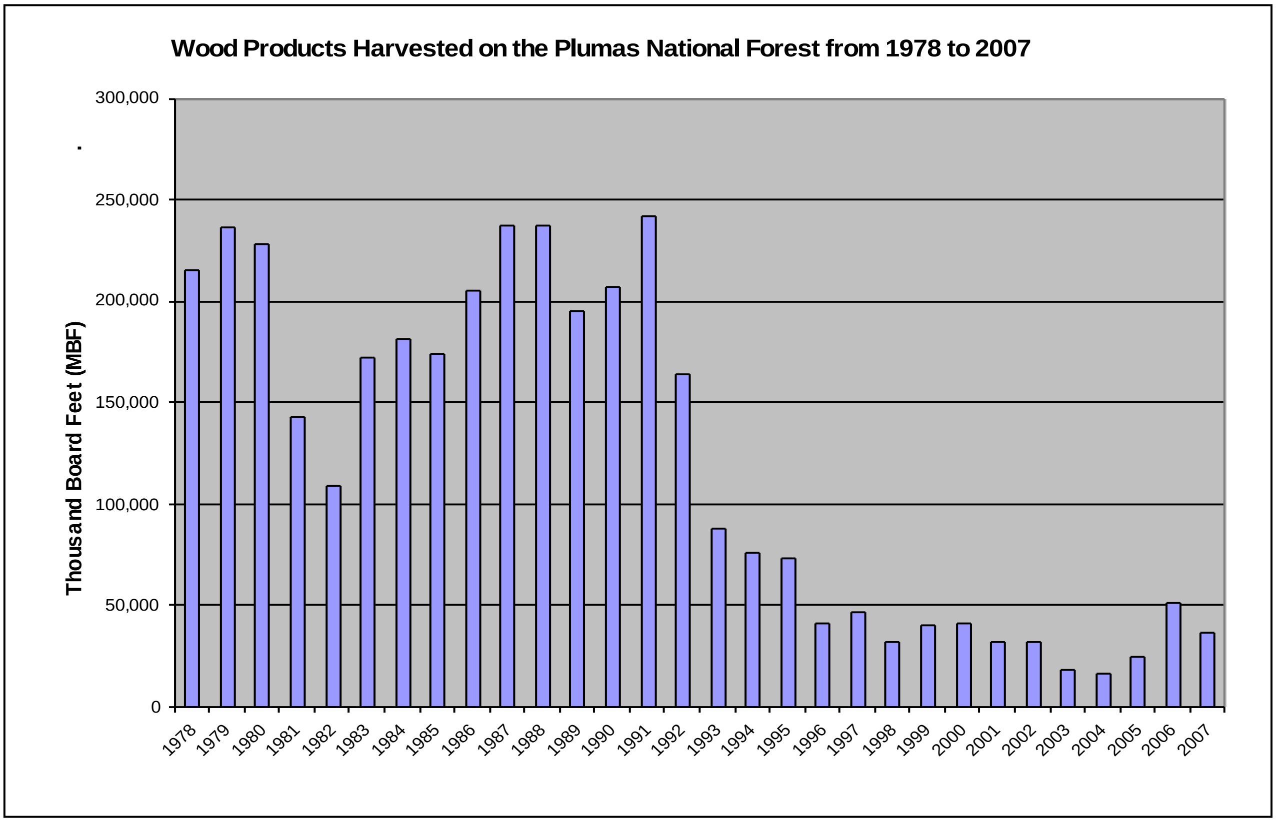


Figure 4-1 Annual amount of wood products sold on the Plumas National Forest

The Proposed Action (Alternative B) has potential to generate $267,951 in Federal Tax collections and $162,111 in state and local tax. The induced effects of the output may potentially generate an estimated $380,000 from income.

Alternative C has the potential to generate $39,795 in federal tax collections and $18,191 in state and local tax. Induced effects would generate $73,179 from income that would circulate through the local economy due to earnings. Some of the other industries to benefit from activities associated with Alternative C are similar to Alternative A.

For these reasons, these action alternatives would provide forestry related employment opportunities, and generate biomass and harvest revenues and timber yield taxes to contribute to counties services, such as maintaining roads and supporting schools. The saw-timber provided by the Proposed Action would also contribute to the stability of local economy by providing a supply of wood products to local industries dependent on forest management activities. The No-action Alternative would forego the opportunity to generate forest by-products and forestry related job opportunities. The preferred Proposed Action (Alternative B) would provide an estimated 2.0 mmbf as timber (sawlog) volume, approximately 3,750 tons biomass (green) and up to 30 forestry related jobs; twice as many as under Alternative C. As the non-commercial funding alternative, forest by-products under Alternative C would not be made available for commercial sale; limited to personal firewood cutting alongside public roads.

4.5.5 Summary of Effects Analysis Across All Alternatives

The No-action Alternative would forego the opportunity to generate forest by-products and forestry related job opportunities. The preferred Proposed Action (Alternative B) would provide an estimated 2.0 mmbf as timber (sawlog) volume, approximately 3,750 tons biomass (green) and up to 30 forestry related jobs; twice as many as under Alternative C. As the non-commercial funding alternative, forest by-products under Alternative C would not be made available for commercial sale; limited to personal firewood cutting alongside public roads.

4.6 Fire and Fuels

4.6.1 Introduction

Beginning in the 1990s, nationally televised news reports about the destructive effects of high severity wildfire, particularly in the western States, increased the public's awareness that millions of Federal forests and rangelands were considered at high risk of large-scale catastrophic fire. "While the increased risk of catastrophic wildland fire is often blamed on long-term drought or expansion of the wildland urban interface (WUI) in the Western United States, the underlying cause is the buildup of forest fuel and changes in vegetation composition over the last century" (USDA and USDI 2004).

Since the '90s, there have been many changes to national administrative procedures governing the preparation of projects intended to reduce fuel concentrations and restore healthy ecological conditions on public land. The most recent national direction relevant to this environmental analysis process is the Healthy Forest Restoration Act (HFRA) of 2003 (16 U.S.C. at 1611-6591). The HFRA emphasizes public collaboration processes for developing and implementing hazardous fuel reduction projects on public land, and also provides other authorities and direction referencing *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Strategy Implementation Plan* (USDA/USDI 2001). The HFRA provides additional authorities intended to expedite the treatment of more acres more quickly. As the Concow Planning Area almost entirely lies within the wildland urban-interface (WUI), most of which is privately owned, a collaborative approach influencing the design and the location of proposed hazardous fuels reduction and vegetative treatments was essential.

The 2004 Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS Record of Decision (ROD) adopts an integrated strategy for vegetation management that is aggressive enough to reduce the risk of wildfire to communities in the urban-wildland interface (WUI), while modifying fire behavior over the broader landscape. The 2004 SNFPA ROD also provides for the implementation of the 1997 *Herger-Feinstein Quincy Library Group* (HFQLG) *Forest Recovery and Economic Sustainability Act*.

One of the major goals of the HFQLG Forest Recovery Act is to establish a Defensible Fuel Profile Zone (DFPZ) network. As the Concow Planning Area (PA) lies within the QLG Pilot Project Area, the action alternatives B and C are designed to add to the QLG Pilot's partially completed landscape DFPZ network, while strategically modifying hazardous fuels conditions to complement hazardous fuel treatment projects on surrounding private lands (refer to the Butte Unit's Community Wildfire Protection Plan).

The following provides a description of potential effects of the Proposed Action (Alternative B) and alternatives to the proposed action (Alternatives A and C) on fire behavior, as well as proposed mitigations measures, where needed.

4.6.2 Analysis Framework: Statute, Regulation, Forest Plan, and Other Direction

Direction relevant and specific to the Proposed Action and the Alternatives as it affects fuel resources includes:

The 1988 Plumas National Forest Land and Resource Management Plan as amended by the 1999 HFQLG final EIS ROD, and as amended by the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS ROD, guides proposed vegetative management activities designed to fulfill ecological, hazardous fuels reduction and contribution to local economies objectives for lands administered by the Feather River Ranger District of the Plumas National Forest. The 2004 SNFPA ROD (pages 68–69) displays the standards and guidelines, including those applicable to the HFQLG Pilot Project Area (Table 2). The Record of Decision (ROD) for 2004 identified the following standards and guidelines applicable to hazardous fuels resources, which were considered during this analysis process.

Relevant standard and guidelines in the project area are:

- Strategically place area fuels treatments across the landscape to interrupt fire spread and achieve conditions that: (1) reduce the size and severity of wildfire and (2) result in stand densities necessary for healthy forest during drought conditions. The spatial pattern of the treatments is designed to reduce rate of fire spread and fire intensity at the head of the fire (Management Standard and Guideline 1);

- Identify gaps in the landscape pattern where fire could spread at some undesired rate or direction and use treatments (including maintenance treatments and new fuels treatments) to fill identified gaps (Management Standard and Guideline 1);

- During mechanical vegetation treatments, prescribed fire, and salvage operations, retain all large hardwoods on the westside except where: (1) large trees pose an immediate threat to human life or property or (2) losses of large trees are incurred due to prescribed or wildland fire. Large montane hardwoods are trees with a dbh of 12 inches or greater (Management Standards and Guidelines 23 discussion under Hardwood Management).

4.6.3 Effects Analysis Methodology

Geographic Scope of Analysis

The analysis of potential effects to fuel resources is presented from the perspective of various spatial scales. The geographic analysis area for direct effects includes DFPZ treatment areas proposed under the action alternatives, including public lands administered by the Forest Service and the Bureau of Land Management. A separate analysis considers potential direct effects of DFPZ treatments unique to burned and unburned areas, shifts in pre- and post treatment fuel models in unburned treatment areas as an indication of fire behavior, and a specific analysis of snag fall in the burned area, as contributors to present and predicted future hazardous surface fuel loading. Indirect and cumulative effects of proposed DFPZs were geographically assessed at the broader Concow Planning Area scale, bounded by major mountain ridges and drainage topographic features (in alignment with major access and evacuation routes where feasible); considered logical in context of traditional fire suppression strategies and tactics (e.g. ground-based approach with aerial support.

Assumptions specific to fire and fuels analysis:

- Flame lengths predicted to be higher than 4 feet will increase the likelihood for more intense fire behavior and greater difficulty in suppression.
- Fire behavior modeling of the action alternatives B and C is based on the assumption that maintenance treatments are completed.
- High fire weather includes the 90th thru 97th percentile weather conditions. This range of weather conditions is assumed to not only capture when the Plumas typically experience large fires, but also the predicted increase in temperature expected by climate change (Association for Fire Ecology, 2006).
- The dynamics between vegetation and fire and fuels are inherently linked; vegetation treatments (and absence thereof) have profound effects on fuel loading and fuel arrangement. These elements influence fire behavior. Similarly, fire has a profound effect on vegetation establishment and development.
- It is assumed historic fire records dating back to 1910 could be incomplete; however, sufficient data exists to demonstrate the continuing influence of wildland fire in and surrounding the proposed DFPZ treatments on public land.
- Unburned area only - It is assumed current fuel resource (linked to vegetative) conditions reflect the sum of all past human-caused and natural disturbance events (e.g., timber and mineral extraction, urbanization, wildfire, etc.), that have occurred within the Concow Planning Area.

Data Sources and Predictive Models

Several types of data were compiled and modeled to provide the basis for understanding disturbance dynamics influencing fuel conditions and fire behavior within Planning Area, and the potential effects of proposed hazardous fuels reduction and vegetative treatments on fire and fuels:

- Historical weather data from Jarbo Gap Remote Automated Weather Station (RAWS).
- The Fire Family Plus (Main et al. 1990) was used to calculate high fire weather conditions.
- The history of large wildfires was derived from the California Fire Alliance Fire Planning and Mapping Tools (2009); provides records of Forest Service and California Department events < 50 acres in size.
- Unburned area only - Tree and crown fuel data based on Forest Service stand exam protocols (Forest Inventory Analysis, 2005); random plots were conducted within 15 proposed treatment areas, considered representative of typical post-fire fuel conditions.
- Unburned area only - Tree lists were developed and field data was modeled using the Forest

- Vegetation Simulator (FVS) forest stand development model. Fire behavior was modeled using Fire Management Analyst (FMA) fire behavior program (refer to Vegetative Resources section for further discussion of FVS).

- Unburned area only - The Fire Management Analyst (FMA) software program (Fire Program Solution, 2003) was used to model and assess the effects of different treatments on fire behavior by action alternative, by treatment method; specifically existing and post-treatment surface and crown fuel conditions.

- Burned area only - Post fire stand information was gathered using 1/50th acre fixed plots. Data gathered included diameter, species, tree height, structure stage, crown ratio, and percent foliage, and structural proportion remaining in crown.

- Burned area only – Field data was modeled in Fire Management Analyst (FMA) to determine, trees per acre, and potential tons per acre of standing woody debris.

- Burned area only –Snag fall and decay rates were modeled based on assumptions used in the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS, and were calculated as 1, 10, 100 (0-3 inch diameter), and 1000 (>3 inch diameter) hour fuels.

- Burned area only - Fire behavior was modeled using BehavePlus 4.0 (Andrews, 2008); data inputs included fuel loading, fuel bed depth and empirical knowledge of Fuels Specialists, gleaned through long term observations of fire effects in similar fuel conditions.

Basis for Analysis/ Fire & Fuel Indicators

The following fire and fuel indicators were used to assess proposed DFPZ treatment effects on potential fire behavior and influence fire suppression and behavior, as described below.

Flame length (feet) – Increased flame lengths can increase suppression intensity and likelihood of torching events and crown fires. Flame length is influenced by fuel and weather conditions and fuel arrangement. The upper limit for direct action by hand crews is generally considered to be 4 feet, and 6 feet is considered the upper limit for direct action by mechanized equipment (dozers). Flame lengths in excess of these limits usually result in indirect action to contain the fire. Desired flame length post treatment is 4 feet or less.

Fuel Loading (tons per acre) – Fuel load and depth are significant fuel properties for predicting whether a fire will be ignited, its rate of spread, and its intensity. Fuel loading can slow the suppression efforts of firefighters if there are large accumulations of dead and down fuel. Heavy accumulation of large woody debris is problematic for fire managers for multiple reasons; it is difficult to reintroduce low severity fire, slows fire line production rates, increases fire line intensity and increase the threat of rolling material on steep slopes. Fuel loading in this analysis is estimated with fuel models that simulate conditions within the Concow Project area. Fuels models 8 and 9 represent desired conditions.

Snags per acre – Fire-killed trees (snags) become hazards to fire fighters during suppression operations. They fall unpredictably, provide a receptive fuel bed for fire brands and throw fire brands creating spot fires. The structural integrity of trees in the burned area has been compromised by burning of the bole, tops and by felling of other trees, and are subject to further wood decay in the long-term.

Although wildland fire fighting is an inherently high risk occupation, it is the presence of thousands of unstable snags (snags in the fire area range from an estimated 60 to 1000 per acre), particularly adjacent to residential neighborhoods, that most concerns fire managers (2004 SNFPA ROD to the final supplemental EIS: Table 2).

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

Canopy base height – Lower canopy base heights allow for an easier transition from surface fires into passive or active crown fires. The average canopy base height is currently 5 feet in green stands; the desired condition is 15 feet.

For the purposes of this analysis, effects to fire and fuel conditions are defined as follows:

- The No-action Alternative was assessed using the entire Concow Planning Area, encompassing an estimated 30,000 acres of various land ownerships and administrative authorities.

- Direct and Indirect Effects are or could be evidenced by shifts in canopy base height and size, fire type, flame length, amount and distribution of fuel loads (and fuel model classification) in surface, ladder (including snag densities), and crown fuels affected by proposed DFPZ treatments aimed at crown fuel removal, cutting, crushing, redistribution and consumption (prescribed burning) of surface and ladder fuels. In the burned area direct and indirect effects are measured by flame length, snags per acre and fuel loading. In the unburned area direct and indirect effects are measured by canopy base height, flame length, fuel loading and fire type.

- Cumulative effects are evaluated in the same way as direct and indirect effects, with consideration for past, present and forseeable .

Fuels Methodology by Action

1. **Direct and indirect effects of proposed DFPZ hazardous fuels reduction and vegetative forest health treatments to fire behavior and fuels conditions.**

Considerations: The establishment and maintenance of proposed Defensible Fuel Profile Zones in the project area has the potential for beneficial effects on fire behavior and fuels conditions in both the short term and long term.

Short-term timeframe: 1 year.

Long-term timeframe: 5, 10 and 20 years.

Spatial boundaries: Proposed DFPZ treatments areas, burned and unburned areas within the Project Area.

Indicator(s):

Burned Area.

(1) Flame length in feet (existing [pre treatment] and post treatment projected into the future; (2) Fuel loading measured by tons per acre (existing [pre treatment] and post treatment projected into the future), and: (3) Snags per acre (pre treatment and post treatment projected into the future)..

Unburned Area.

(1) Flame length in feet (under existing [pre treatment] conditions and immediately post treatment); (2) Rate of spread in chain(s) per hour (existing and immediately post treatment); (3) Fuel loading measured by tons per acre (existing [pre treatment] and post treatment projected into the future), and; (4) Canopy base height in feet (existing [pre treatment] and immediately post treatment).

Methodology: The potential direct and indirect effects of the alternatives considered in detail are discussed in relationship to existing and altered future predicted fuel conditions and fire behavior. Effects are described in context spatial distribution, timing and extent of proposed DFPZ treatment areas and methods (groupings and by individual proposed treatment).

Table 4-5 Parameters Used for Stand-Level Modeling Under High Fire Weather Conditions

Weather Parameters	Observations
Air Temperature	85ºF
1-hour fuel moisture	3 percent
10-hour fuel moisture	4 percent
100-hour fuel moisture	7 percent
20-foot wind speed	13 mph
Herbaceous fuel moisture	30 percent
Live woody fuel moisture	75 percent

Burned Area.

- Post fire stand information including diameter, tree species, tree height, structure stage (surface and canopy), crown ratio, percent foliage, and structural proportion remaining in crown. This data was entered into FMA to determine, trees per acre, and potential tons per acre of standing woody debris.

- The accumulated fuel buildup has been modeled on a temporal basis assuming snag fall and decay rates as used in the 2004 SNFPA FSEIS; the results of this modeling are presented in terms of tons per acre per fuel size class at year 1, 5, 10 and 20. Also, an analysis of projected snags per acre expected to be still standing in that particular year, in order to demonstrate the buildup of surface fuels due to snag fall.

- Fuel loads are measured for two major categories for this analysis: (1) 1, 10, 100 hour fuels (woody material 0-3" in diameter) and (2) 1000 (>3 inch diameter) hour fuels based on the FMA program parameters. Woody debris made up of 0-3" diameter material is considered small diameter fuels that contribute to surface fire spread rate in fire behavior models.

  Material >3" is considered large diameter fuel and contributes less to fire spread rate, however large accumulation reduces fire fighting initial attack production rates. Depending on 1000 hour fuel moistures surface fire intensity may not increase but residence time will and the potential for unwanted fire effects to soils, vegetation and watershed values will exist.

- Fire behavior for the burned area was calculated using Behave Plus 4.0 (Andrews, 2008). Fuel models were chosen by fuel loading, fuel bed depth and empirical knowledge of the Forest and District Fuels Specialist witnessing fires burning in similar fuel beds.

Unburned Area.

- The Fire Management Analyst (FMA) software program (Fire Program Solution, 2003) was used to model and assess the effects of different treatments on fire behavior by alternative. Tree and crown fuel data was processed and utilized in the Forest Vegetation Simulator model, where tree lists were developed for export to the FMA program. FMA was utilized to determine existing and post-treatment surface and crown fuel conditions as well as determination of potential fire behavior and effects associated with the alternatives. Fire behavior results displayed in this report were based on, aspect, slope, strategic suppression location, and harvest and fuel treatment types.

- The different vegetation configurations within the project area were assigned fire behavior prediction fuel models (Anderson, 1982, Fire Program Solutions, 2003 and Scott and Burgan, 2005). Some fuel models from the FMA program master fuels list were used to capture differences in fuel bed depth and fuel loading from Anderson's Fire Behavior Prediction (FBP) fuel models.

- The history of large fires was derived from the California Fire Alliance Fire Planning and Mapping Tools (2009) that tracks both Forest Service and California Department of Forestry large fires (>50 acres). Large fire history dating back to 1910 was analyzed. Fires less than 50 acres were not analyzed as data is not available.

Rationale: Management objectives relating to fuels/fire management from the Sierra Nevada Forest Plan Amendment Final Supplement Environmental Impact Statement (SNFPA FSEIS, 2004) and HFQLG Act:

Create defensible space near communities, and provide a safe and effective area for suppressing fire.

Design economically efficient treatments to reduce hazardous fuels.

Establish and maintain a pattern of area treatments that is effective in modifying wildfire behavior.

Management objectives relating to fuels/fire management from the Sierra Nevada Forest Plan Amendment Final Supplement Environmental Impact Statement (SNFPA FSEIS, 2004) and HFQLG Act for fire restoration:

Design project to manage the development of fuel profiles over time.

Design projects to reduce potential soil erosion and the loss of soil productivity caused by loss of vegetation and ground cover.

Design project to protect and maintain critical wildlife habitat.

Design projects to recover the value of timber killed or severely injured by the disturbance.

2. Cumulative effects of proposed DFPZ hazardous fuels reduction and vegetative forest health treatments to fire behavior and fuels conditions.

Considerations: Fire suppression practices, along with the aggregate affects of prior human actions and natural events, have affected fuel resources. For the purposes of this assessment of cumulative effects, current conditions were used as a proxy for representing the residual effects of past human actions and natural events to fuel characteristics and distribution; regardless of which particular action or event contributed to those effects. The establishment and maintenance of proposed Defensible Fuel Profile Zones under the action alternatives, along with recently completed defensible space (shaded fuel breaks) on private land and Bureau of Land Management hazardous fuels reduction projects, would contribute to cumulative effects in the Concow Planning Area.

Short-term timeframe: not applicable; cumulative effects analysis would be done only for the long-term time frame.

Long-term timeframe: 5, 10 and 20 years.

Spatial boundaries: Concow Planning Area

Indicator(s): Burned Area. 1) Shifts in flame lengths (average feet), before and after DFPZ treatment methods; 2) Shifts in fuel loading (average tones per acre) before and after DFPZ treatment methods, and; 3) Shifts in average number of snags per acre before and after DFPZ treatment methods.

Unburned Area. 1) Shifts in flame lengths (average feet), before and after DFPZ treatment methods; 2) Shifts in fuel loading (average tones per acre) before and after DFPZ treatment methods; 3) Shifts in canopy base heights (average feet) before and after DFPZ treatment methods; 4) Shifts in Fire Type before and after DFPZ treatment methods.

Methodology: Alternatives B and C – potential cumulative effects are discussed in relationship to the spatial distribution, timing and extent of proposed DFPZ treatment methods.

Rationale: The Final Supplemental Environmental Impact Statement (2003) to the HFQLG Act FEIS and ROD documented the environmental analysis of the effects of alternative management strategies for the maintenance of DFPZs within the HFQLG Pilot Project Area. Defensible Fuel Profile Zone (DFPZ) maintenance was analyzed and measured as shifts in flame length, fuel loading, and snags per acre, as compared to pre-treatment conditions.

4.6.4 Environmental Consequences

The following section describes direct effects to fuel conditions in context of burned and unburned areas in the Concow Project Area (public lands only), using quantitative relative indicators including flame length, fuel loading, canopy base height, fire type, and snags densities (burned area only). Refer to tables 4-21 through 4-23 for a comparative summary of no-action compared to Alternatives B and C under the "Summary of Effects Analysis Across All Alternatives" section to follow.

Alternative A – No-action

Direct and Indirect Effects to Fire and Fuels.

Burned Area.

Under the No-action Alternative, Defensible Fuel Profile Zones (DFPZs) would not be established near the towns of Yankee Hill to connect defensible space fuel breaks established along the Rim Road on private land; a major evacuation route for residents during a wildfire.

Flame Length. Surface fuels in many areas are negligible due to their consumption by fire in 2008. By year 1 or 2 after the fire, any needles on the trees killed by the fire will drop, but will not present a fuels problem in terms of potential fire. Low intensity fire may creep around with flame length less than 1 foot (See table 4-6 below). Without vertical or horizontal continuity of fuels, fire size is estimated to be small.

Table 4-6 Flame Lengths - Current Condition

Percent Slope	20 Percent	40 Percent	60 Percent	80 Percent
Flame Length (feet)	0.5 feet	0.6 feet	0.7 feet	0.8 feet

Fuel Loading. Surface fuel loading is extremely low as nearly all material less than 3 inches in diameter was consumed in 2008. In the next year or two, most remaining needles and leaves on the scorched trees will drop, but will not contribute enough to surface fuel loading to pose a fuels problem. Fuel model TL1 (Scott and Bergen, 2005) was used to represent the majority of the surface fuel loads in the burned area (averaging an estimated 1 ton per acre). Scott and Bergan's fuel model TL1 was considered a good fit for the recently burned forests in the Concow Project Area.

Modeling indicates over time snags will deteriorate and fall contributing to future surface fuel loading, and brush will quickly respond adding an additional live fuel load of 2-5 tons per acre. Standing tons per acre is varied across the Project Area (refer to table 4-7 for potential fuel loading by size class).

Table 4-7 Fuel Loading in Range of Standing Tons per Acre - Burned Area

Size Classes	1 to 6 inches in diameter	6 to 12 inches in diameter	11 to 24 inches in diameter
Fuel Loading (tons per Acre)*	27 – 97 t/a	12 – 187 t/a	119 – 166 t/a

*Data derived from FIA plots; modeled in FVS at a stand level

Existing surface fuels would remain at their current levels of approximately 1 ton per acre in burned area in the short-term, but will continue to accumulate over time. Without DFPZ treatments, surface fuels would continue to increase eventually resulting in fuel conditions prone to high intensity wildfires.

Snags per acre. The Butte Complex wildfires left a landscape of fire killed trees within the wildland urban-interface (WUI), where fire suppression resources are expected to protect life and property. Snags in the fire area range from approximately 60 to 1000, averaging 400 snags per acre. The structural integrity of trees in the burned area has been compromised by burning of the bole, tops and by felling of other trees. These snags or Danger Treedanger trees pose a serious threat to the public and firefighters, as they can fall unpredictably by root pull, wind, or stem rot. Historically, falling trees, snags, and rocks account for over 8 percent of Federal wildand firefighter fatalities (Wildland Firefighter Fatalities in the Unitied States, 1990-2006, MTDC, 2007). Due to the high density of snag hazards in the burned area, conditions will remain extremely hazardous for fire suppression crews into the long-term.

Unburned Area.

Under the No-action Alternative, Defensible Fuel Profile Zones (DFPZs) would not be established near the towns of Magalia or Paradise to connect defensible space fuel breaks established along Coutolenc Road on private land; a major evacuation route for residents during a wildfire.

Flame Length. Vegetative conditions are intimately linked to fire behavior and fuel loading. Fire exclusion, past harvesting practices, and changes in various other land practices have decreased the incidence of historic low intensity fires, allowing for a build-up of surface and canopy fuels (Peterson et al. 2005). Stands that have skipped fire cycles generally have heavy surface fuel loads, and hundreds of small trees per acre contributing to low canopy base heights. Heavy surface fuel loads and low canopy base heights increase potential flame lengths and possible torching (Graham et al. 2004). Horizontal continuity of surface fuels and vertical continuity of ladder fuels would allow for rapid spread of fire.

Under the No-action Alternative, predicted flame lengths would continue to average over 6 feet in unburned stands. Flame lengths averaging 6 feet are not considered safe for direct attack with ground suppression resources.

Fuel Loading. Dead and down fuel loading is high and fuel ladders are present due to growth of a dense understory making for low canopy base heights. Accumulations of limb wood create a fuelbed of light slash, estimating 12 tons per acre of dead and down woody debris less than 3 inches in diameter (FM 10) cover 17 percent of the unburned federal lands. Brush fuel models account for 40 percent of the area; with lack of disturbance, brush becomes decadent increasing dead fuel loading. Fuel models 8 and 9 make up 33 percent of the unburned area, meeting the surface fuel loading component of the desired condition.

The following section describes current fuel conditions within proposed treatment areas under the action alternatives. This information provides fuel conditions under the No-action Alternative, by unique area(s), modeled 5, 10 and 20 years into the future. Tables 4-8 and 4-9 display average fuel loading, snags per acre, and average flame lengths present today, in areas proposed for mechanical treatments under the action alternatives. This provides a baseline from which modeled post-treatment conditions can be compared, summarized at the end of this section.

Table 4-8 No Treatment (Existing & Projected Future Conditions) in Areas proposed for Thinning and Mastication under the Action Alternatives

Alternative A (No Action)				
Year	**0-3" fuel load**	**>3" fuel load**	**Snags per acre**	**Flame Length**
1	0.31 tons/acre	2.22 tons/acre	512	<1 foot
5	1.29 tons/acre	10.14 tons/acre	340	2-3 feet
10	2.09 tons/acre	17.63 tons/acre	209	4-10 feet
20	2.81 tons/acre	27.22 tons/acre	86	4-34 feet

*Fire behavior output from Behave with a 0-40% slope

Table 4-9 No Treatment (Existing & Projected Future Conditions) in Areas proposed for Mechanical Thinning and Hand Cut, Hand Pile and Burn under the Action Alternatives

Alternative A (No Action)				
Year	**0-3" fuel load**	**>3" fuel load**	**Snags per acre**	**Flame Length**
1	0.47 tons/acre	3.59 tons/acre	508	<1 foot
5	1.81 tons/acre	15.87 tons/acre	338	3-4 feet
10	2.23 tons/acre	19.58 tons/acre	186	8-13 feet
20	3.96 tons/acre	42.90 tons/acre	87	31-41 feet

*Fire behavior output from Behave with a 20-80% slope

Table 4-8 reflects the average fuel loading, snags per acre and flame lengths, assuming no prescribed burning in these areas within the Butte Complex. Table 4-9 reflects the average fuel loading, snags per acre and flame lengths, assuming no hand cut, pile and burning areas. Table 4-10 reflects the average fuel loading, snags per acre and flame lengths in areas proposed for mastication.

Table 4-10 No Treatment (Existing & Projected Future Conditions) in Areas proposed for Prescribed Burning under the Action Alternatives

Alternative A (No Action)				
Year	**0-3" fuel load**	**>3" fuel load**	**Snags per acre**	**Flame Length**
1	0.14 tons/acre	0.97 tons/acre	396	<1 foot
5	0.61 tons/acre	4.27 tons/acre	258	3-4 feet
10	0.99 tons/acre	7.38 tons/acre	153	8-10 feet
20	1.33 tons/acre	11.35 tons/acre	59	32-42 feet

*Fire behavior output from Behave with a 20-80% slope

Table 4-11 No Treatment (Existing & Projected Future Conditions) in Areas proposed for Hand Cut, Hand Pile and Burn under the Action Alternatives

Alternative A (No Action)				
Year	0-3" fuel load	>3" fuel load	Snags per acre	Flame Length
1	0.12 tons/acre	0.60 tons/acre	214	<1 foot
5	0.49 tons/acre	2.65 tons/acre	139	3-4 feet
10	0.77 tons/acre	4.57 tons/acre	82	8-10 feet
20	0.99 tons/acre	6.97 tons/acre	30	31-41 feet

*Fire behavior output from Behave with a 20-80% slope

Table 4-12 No Treatment (Existing & Projected Future Conditions) in Areas proposed for Mastication under the Action Alternatives

Alternative A (No Action)				
Year	0-3" fuel load	>3" fuel load	Snags per acre	Flame Length
1	0.16 tons/acre	1.30 tons/acre	503	<1 foot
5	0.66 tons/acre	5.86 tons/acre	324	3-4 feet
10	1.07 tons/acre	10.34 tons/acre	193	4-10 feet
20	1.46 tons/acre	16.45 tons/acre	73	4-34 feet

Under the No-action Alternative, existing surface fuels would remain at their current levels averaging an estimated 9 tons/acre overall. Under the No-Action alternative, surface fuels would continue to increase eventually resulting in high intensity wildfires.

Indirect Effects: Burned Area.

Canopy Base Heights and Fire Types. Under the No-action Alternative, current environmental conditions in the Concow Planning Area would remain vulnerable to large, high intensity fires.

Flame Length. As time passes, the number of snags falling will increasingly contribute to the surface fuels. In the long-term, fuel sizes, live and dead fuel loading (tonnage), compactness, horizontal continuity, and vertical arrangement could pose a fire threat or contribute to conditions (where flame lengths exceed 4 feet), which inhibit or preclude safe firefighting direct attack practices.

Fuel Loading. Brush will flourish in the fire area. Wildfires that burned at similar elevation on the Feather River RD have become brush fields of deer brush, Manzanita, Black oak and Tan oak. Photos of the 1999 Pendola fire show brush greater than 10 feet (See Figures 4-2 and 4-3). The 2002 Peterson fire also illustrated the brush response after a high intensity fire. During a wildfire, young brush can act as a heat sink rather than a heat source; however as brush age's branches begin to die off creating a dead component. The combination of decadent brush, heavy accumulation of surface fuels and low live fuel moistures during the late summer months allow for high intensity fires with large flame lengths and slow production rates for firefighters.

Figure 4-2 2002 Peterson Fire - Brush response

Under the No-action Alternative, the fire and fuels objectives of creating defensible space near communities, providing safe and effective areas for fire suppression, and develop fuel profiles over time would not be met. Burning snags would contribute to spotting and increase fire size (USDA Forest Service, 1966, 1986). Firefighter and public safety would be jeopardized due to the increased potential for snag fall (National Wildfire Coordination Group, 2002).

Figure 4-3 1999 Pendola Fire, brush response

Indirect Effects: Unburned Area.

Lower canopy base heights allow for an easier transition from surface fires into passive or active crown fires. The average canopy base height is currently 5 feet in green stands; the desired condition is 15 feet. Under the No-action Alternative, there would be a continued shift towards and increased proportions of shade-tolerant, less fire-adapted species (true firs and incense-cedar) and decreased proportions of shade-intolerant, fire-adapted species such as ponderosa pines.

In the unburned portion of the project, the desired condition of reducing flame length, fuel loading, canopy cover and increasing canopy base height would not be met. Natural recovery of the burned area would not maintain the desired condition of reducing flame lengths, fuel loadings, and increasing canopy base heights to protect remnant forest structure.

Alternative A – No-action

Cumulative Effects to Fire and Fuels.

Under the No-action Alternative, current trends of larger fires of high intensity and extensive resource losses, similar to the scope of the 2008 Butte Lightning Complex, would persist. Stands in the area will not be fire resilient and the ecological characteristics of high frequency; low to moderate severity fire regimes will not be restored.

This area of the Plumas National Forest has a history of large, stand replacing wildfires that have occurred including the 2008 Butte complex, 2001 Highway 70 and Poe fires and the 2000 Concow fire. The effects of these fires include loss of life, structures, critical habitat for threatened and endangered species, timber, plantations, damage to soils, watershed and recreational values. The financial costs of suppression, emergency rehabilitation and restoration of these fires have been high. There is a cumulative impact from the loss and/or damage to property and natural resources and the associated financial costs mitigating these negative effects under this alternative.

The No-action Alternative would not support working cooperatively with adjacent landowners and other agencies to execute fuel reduction projects contiguously across jurisdictional boundaries. Value of a strategic landscape approach to fuel treatment would be lost, in that treatments on state and private lands would be isolated and rendered less effective. Fires burning across National Forest boundaries would cause unacceptable damage to adjacent private lands.

Alternative B – Preferred Proposed Action

The following sections present effects to fire and fuels by individual Defensible Fuel Profile Zone (DFPZ) treatment method and groups of treatment methods typically implemented together, such as hand cut, pile and burn surface fuels treatments. Each treatment subsection discusses effects in context of flame length, fuel loading and snag level indicators. Refer to tables 4-21 and 4-23 for a comparative summary of no-action compared to Alternatives B and C under the "Summary of Effects Analysis Across All Alternatives" section to follow.

Direct Effects to Fire and Fuels

Mechanical Thinning.

Tables 4-13 and 4-14 display the average fuel loading, snags per acre and flame lengths in mechanical thinning, mastication and hand cut, pile and burn treatment areas, proposed to establish Defensible Fuel Profile Zones (DFPZs) on public land.

Table 4-13 Thinning and Mastication

Alternative B				
Year	**0-3" fuel load**	**>3" fuel load**	**Snags per acre**	**Flame Length**
1	1.27 tons/acre	5.39 tons/acre	4	3-4 feet
5	1.32 tons/acre	6.57 tons/acre	3	2-3 feet
10	1.39 tons/acre	7.85 tons/acre	3	2-3 feet
20	1.47 tons/acre	9.76 tons/acre	2	2-3 feet

*Fire behavior output from Behave with a 0-40% slope

Table 4-14 Mechanical thinning and hand cut, pile and burn

Alternative B (Proposed Action)				
Year	**0-3" fuel load**	**>3" fuel load**	**Snags per acre**	**Flame Length**
1	0.10 tons/acre	1.13 tons/acre	29	<1 foot
5	0.43 tons/acre	5.17 tons/acre	23	2-3 feet
10	0.72 tons/acre	9.33 tons/acre	18	4-5 feet
20	1.03 tons/acre	15.39 tons/acre	10	4-5 feet

*Fire behavior output from Behave with a 20-80% slope

Flame Length. Thinning followed by biomass treatment in unburned treatment areas would reduce the average flame length to 2 feet, a decrease of 62 percent. Mastication of the standing dead fuel would redistribute woody material, making it available surface fuel. Flame length would increase an average of 3 feet in burned areas that are thinned followed by mastication; this still meets the desired condition of flame lengths less than 4 feet.Flame length would average less than 1 foot in the burned areas that are thinned followed by hand cut, pile and burn.

Fuel Loading._ Fuel loading in unburned thinned and masticated treatment areas would decrease by 44 percent; averaging approximately 7 tons per acre. In the burned area, 0-3 inch surface fuel loading would increase 300 percent in areas treated with removal and mastication in year 1, as scorched and fire-killed ladder and canopy fuels would be felled, cut, shredded, and on gentle slopes, chipped and scattered, generating horizontally continuous surface fuels. However, wood decomposition rates (refer to Vegetative Resources section for further discussion on wood decay assumptions) would maintain fuel levels < 5 tons per acre into the long-term. The large wood (>3 inch) fuel loading also initially increases by more than 100 percent due to initial treatment; not reaching the desired 10-15 tons per acre until year 20.

In the long-term, fuel loading would be reduced by 98 percent in 0-3" material, and 67 percent in material > 3 inches, where treated with removal, and spatially overlapping handcut, pile and burn treatments under Alternative B, compared to untreated conditions under the No-action Alternative.

Snags per acre._Within burned treatment areas, snags (average number per acre) would decrease by an estimated 99 percent (averaging 4 per acre), as a consequence of applying combined thinning and mastication methods, and approximately 94 percent in the thin and hand treat areas, compared to the No-action Alternative. Areas proposed for mechanical thinning and hand cut, hand pile and burning treatments would retain approximately 29 snags per acre; however, standing, unstable snags considered hazardous to firefighter, forest workers and visitors would be minimized by retaining small patches (generally < ½ acre in size), concentrated near stream channels, randomly distributed across the landscape (where larger residual snags remain), away from (> 250 feet) residential property boundaries.

Prescribed Burning.

Table 4-15 displays the average fuel loading, snags per acre and flame lengths in prescribed burn areas.

Table 4-15 Prescribed Burning

Alternative B (Proposed Action)				
Year	**0-3" fuel load**	**>3" fuel load**	**Snags per acre**	**Flame Length**
1	0.14 tons/acre	0.97 tons/acre	396	<1 foot
5	0.61 tons/acre	4.27 tons/acre	258	3-4 feet
10	0.99 tons/acre	7.38 tons/acre	153	3-4 feet
20	1.33 tons/acre	11.35 tons/acre	59	3-4 feet

*Fire behavior output from Behave with a 20-80% slope

Flame Length. Prescribe burning will drop the average flame length to 1 foot, an 83 percent decrease in green stands. Within the Butte complex prescribed fire will be used as maintenance in units that burned with low severity. Flame lengths will remain less than 1 foot in the burned area.

Fuel Loading. Prescribe burning will reduce pre-existing surface fuels in treated units. The average dead and down fuel loading post prescribed burn is 1 tons per acre. A 66 percent decrease from the existing condition. Fuel loading in the burned units will stay relatively the same with maintenance burns keeping fuel loading low.

Snags per acre. Snags per acre will remain unchanged. Table 15 reflects the amount of snags that will fall over time. The majority of snags in table 15 are small diameter trees that were killed from low intensity fire during the Butte complex. During the first five year period, modeling indicates 138 snags will fall; these would contribute to surface fuel loading, which in turn would be reduced by maintenance prescribed burning.

Hand cut, pile and burn.

Table 4-16 reflects the average fuel loading, snags per acre and flame lengths in hand cut, pile and burn treatment areas.

Table 4-16 Hand cut, pile and burn

Alternative B (Proposed Action)				
Year	**0-3" fuel load**	**>3" fuel load**	**Snags per acre**	**Flame Length**
1	0.07 tons/acre	0.51 tons/acre	25	<1 foot
5	0.25 tons/acre	2.29 tons/acre	20	2-3 feet
10	0.43 tons/acre	4.05 tons/acre	15	2-3 feet
20	0.62 tons/acre	5.79 tons/acre	10	4-5 feet

*Fire behavior output from Behave with a 20-80% slope

Flame Length. Hand thinning conifers <10 inch DBH followed by hand pile and burning will drop the average flame length to 2 foot, a decrease of 71 percent in green stands. There is no change in flame length in the burned area of the project with flame lengths remaining less than 1 foot.

Fuel Loading. Hand piling and burning will remove activity generated material and existing surface fuels. Fuel loading of dead and down surface fuels will average 3 tons per acre in green stands, a 59 percent decrease from the existing condition.

In burned stands there is an increase in fine fuel loading of 77 percent; however fuel loading remains below the desired condition of 5 tons per acre. The increase may be contributed to the incidental breakage when trees are felled.

Snags per acre. Green stand prescriptions are designed to leave the desired 4 largest snags per acres.Snags per acre in burned stands will decrease by 87 percent, leaving approximately 18 snags per acre. This exceeds the desired condition for snags.

Mastication.

Table 4-17 reflects the average fuel loading, snags per acre and flame lengths in mastication treatment areas.

Table 4-17 Mastication

Alternative B (Proposed Action)				
Year	**0-3" fuel load**	**>3" fuel load**	**Snags per acre**	**Flame Length**
1	1.08 tons/acre	5.72 tons/acre	29	3-4 feet
5	1.32 tons/acre	8.84 tons/acre	24	2-3 feet
10	1.55 tons/acre	12.06 tons/acre	20	3-4 feet
20	1.83 tons/acre	16.71 tons/acre	13	3-4 feet

*Fire behavior output from Behave with a 0-40% slope

Flame Length. Mastication in green stands will drop the average flame length from 8 feet to 2 feet, a decrease of 73 percent.

Mastication in burned stands will increase flame lengths from <1 foot to approximately 4 feet. Masticated fuel beds compact from machinery driving over it and through decomposition, flame length would be expected to decrease by year 2 to flame lengths of 2-3 feet.

Fuel Loading. Surface fuel loading increases after mastication treatment. However, as the fuel bed depth becomes denser and surface to volume ratio becomes less with larger particles, fire behavior is often modified. In a 2007 Final Report published by Knapp et al, they found that by reducing fuel bed depth, mastication modified fire behavior. Fire behavior modeling was done using sub sets of fuel model 11 from FMAs master list to reflect fuel bed depth and loading. Fuel loading results were taken from the fuel model used to predict fire behavior, and thus appear to have decrease from the mastication treatment by 24 percent in green stands.

Fuel loading increased in masticated units in the burned area. Both small diameter fuel loading (0-3 inch) and large woody debris (>3 inch) increase by more than 100 percent, increasing approximately 1.0 and 6.0 tons per acre respectively. Neither size class is more than the desired conditions set by HFQLG.

Snags per acre. Green stand prescriptions are designed to leave the desired 4 largest snags per acres. Snags per acre drop by 94 percent in masticated units, leaving approximately 31 snags per acre in burned areas. This is higher than the desired condition..

Alternative B

Indirect Effects to Fire and Fuels

The following sections present effects to fire and fuels by individual Defensible Fuel Profile Zone (DFPZ) treatment method and groups of treatment methods typically implemented together.

Thinning.

The reduction of canopy cover and snag density would enhance the capabilities of firefighting suppression resources by decreasing resistance to control. By reducing the canopy cover, the effectiveness of firefighting aircraft would improve retardant and water penetration through the canopy to the surface fuels, thereby slowing the fire progression so ground units would be more effective. Decreasing the number of snags per acre will create a safer environment for the public and fire fighters.

Removal of dead trees in the project area will decrease the amount of future large woody debris to a desired level (10-15 tons per acre) by post treatment year 10. Fine fuel loads (0"-3" down material) will be below desired conditions in removal units. Removal units followed by mastication of trees will provide ground cover to protect against erosion, however continuous surface fuels may contribute to surface fire spread.

Thinning in stands with high densities of shade tolerant, less fire adapted species and leaving larger fire resilient pine species will trend the treated stands back towards a fire resilient ecosystem. Thinning will increase canopy base height in the green stands to greater than 15 feet; this will decrease the threat of torching and passive crown fire. Decreased flame lengths would allow for firefighters to make a direct attack during the initial stage of a fire. Direct attack normally leads to smaller fire size resulting in less negative fire effects, such as tree mortality, ground cover disturbance and wildlife habitat loss.

Thinning by itself will reduce ladder and canopy fuels and reduces the chance of crown fire; it does not necessarily alter surface fuels or surface fire intensity (Agee and Skinner, 2005). Whole tree yarding will remove the majority of activity generated fuels and break up continuity of remaining surface fuels. Mechanical-only treatments with whole tree yarding have been found to reduce potential fire severity (Stephens and Moghaddas, 2009).

Defensible Fuel Profile Zone treatment areas that do not meet the desired 5 tons per acre in small diameter material post treatment may need a follow up underburn treatment. The combination of thinning and prescribe fire has been shown to effectively reduce fire severity (Stephens and Moghaddas, 2005a and 2009).

In thinned and masticated units, surface fire intensities may not be altered causing longer periods of flaming or smolder combustion, resulting in more stem or fine-root damage to proximate trees (Kobziar, Moghaddas and Stephens, 2006). FMA + uses tree crown volume scorch and bark thickness to measure probability of mortality (Carlton, 2005). This may under-predict projected mortality in these stands.

Prescribed Burning.

As part of the Concow Project, approximately 460 acres could be burned during project implementation; this would include follow-up underburning to other treatments. Prescribe burning by itself is often hard to accomplish due to heavy fuel accumulations, dense understory, and operational limitations. Mechanical thinning followed by prescribed fire may be necessary to gain fire resiliency faster than prescribed fire alone (North et al. 2009).

The analysis indicates that prescribed underburning would result in 60 percent mortality in residual conifers (10 inches dbh and less), and most shrubs. This means that there would be a short-term increase in fire hazard in those units only treated by underburning. However, the reduction of surface fuels by underburning would mitigate this short-term hazard over the majority of the area, in both the underburn-only units, as well as those that are planned for harvest or mastication. It is important to note that units only treated by underburning may not reach the desired condition with only one treatment and could require a follow-up underburn within 2–5 years of the first, if the desired condition is not reached.

Underburning is nonselective as it may kill some dominant and co-dominant trees which may have been otherwise retained in mechanical treatments. Implementation of prescribed burning treatments would have a negligible to minor effect on species composition in underburn units. Torching may result in gaps in the canopy typically less than 0.5 acre in size, creating small openings in the overstory where shade-intolerant species may become established and grow.

Thinning and prescribed fire can modify understory microclimate that was previously buffered by overstory vegetation (Agee 1996, Scott and Reinhardt 2001, Pollet and Omi 2002). However, when all the effects (reductions in surface fuels, flame lengths, and ladder fuels, and an increase in fire suppression production rates) of the treatments are considered together, the fuel treatment activities would mitigate the effects caused by the decreased relative humidity and increased temperature (Rothermel 1983; Agee 1996; van Wagtendonk 1996; Agee et al. 2000).

Decreased flame lengths would allow for greater occurrence of firefighters making a direct attack during the initial stage of a fire. Direct attack normally leads to smaller fire size resulting in less negative fire effects, such as tree mortality, ground cover disturbance and wildlife habitat loss.

Hand Thinning (Cutting), Hand Pile and Burn.

Effects of pile burning treatments would be highly localized and dispersed. Some effects of pile burning include scorch and subsequent mortality of individual trees; however, this would be a negligible effect due to the relative scale and dispersion associated with the nature of these treatments. These treatments would reduce understory vegetation and would result in incidental mortality in the midstory but would not be expected to change CWHR size class.

Mastication.

Surface fuel loading will increase in masticate units; however mastication machinery tends to chop material into finer particles creating a more compact fuel bed (Knapp et al. 2007) In the advent of future wildfires the mastication treatments will reduce the potential for crown fire spread and propagation (Graham et al. 2004, Omi and Martinson 2002). Aerially delivered retardant effectiveness would increase, as reduction of canopy cover would facilitate penetration onto surface fires. These factors combined would result in smaller final fire size and a reduction in loss. This would meet the standards and guidelines for the land allocations involved per the SNFPA as well as the site-specific objectives of the Forest Fire Management Plan.

The number of snags left in mastication units poses a danger to firefighters and weakens the effectiveness of the DFPZ, however they will provide habitat for wildlife away from homes, private property lines and roads. Another effect of the remaining snags in RHCAs is it decreases the chance to re-enter these areas for maintenance in later years due to the danger of snag fall.

Alternative B

Cumulative Effects to Fire and Fuels

It is the combined effects of the prescribed fuel treatments that have the greatest benefit in changing fire behavior. The strategic location of units along ridgelines and adjacent to past and future fuels treatments on public and private land increases the overall effectiveness of treatments. Stand-level treatments would reduce potential fire behavior, fire related tree mortality, and spotting in treatment units. These treatments would increase the ability of fire management personnel to suppress and contain wildfires during initial and extended operations while increasing firefighter and public safety.

Treatment on federal lands immediately adjacent to homes and private property that increase a landowner's hazardous fuels clearance may produce the best protection for structures. Schoennagel et al (2009) suggests that ignitability of building materials and abundance and arrangement of fuels immediately surrounding a structure may best predict its burn potential in the event of a wildfire.

At the landscape level, these treatments would provide connectivity between existing fuel treatments and break up the continuity of surface and crown fuels. A reduction in landscape-level fire related tree mortality would help maintain stand structure in RHCAs, PACs, and HRCAs in or near the Project Area. Modifying forest structure and treating surface fuels will create fire resilient stands (Pollet and Omi 2002, Graham et al. 2004) and restore the ecological characteristics associated with high frequency, low to moderate severity fire regimes (Kilgore 1973).

Alternative C

Direct Effects to Fire and Fuels

The following sections present effects to fire and fuels by individual Defensible Fuel Profile Zone (DFPZ) treatment method and groups of treatment methods typically implemented together, such as hand cut, pile and burn surface fuels treatments. Each treatment subsection discusses effects in context of flame length, fuel loading and snag level indicators. Refer to tables 21 and 23 for a comparative summary of no-action compared to Alternatives B and C under the "Summary of Effects Analysis Across All Alternatives" section to follow.

Prescribed Burning.

There would be no difference in direct effects between Alternatives B and C; both would reduce hazardous fuels to achieve DFPZ desired conditions in the long term.

Table 4-18 Prescribed Burning

Alternative C				
Year	**0-3" fuel load**	**>3" fuel load**	**Snags per acre**	**Flame Length**
1	0.14 tons/acre	0.97 tons/acre	396	<1 foot
5	0.61 tons/acre	4.27 tons/acre	258	3-4 feet
10	0.99 tons/acre	7.38 tons/acre	153	3-4 feet
20	1.33 tons/acre	11.35 tons/acre	59	3-4 feet

*Fire behavior output from Behave with a 20-80% slope

Flame Length. Prescribe burning will drop the average flame length to 1 foot, an 83 percent decrease in green stands. Within the Butte complex prescribed fire will be used as maintenance in units that burned with low severity. Flame lengths will remain less than 1 foot in the burned area.

Fuel Loading. Prescribe burning will reduce pre-existing surface fuels in treated units. The average dead and down fuel loading post prescribed burn is 1 tons per acre. A 66 percent decrease from the existing condition. Fuel loading in the burned units will stay relatively the same with maintenance burns keeping fuel loading low.

Snag per acre. Snags per acre will remain unchanged. Table 4-18 reflects the amount of snags that will fall over time. The majority of snags in table 4-18 are small diameter trees that were killed from low intensity fire during the Butte complex. During the first five year period, 138 snags will fall; these will contribute to surface fuel loading which will be reduced by maintenance burning.

Hand cut, pile and burn.

Table 4-19 reflects the average fuel loading, snags per acre and flame lengths within hand cut, pile and burn units.

Table 4-19 Hand cut, pile and burn

Alternative C				
Year	**0-3" fuel load**	**>3" fuel load**	**Snags per acre**	**Flame Length***
1	0.23 tons/acre	1.32 tons/acre	71	<1 foot
5	0.72 tons/acre	4.72 tons/acre	52	2-3 feet
10	1.09 tons/acre	7.75 tons/acre	35	8-10 feet
20	1.39 tons/acre	11.27 tons/acre	18	31-41 feet

*Fire behavior output from Behave with a 20-80% slope

Flame Length. Hand thinning conifers <10 inch DBH followed by hand pile and burning will drop the average flame length to 2 foot, a decrease of 71 percent in green stands. There is no change in flame length in the burned area of the project with flame lengths remaining less than 1 foot.

Fuel Loading. Hand piling and burning will decrease small diameter dead and down fuel less than 3 inches in diameter. Fuel loading of dead and down surface fuels will average 3 tons per acre in green stands, a 59 percent decrease from the existing condition. In burned stands there is a slight increase in fine fuel loading of 10 percent in the first year; however fuel loading remains below the desired condition of 5 tons per acre. The increase may be contributed to the incidental breakage when trees are felled.

Snags per acre. Green stand prescriptions are designed to leave the desired 4 largest snags per acres. Snags per acre in burned stands will decrease by 78 percent, leaving approximately 71 snags per acre. This exceeds the desired condition.

Mastication.

Table 4-18 reflects the average fuel loading, snags per acre and flame lengths in mastication units. See Appendix B for comparison of existing condition and action alternatives in green and burned stands.

Table 4-20 Mastication

Alternative C				
Year	**0-3" fuel load**	**>3" fuel load**	**Snags per acre**	**Flame Length**
1	0.91 tons/acre	3.45 tons/acre	80	3-4 feet
5	1.30 tons/acre	8.42 tons/acre	63	2-3 feet
10	1.78 tons/acre	13.33 tons/acre	48	4-10 feet
20	2.31 tons/acre	19.91 tons/acre	30	4-34 feet

*Fire behavior output from Behave with a 0-40% slope

Flame Length. Mastication in green stands will drop the average flame length from 6 feet to 3 feet, a decrease of 50 percent. Mastication in burned stands will increase flame lengths from <1 foot to approximately 4 feet. Masticated fuel beds compact from machinery driving over it and through decomposition, flame length would be expected to decrease by year 2 to flame lengths of 2-3 feet.

Fuel Loading. Mastication rearranges the existing fuel load in the treatment area. Surface fuel loading increases after mastication treatment. However, as the fuel bed depth becomes denser and surface to volume ratio becomes less with larger particles, fire behavior is often modified, flame length decreases while resident heat may increase. In a 2007 Final Report published by Knapp et al, they found that by reducing fuel bed depth, mastication modified fire behavior. While fire behavior is modified, fire effects may still result in high levels of tree mortality.

Fire behavior modeling was done using sub sets of fuel model 11 from FMAs master list to reflect fuel bed depth and loading. Fuel loading results were taken from the fuel model used to predict fire behavior, and thus appear to have decrease from the mastication treatment by 20 percent in green stands.

Fuel loading increased in masticated units in the burned area. Both small diameter fuel loading (0-3 inch) and large woody debris (>3 inch) increase by more than 100 percent, increasing approximately 1.3 and 3.45 tons per acre respectively. Neither size class is more than the desired conditions set by HFQLG.

Snags per acre. Green stand prescriptions are designed to leave the desired 4 largest snags per acres. Snags per acre drop by 82 percent in masticated units, leaving approximately 80 snags per acre in burned areas. This is higher than the desired condition. The snags left will be more evenly distributed under alternative C than in alternative B because of the 11 inch diameter cap in alternative C. These snags pose a danger to firefighters and the general public.

Alternative C

Indirect Effects to Fire and Fuels

The following sections present effects to fire and fuels by individual Defensible Fuel Profile Zone (DFPZ) treatment method and groups of treatment methods typically implemented together, such as hand cut, pile and burn surface fuels treatments.

Prescribed Burning.

As part of the Concow Project, approximately 460 acres could be burned during project implementation; this would include follow-up underburning to other treatments. Prescribe burning by itself is often hard to accomplish due to heavy fuel accumulations, dense understory, and smoke constraints. Mechanical thinning followed by prescribed fire may be necessary to gain fire resiliency faster than prescribed fire alone (North et al. 2009) Analysis indicates that prescribed underburning would result in 60 percent mortality in residual conifers (10 inches dbh and less), and most shrubs. This means that there would be a short-term increase in fire hazard in those units only treated by underburning. However, the reduction of surface fuels by underburning would mitigate this short-term hazard over the majority of the area, in both the underburn-only units, as well as those that are planned for harvest or mastication. It is important to note that units only treated by underburning may not reach the desired condition with only one treatment and could require a follow-up underburn within 2–5 years of the first, if the desired condition is not reached.

Underburning is nonselective as it may kill some dominant and co-dominant trees which may have been otherwise retained in mechanical treatments. Implementation of prescribed burning treatments would have a negligible to minor effect on species composition in underburn units. Torching may result in gaps in the canopy typically less than 0.5 acre in size, creating small openings in the overstory where shade-intolerant species may become established and grow.

Decreased flame lengths would allow for greater incidence of firefighters making a direct attack during the initial stage of a fire. Direct attack normally leads to smaller fire size resulting in less negative fire effects, such as tree mortality, ground cover disturbance and wildlife habitat loss.

Hand Thinning (Cutting), Hand Pile and Burn.

There is little reduction of canopy cover in Alternative C, reducing canopy by 8-13 percent (see vegetation section). The average remaining canopy cover in green stands is 70 percent; canopy cover this high renders firefighting aircraft less effective as retardant and water drops will not effectively penetrate the canopy. Crown fire burning into treated stands with 70% canopy cover will not significantly change.

Hand thinning in stands with high densities of shade tolerant, less fire adapted species and leaving larger fire resilient pine species will trend the treated stands back towards a fire resilient ecosystem. Hand thinning will increase canopy base height in the green stands to greater than 15 feet; this will decrease the threat of torching and passive crown fire if a fire is initiated in the treated stand. Decreased flame lengths would allow for firefighters to make a direct attack during the initial stage of a fire. Direct attack normally leads to smaller fire size resulting in less negative fire effects, such as tree mortality, ground cover disturbance and wildlife habitat loss.

There is higher snag density in alternative C than alternative B in the burned portion of the project area. The snags will be more evenly distributed if alternative C is implemented due to the 11 inch diameter cap on conifers and the 6 inch diameter limit on hardwoods. Firefighter and public safety would be jeopardized due to the increased potential for snag fall (National Wildfire Coordinating Group, 2002).

Areas of high snag densities compromise direct attack capabilities, leading to larger fire size and possibly more resource damage. During the 2008 Butte Complex a portion of the 2000 Storrie fire re-burned, fire suppression modules turned down assignments to directly attack this portion of the fire due to the heavy concentration of snags and thick brush. The incident management team made the decision to indirectly attack this area increasing fire size, the area burned with high intensity consuming surface fuels and brush (Estes, 2009 pers. com.).

High snag densities will also decrease the possibility of maintenance treatments as the danger of snag fall increases over time. Without maintenance treatment Alternative C is only effective until approximately year 10, at which time thick brush and heavy fuel loading from falling snags result in flame lengths of 9 feet.

Effects of pile burning treatments would be highly localized and dispersed. The effects pile burning includes scorch and subsequent mortality of individual trees; however, this would be a negligible effect due to the relative scale and dispersion associated with the nature of these treatments. These treatments would reduce understory vegetation and would result in incidental mortality in the midstory but would not be expected to change CWHR size class.

Mastication.

Mastication will rearrange existing fuel loads resulting in increased surface fuel loading. Mastication machinery tends to chop material into finer particles creating a more compact fuel bed (Knapp et al.). In the advent of future wildfires the mastication treatments will reduce the potential for crown fire spread and propagation (Graham et al. 2004, Omi and Martinson 2002). Surface fire intensities may not be altered causing longer periods of flaming or smolder combustion, resulting in more stem or fine-root damage to proximate trees (Kobziar, Moghaddas and Stephens, 2006).

There are higher snag densities in Alternative C than Alternative B in the burned portion of the project area. The snags will be more evenly distributed if alternative C is implemented due to the 11 inch diameter cap on conifers and the 6 inch diameter limit on hardwoods. Firefighter and public safety would be jeopardized due to the increased potential for snag fall (National Wildfire Coordinating Group, 2002).

Alternative C

Cumulative Effects to Fire and Fuels

It is the combined effects of the prescribed fuel treatments that have the greatest benefit in changing fire behavior. In the burned area of the project the cumulative effects of Alternative C are positive in the short term, decreasing fire behavior and providing connectivity between private and public lands. Because of the large number of snags remaining in the project area maintenance treatments will be unlikely to occur. Influx of brush and heavy fuel loading from snag fall will result in more intense fire behavior in the long term.

The strategic location of units along ridgelines and adjacent to past and future fuels treatments on public and private land increases the overall effectiveness of treatments.

Stand-level treatments would reduce potential fire behavior, fire related tree mortality, and spotting in treatment units. These treatments would increase the ability of fire suppression personnel to suppress and contain wildfires during initial operations while increasing firefighter and public safety.

Schoennagel et al (2009) suggests that ignitability of building materials and abundance and arrangement of fuels immediately surrounding a structure may best predict its burn potential in the event of a wildfire. Treatment on federal lands immediately adjacent to homes and private property that increase a landowner’s hazardous fuels clearance may produce the best protection for structures.

At the landscape level, Alternative C would provide connectivity between existing fuel treatments and break up the continuity of surface fuels. The small reduction in canopy cover will not break up the horizontal continuity of the canopy to allow for effective aerial firefighting or to cause approaching crown fire to drop to the ground. A reduction in landscape-level fire related tree mortality would help maintain stand structure in Riparian Habitat Conservation Areas (RHCAs), Protection Activity Centers (PACs), and Home Range Core Areas (HRCAs) in or near the Concow Project Area.

4.6.5 Summary of Effects Analysis Across All Alternatives

The following tables (tables 4-21 to 4-23) summarize Defensible Fuel Profile Zone (DFPZ) fuel reduction treatment methods proposed under Alternatives B and C (action alternatives) in comparison to the No-action Alternative.

Table 4-21 Fire behavior results by alternative for unburned stands analyzed.

Treatment Area	Treatment Type	Fuel Model	Rate of Spread (chains/hr)	Flame Length (feet)	Fire Type	Fuel Loading (tons/acre)	Canopy Base Height (feet)
1052	No Action	5Z	36	9	Passive	5	1
	Alt. B Mast	11DB	5	3	Surface	9	15
	Alt. C Mast	11DB	5	3	Surface	9	15
1053	No Action	5A	26	6	Surface	3	NA
	Alt. B UB	TL1	1	1	Surface	1	NA
	Alt. C UB	TL1	1	1	Surface	1	NA
1061	No Action	5Z	59	11	Surface	5	1
	Alt. B HCPB	8A	3	1	Surface	4	6
	Alt. C HCPB	8A	3	1	Surface	4	6
1064	No Action	10A	7	4	Passive	8	6
	Alt. B Thin/mast	11DA	3	2	Surface	9	76
	Alt. C Mast	11MB	7	4	Surface	9	66
1068	No Action	9Z	12	4	Surface	5	37
	Alt. B HCPB	9M	9	3	Surface	3	45
	Alt. C HCPB	9M	9	3	Surface	3	45
1069	No Action	10M	9	6	Passive	12	1
	Alt. B Thin/mast	11MA	4	3	Surface	12	73
	Alt. C Mast.	11MB	6	4	Surface	12	68
1070	No Action	10M	9	6	Passive	12	1
	Alt. B Thin/mast	11BB	2	1	Surface	4	NA
	Alt. C Mast.	11CB	3	2	Surface	7	36
1073	No Action	10M	11	6	Passive	12	1
	Alt. B HCPB	9A	7	2	Surface	2	49
	Alt. C HCPB	9A	7	2	Surface	2	49
1078	No Action	10M	9	6	Passive	12	3
	Alt. B Thin/mast	11DA	3	2	Surface	9	NA
	Alt. C Mast	11DB	5	3	Surface	9	49
1080	No Action	9Z	12	4	Passive	5	6
	Alt. B Thin/mast	9A	6	2	Surface	2	94
	Alt. C Mast	9Z	12	4	Surface	5	59
1082	No Action	10M	9	6	Passive	12	4
	Alt. B Mast.	11BB	2	1	Surface	4	9
	Alt C Mast	11BB	2	1	Surface	4	9
1083	No Action	10M	9	6	Passive	12	3
	Alt. B Thin/mast	11BC	3	2	Surface	4	93
	Alt. C Mast	11CC	5	3	Surface	7	8
1087	No Action	10M	10	6	Surface	12	3
	Alt. B Thin/mast	11CA	2	2	Surface	7	NA
	Alt. C Mast	11CC	5	3	Surface	7	NA

Treatment Area	Treatment Type	Fuel Model	Rate of Spread (chains/hr)	Flame Length (feet)	Fire Type	Fuel Loading (tons/acre)	Canopy Base Height (feet)
1088	No Action	10M	6	5	Passive	12	3
	Alt. B Thin/mast	11MA	3	2	Surface	12	55
	Alt. C Mast	11MB	5	3	Surface	12	49
Average	No Action		16	6		9	5
	Alt. B		4	2		6	52
	Alt. C		5	3		7	38

Table 4-22 Comparison of Existing Condition and Alternative B (Proposed Action)

Treatment	Element	Existing Condition			Alternative B Post-Treatment		Percent Benefit	
Green Stands								
Thin & masticate	Flame Length (ft)	5.3			2		62% decrease	
	Fuel Loading (tons/acre)	13.25			7.37		44% decrease	
Mastication	Flame Length (ft)	7.5			2		73% decrease	
	Fuel Loading (tons/acre)	8.5			6.5		24% decrease	
Underburn	Flame Length (ft)	6			1		83% decrease	
	Fuel Loading (tons/acre)	3			1		66% decrease	
Hand thin/Pile	Flame Length (ft)	7			2		71% decease	
	Fuel Loading (tons/acre)	7.5			3		59% decrease	
Burned Stands		Year						
Thin & masticate	Flame Length (ft)	1	.5		3.5		600% increase	
		5	2.5		2.5		0% increase	
		10	7		2.5		64% decrease	
		20	16		2.5		84% decrease	
Dead and down woody debris			0-3”	3” +	0-3”	3” +	0-3”	3” +
	Fuel Loading (tons/acre)	1	0.31	2.22	1.27	5.39	309% increase	143% increase
		5	1.29	10.14	1.32	6.57	2% increase	35% decrease
		10	2.09	17.63	1.39	7.85	33% decrease	55% decrease
		20	2.81	27.22	1.47	9.76	48% decrease	64% decrease
	Snags per acre	1	512		4		99% decrease	
		5	340		3		99% decrease	
		10	209		3		99% decrease	
		20	86		2		98% decrease	
Mechanical Thin & Hand Thin/Pile	Flame Length (ft)	1	0.5		0.5		0% increase	
		5	3.5		2.5		29% decrease	
		10	11		4.5		59% decrease	
		20	37		4.5		88% decrease	
Dead and down woody debris			0-3”	3” +	0-3”	3” +	0-3”	3” +
	Fuel Loading (tons/acre)	1	0.47	3.59	0.1	1.13	98% decrease	67% decrease
		5	1.81	15.87	0.43	5.17	76% decrease	67% decrease

Treatment	Element	Existing Condition			Alternative B Post-Treatment		Percent Benefit	
		10	2.23	19.58	0.72	9.33	68% decrease	52% decrease
		20	3.96	42.9	1.03	15.39	74% decrease	64% decrease
	Snags per acre	1	508		29		94% decrease	
		5	338		23		93% decrease	
		10	186		18		90% decrease	
		20	87		10		89% decrease	
Mastication	Flame Length (ft)	1	0.5		3.5		600% increase	
		5	3.5		2.5		29% decrease	
		10	7		3.5		50% decrease	
		20	16		3.5		78% decrease	
Dead and down woody debris			0-3”	3 +	0-3”	3” +	0-3”	3” +
	Fuel Loading (tons/acre)	1	0.16	1.30	1.08	5.72	575% increase	340% increase
		5	0.66	5.86	1.32	8.84	100% increase	51% increase
		10	1.07	10.34	1.55	12.06	45% increase	17% increase
		20	1.46	16.45	1.83	16.71	25% increase	2% increase
	Snags per acre	1	503		29		94% decrease	
		5	324		24		93% decrease	
		10	193		20		90% decrease	
		20	73		17		77% decrease	
Underburn	Flame Length (ft)	1	<1 foot		<1 foot		No change	
		5	3-4 feet		3-4 feet		No change	
		10	8-10 feet		3-4 feet		62-60% decrease	
		20	32-42 feet		3-4 feet		90% decrease	
	Fuel Loading (tons/acre)	1	0.14	0.97	0.14	0.97	No change	
		5	0.61	4.27	0.61	4.27	No change	
		10	0.99	7.38	0.99	7.38	No change	
		20	1.33	11.35	1.33	11.35	No change	
	Snags per acre	1	396		396		No change	
		5	258		258		No change	
		10	153		153		No change	
		20	59		59		No change	
Hand thin & Pile	Flame Length (ft)	1	0.5		0.5		No change	
		5	3.5		2.5		29% decrease	
		10	9		9		No change	
		20	36		36		No change	
Dead and down woody debris			0-3”	3” +	0-3”	3” +	0-3”	3” +
	Fuel Loading (tons/acre)	1	0.12	0.60	0.07	0.51	42% decrease	15% decrease
		5	0.49	2.65	0.25	2.29	49% decrease	14% decrease
		10	0.77	4.57	0.43	4.05	44% decrease	11% decrease
		20	0.99	6.97	0.62	5.79	37% decrease	17% decrease
	Snags per acre	1	214		25		88% decrease	
		5	139		20		86% decrease	
		10	82		15		82% decrease	
		20	30		10		67% decrease	

Table 4-23 Comparison of Alternative A (No Action) and Alternative C Non commercial-funded Action Alternative

Treatment	Element	Existing Condition			Alternative C Post-Treatment		Percent Benefit	
Green Stands								
Mastication	Flame Length (ft)	6			3		50% decrease	
	Fuel Loading (tons/acre)	10			8		20% decrease	
Underburn	Flame Length (ft)	6			1		83% decrease	
	Fuel Loading (tons/acre)	3			1		66% decrease	
Hand thin/Pile	Flame Length (ft)	7			2		71% decease	
	Fuel Loading (tons/acre)	7.3			3		59% decrease	
Burned Stands		Year						
Mastication	Flame Length (ft)	1	0.5		3.5		600% increase	
		5	3.5		2.5		29% decrease	
		10	7		7		No change	
		20	19		19		No change	
			0-3”	3 +	0-3”	3” +	0-3”	3” +
	Fuel Loading (tons/acre)	1	0.16	1.33	0.91	3.45	506% increase	159% increase
		5	0.69	6.17	1.30	8.42	88% increase	63% increase
		10	1.14	10.81	1.78	13.33	56% increase	23% increase
		20	1.57	16.90	2.31	19.91	47% increase	18% increase
	Snags per acre	1	451		80		82% decrease	
		5	296		63		79 % decrease	
		10	180		48		73% decrease	
		20	73		30		59 % decrease	
Underburn	Flame Length (ft)	1	<1 foot		<1 foot		No change	
		5	3-4 feet		3-4 feet		No change	
		10	8-10 feet		3-4 feet		62-60% decrease	
		20	32-42 feet		3-4 feet		90% decrease	
	Fuel Loading (tons/acre)	1	0.14	0.97	0.14	0.97	No change	
		5	0.61	4.27	0.61	4.27	No change	
		10	0.99	7.38	0.99	7.38	No change	
		20	1.33	11.35	1.33	11.35	No change	
	Snags per acre	1	396		396		No change	
		5	258		258		No change	
		10	153		153		No change	
		20	59		59		No change	
Hand thin/Pile	Flame Length (ft)	1	0.5		0.5		No change	
		5	3.5		2.5		29% decrease	
		10	9		9		No change	
		20	36		36		No change	
Dead and down woody debris			**0-3”**	**3” +**	**0-3”**	**3” +**	**0-3”**	**3” +**
	Fuel Loading (tons/acre)	1	0.21	1.12	0.23	1.32	10% increase	18% increase
		5	0.81	4.85	0.72	4.72	11% decrease	2% decrease
		10	1.32	8.22	1.09	7.75	17% decrease	6% decrease
		20	1.66	12.20	1.39	11.27	16% decrease	8% decrease
	Snags per acre	1	317		71		78% decrease	
		5	207		52		75% decrease	
		10	123		35		72% decrease	
		20	46		18		61 % decrease	

4.7 Vegetative Resources

4.7.1 Introduction

The management of the Nation's renewable resources is highly complex and the uses, demand for, and supply of the various resources are subject to change over time. The Forest Service (FS) and Bureau of Land Management (BLM), by virtue of delegated statutory authorities for management of public lands, are responsible for assuring the Nation maintains a natural resource conservation posture that will meet the requirements of the American people in perpetuity (Resource Planning Act of 1974, National Forest Management Act of 1976). The preservation of diverse plant communities and associated wildlife habitats is influenced by the suitability and capability of a specific land area (e.g., soil fertility, micro-scale climatic conditions, slope position, etc.), as well as the severity and frequency of disturbances.

The Concow Planning Area is characterized by a very diverse group of vegetation and habitat types; traversing a wide elevation band and mix of soil types influencing vegetation patterns across the landscape. The primary vegetation habitat types (Mayer and Laudenslayer 1988) include Sierran mixed conifer, Douglas-fir, Ponderosa pine, montane hardwood-conifer, montane hardwood and shrub dominated lower elevations with mixed chaparral and grasslands. Inclusions of closed-cone pine-cypress habitat type (McNabb Cypress) are found on serpentine soils spanning the northern and northeastern portions of Planning Area.

Vegetative resources have been drastically altered by numerous human-caused and natural disturbances including urbanization, historic public and private land management practices, insects and diseases, and most recently in 2008, by moderate and high severity wildfire. The 2004 Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS ROD adopts an integrated strategy for vegetation management that is aggressive enough to reduce the risk of wildfire to communities in the urban-wildland interface (WUI), while modifying fire behavior over the broader landscape.

The following provides a description of potential effects of the Proposed Action (Alternative B) and alternatives to the proposed action (Alternatives A and C) to vegetative resources, as well as proposed mitigations measures, where needed.

4.7.2 Analysis Framework: Statute, Regulation, Forest Plan, and Other Direction

Direction relevant and specific to the Proposed Action and the Alternatives as it affects vegetation resources includes:

The 1988 Plumas National Forest Land and Resource Management Plan (commonly referred to as the "Forest Plan"), as amended by the 1999 HFQLG final EIS ROD, and as amended by the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS ROD, guides proposed vegetative management activities designed to fulfill ecological, hazardous fuels reduction and contribution to local economies objectives for lands administered by the Plumas National Forest, Feather River Ranger District. The 2004 SNFPA ROD (pages 68–69) displays the standards and guidelines, including those applicable to the HFQLG Pilot Project Area (Table 2).

The Record of Decision (ROD) for the 2004 Sierra Nevada Forest Plan Amendment identified the following standards and guidelines applicable to hazardous fuels and management of vegetative resources, which were considered during this analysis process.

Relevant standard and guidelines in the Concow Project Area are:

- Where young plantations are included within area treatments, apply the necessary silvicultural and fuels reduction treatment to: (1) accelerate the development of key habitat characteristics, (2) increase stand heterogeneity, (3) promote hardwoods, and (4) reduce risk of loss to wildland fire (Management Standard and Guideline 3);
- Promote shade intolerant pines and hardwoods (Management Standard and Guideline 12);
- Goals for lower westside hardwood forest ecosystems include establishing and maintaining a diversity of structural and seral conditions in landscapes in proportions that are ecologically sustainable at the watershed scale. Fire and Fuels Management (Management Standards and Guidelines 18 - 26): see discussion under Hardwood Management.

4.7.3 Effects Analysis Methodology

Geographic Scope of Analysis

The analysis of potential effects to vegetative resources is presented from the perspective of various spatial scales. The geographic analysis area for overall direct effects includes DFPZ treatment areas proposed under the action alternatives, including public lands administered by the Forest Service and the Bureau of Land Management.

Indirect and cumulative effects were geographically assessed at the broader Concow Planning Area scale, bounded by major mountain ridges and drainage topographic features, which can be logically identified and mapped. This broad geographic analysis area was analyzed for all identified ownerships (e.g., federally-administered public, state, private lands, etc.), as well as for public lands only. This spatial context for assessing potential effects of proposed treatments to vegetative resources is considered appropriate to allow for complex influences associated with diverse land use policies and checkerboard ownership patterns. .

Data Sources and Predictive Models

Several types of data were compiled and modeled to provide the basis for understanding stand development and disturbance dynamics influencing vegetative resources within Planning Area, and the potential effects of proposed hazardous fuels reduction and vegetative treatments on this resource:

- Extensive inventories were conducted in proposed DFPZ treatment areas (except for underburn, mastication, or hand piling methods) to ensure that silvicultural prescriptions are consistent with the amended 1988 Plumas National Forest (NF) LRMP. Attributes of existing vegetation were collected to determine basal area, number of trees per acres, tree growth and species present. Vegetative inventory field methods and data protocols follow guidance described in the Forest Inventory and Analysis User's Guide for the Pacific Southwest Region.

- The Forest Inventory and Analysis program was used to generate various reports.
- The Forest Vegetation Simulator (FVS) forest growth model was used to predict forest stand development into the future, aiding in the determination of indirect and cumulative effects to vegetative resources.
- Aerial photography and eveg and asveg geographic information system (GIS) data was used to identify vegetative (timber) types on private land.
- Vegetation type mapping was completed by Ron O'Hanlon, in association with the Vegetation Management Solutions for the National Forest land in the project analysis area, and the eveg and asveg combo GIS layers were utilized to determine vegetation on private land.
- 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 was used to collect data from a series of systematic points located within a number of stands with a possible need for treatment. Sample points consisted of up to five nested plots: 1) A variable radius prism plot to gather data on large (greater than 4.9 inches diameter at breast height [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 were recorded for each live tree sampled in variable radius prism plots: species, diameter, crown position, and live crown ratio. Height and age measurements were also recorded.

  In the four remaining plots, information was collected on the number of seedlings present, the species, percent cover and average height of understory brush, and the size and condition of standing snags and large down logs. The field data were loaded into the Forest Inventory and Analysis program and then translated into the Forest Vegetation Simulator—a forest growth model that predicts forest stand development. This model was used to obtain present conditions of stands as well as predict stand development after alternative treatments.

Basis for Analysis/Vegetative Resources Indicators

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. Focusing on individual actions would be less accurate than looking at individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. By looking at current conditions, the residual effects of past human actions and natural events are captured, regardless of which particular action or event contributed to those effects.

The Council on Environmental Quality issued an interpretive memorandum on June 24,2005, regarding analysis of past actions, which states "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions." For these reasons, the analysis of past actions in this section is based on current environmental conditions.

The 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 Defensible Fuel Profile Zone (DFPZ) effectiveness (10 to 20 years).

The following vegetative resource indicators were used to assess effects:

- Tree Species Composition - Species composition is the percentage of species within individual stands, characterized by dominant vegetation types. The Concow Project evaluates tree species composition distributed across the landscape.

- Forest Health and Resiliency – Forest health and resiliency effects are discussed in terms stand density and structure. Stand density and structure is analyzed using three measures of stocking and density: trees per acre and their distribution by diameter class, square feet of basal are per acre, and percent canopy cover. These attributes aid in the assessment of overall stand structure by providing insight into the number, size and position of trees both vertically and horizontally. Landscape age class distribution is the indicator also used to measure the cumulative effects to vegetation across the Project Area. CWHR size class and density class (Mayer and Laudenslayer, 1988) is used as a proxy for seral stages to measure change on the landscape structure at a horizontal profile, allowing for a congruent analysis of effects on forest vegetation and wildlife habitat.

- Defensible Fuel Profile Zone (DFPZ) Maintenance – The need for maintenance of DFPZs was analyzed and measured by using canopy cover by proposed treatment type and percent cover of sprouting hardwoods and brush.

For purposes of this analysis, vegetative resource effects are defined as follows:

- Direct Effect is or could be caused by proposed hazardous fuels reduction and vegetative treatments on CWHR conditions

- Indirect Effects to vegetative resources could occur; placing resources at a greater risk to wildfire disturbances and altering CWHR conditions.

Vegetative Resources Methodology by Action

- **Direct/indirect effects of proposed DFPZ hazardous fuels reduction and vegetative forest health treatments to vegetative resources.**

Considerations: The establishment and maintenance of proposed Defensible Fuel Profile Zones (DFPZ) in the project area has the potential for both adverse and beneficial effects to vegetative resources in both the short term and long term.

Short-term timeframe: 1 year.

Spatial boundaries: Proposed treatments areas, burned and unburned areas within the Planning Area.

Indicators:

Unburned area:

(1) Change in tree species composition (shifts from shade tolerant to shade intolerant tree species; black oak trees per acre by size classes [existing and post treatment]), and; (2) Percent changes in acres of California Wildlife Habitat Relationship (CWHR) size classes and stand density characteristics measured by canopy closure, basal area in square feet per acre; and trees per acre (pre and post treatments).

Burned area:

(1) Tree species composition (shifts in shade intolerant and shaded tolerant tree species); and (2) Snag fall and average number of snags per acre.

Long-term timeframe: 20 years.

Indicator: (1) Potential risk for adverse effects associated with destructive wildfire.

Methodology: Alternative B (the Proposed Action) - potential direct and indirect effects are discussed in relationship to predicted shifts in tree species composition, forest health and forest resiliency, as influenced by various proposed DFPZ treatment methods or types. For the purpose of evaluating these 3 ecosystem indicators, treatment types are organized into unique groupings considered to have similar effects to vegetative resources. Treatment methods are grouped and evaluated as follows:

- Removal (Burned area only)
- Radial Release and Thinning (Unburned area only)
- Mastication and Chipping
- Handcutting, Handpiling, and Lop and Scatter
- Underburning and Pile Burning
- Tree Planting (Burned area only)
- Oak Release

For Alternative C (the Alternative to the Proposed Action), potential direct and indirect effects are also discussed in relationship to predicted shifts in tree species composition, forest health and forest resiliency, influenced by the various proposed treatment methods or types. Treatment methods are grouped and evaluated as follows:

- Roadside Danger Tree Felling
- Mastication and Chipping

- Handcutting and Handpiling
- Roadside Pruning
- Underburning and Pile Burning
- Tree Planting (Burned area only)
- Oak Release (Burned area only)

Predicted modeled forest stand development as described herein, in relationship to current conditions (No-action Alternative) and spatially overlapping proposed DFPZ treatment areas (action alternatives B and C).

Rationale: The *National Environmental Policy Act* requires the federal Government to insure consideration of economic and environmental aspects of various systems of renewable resource management, including the related systems of silviculture and protection of forest resources. The Act provides land management direction including:

- Provide for diversity of plant and animal communities based on the suitability and capability of the specific land area;
- Steps should be taken to preserve tree species diversity;
- Timber harvest (or biomass operations) will not irreversibly damaged, soil, slope or other watershed conditions;
- Protect 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)).

- **Cumulative effects of proposed DFPZ hazardous fuels reduction and vegetative forest health treatments to vegetative resources.**

Considerations: Cumulative Effect is or could be caused by proposed hazardous fuels reduction and vegetative treatments to affect CWHR conditions for the long-term.

Short-term timeframe: not applicable; cumulative effects analysis would be done only for the long-term time frame.

Long-term timeframe: 10, 20 and 25 years.

Spatial boundaries: Planning Area (all ownerships and public land only) -Vegetation management activities have localized effects on vegetation attributes such as canopy cover, tree density, and tree size and are generally confined to the treatment area. Therefore cumulative effects analyses of vegetation resources are geographically bounded to the Concow Planning Area.

Indicator(s): Defensible Fuel Profile Zone (DFPZ) Maintenance analyzed and measured as shifts in tree canopy cover from pre-treatment conditions by proposed treatment type and percent cover of sprouting hardwoods and brush.

Methodology: Use existing data from vegetative resource aerial imagery, maps (GIS spatial layers), information obtained from field inventories of the project area; modeled using the Forest Vegetation Simulator (FVS).

Rationale: The Final Supplemental Environmental Impact Statement (2003) to the HFQLG Act FEIS and ROD documented the environmental analysis of the effects of alternative management strategies for the maintenance of DFPZs within the HFQLG Pilot Project Area. 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 2 years of the treatment to be effective. By not including the use of herbicides for the Concow project at this time, their use for DFPZ maintenance is essentially precluded. If DFPZ objectives in treatment units are not met, an underburn could 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 treatments such as mastication and grapple pulling and hand treatments. The use of herbicides for DFPZ maintenance within the Concow project is not being proposed at this time.

4.7.4 Environmental Consequences

Alternative A - No-action

Direct and Indirect Effects to Vegetative Resources:

Burned Area

Tree Species Composition. Leaving areas of high vegetation burn severity untreated under the no action alternative would allow sprouting hardwoods and brush to completely recover the site. Sprouting hardwoods number in the thousands per acre in most areas, and include tanoak, canyon live oak, black oak, and California bay laurel. These hardwoods along with a variety of brush species are expected to achieve high density and stocking levels within a relatively short period of time following the fire.

In Figure 4-4 below, a typical stand of sprouting black oak and tanoak has hundreds to thousands of stems per acre following the fire. Current age classes of mixed conifer and mixed conifer-hardwood remaining in partially burned areas will slowly contribute to the eventual re-establishment of conifer species by increasing seed availability. Natural regeneration of conifers would be confined to areas surrounding a local limited seed source.

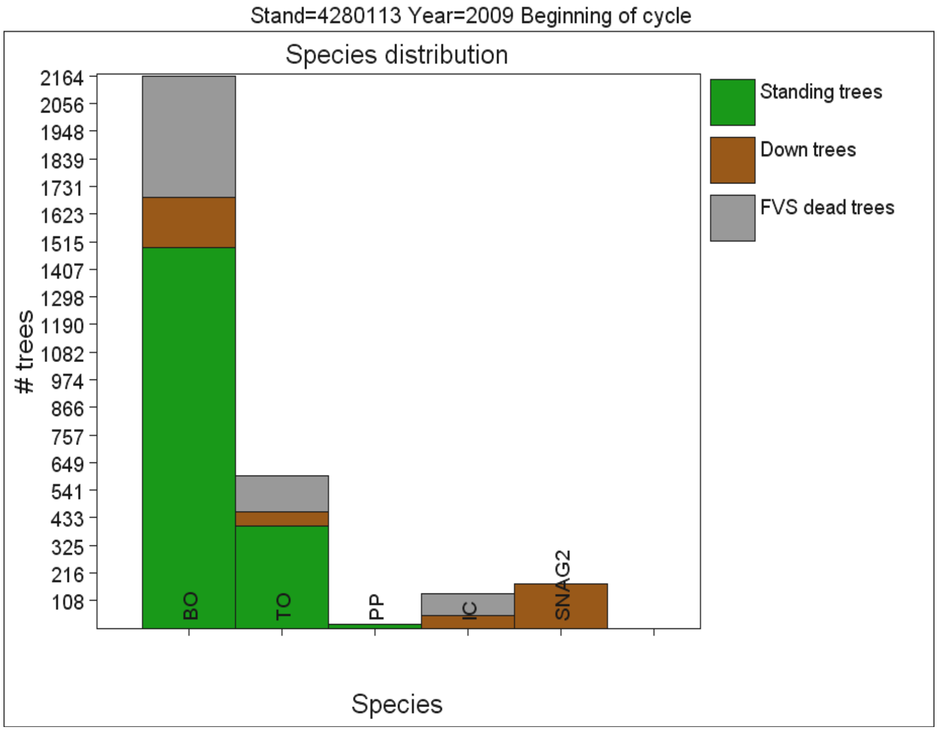


Figure 4-4 Species Composition for Typical Stand with Sprouting Hardwood Component, Post-Fire in the No-Action Alternative (FVS Simulation)

Forest Health . Canopy closure of hardwoods is expected to occur within 10-15 years on some of the highly productive tanoak areas and within 15-20 years on less productive sites. Cover will be composed mainly of brush and hardwoods. Studies measuring tanoak sprout height growth following fire and cutting in Trinity County and elsewhere show tanoak sprouts were from 4-15 feet tall within 6 years after disturbance with crown diameters from 5 to 15 feet (Roy 1957, McDonald, 1999). Initial height growth of tanoak often surpasses that of all other vegetation immediately after disturbance. One year after the BTU fire, field observations note that tanoak sprouts exceed 3 feet in height on the best growing sites.

Black oak height growth post disturbance is less impressive than tanoak but still responds well to open growth conditions, on good sites reaching 4-5 feet by year 4 (Plumb and McDonald, 1981). Growth projections utilizing the Forest Vegetation Simulator (FVS, 2009) on stands in the Concow area indicate moderate to high early growth rates, though growth rates were less for sites in the Concow area compared to those on the more productive sites in the Challenge studies. Ten year growth projections (FVS) following BTU fire was 2-9 feet for black oak and 4-13 feet for tanoak. Both tanoak and black oak are capable of outgrowing and out-competing any conifer seedlings that may become established post-fire.

The absence of a conifer seed source in many areas will result in domination by shrubs and/ or hardwoods for several decades in the future. Competing vegetation such as *Ceanothus spp* and *Arctostapholus spp*. have dormant seed stored in the soil that was stimulated by fire, forming a literal carpet of brush seedlings.

Studies show that following fire, tens of thousands of *Ceanothus spp*. seedlings may germinate and develop to a height of 2-8 feet in 10 years and 70-90 percent cover (Anderson, 2001). Brush cover becomes limiting to growth of conifer seedlings, sapling and pole size trees when it reaches 30 percent cover, estimated to occur in 3-5 years following fires. In partially burned areas, new conifer seedlings will face formidable competition from the variety rapidly growing brush species.

Forest Resiliency. Over the next 5 to 20 years, the tops of standing snags will begin to break off and fall to the ground. According to a summary of the literature pertaining to snag fall rates (Smith and Cluck, 2007) a number of factors are influential on fall rate including tree diameter breast height (DBH), species, cause of mortality as well as other indirect determinants such as weather and slope position. Generally, a lag time exists from to 2 to 5 years before the smaller trees (<10 inches DBH) fall, followed by larger trees.

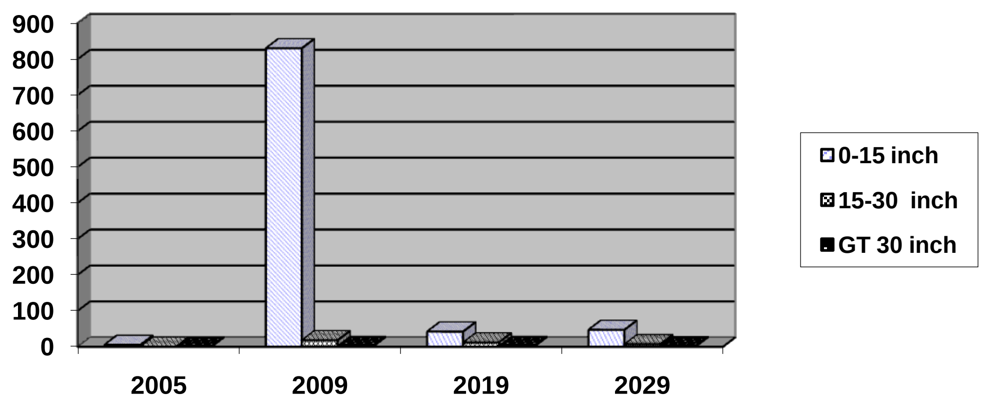


Figure 4-5 Average number of Snags per Acre Post-fire (2009-2029) as Predicted by FVS

In the above mentioned study, the “fall rate” (half life of snags) was the number of years required for half of the snags to fall in the sample of studies over the years. Smith and Cluck reported that in six different studies, over half the snags fell in 4 to 16 years time following fire. In FVS projections for the Concow area, over 95 percent of the snags fell within 10 years (See figure 4-5).

Of the total snags that fell or broke off, 90 percent were less than 15 inches in diameter. The potential amount of small diameter fuel loading less than 15 inches in diameter is significant issue for future vegetation management and presents a problem for future stand resiliency to fire and other disturbances.

Over time larger falling snags (>15 inches in diameter) that break apart will slowly accumulate and contribute to additional surface fuel loading. Estimates of standing dead trees per acre in the Concow area represent a range of 100 to over 150 tons per acre. This heavy fuel accumulation along with naturally regenerating brush and hardwoods, will lead to a future long-term vegetation management concern for future fire resiliency both from natural and planned fire ignitions. Studies examining the long term effects burning of large coarse woody debris (Monsanto and Agee, 2008) found that fuel loading of coarse woody debris post-fire was much higher than what would be found naturally in old growth stands and was in excess of optimum levels necessary for wildlife and soil concerns. Down log decomposition rates in one study indicated that it could take from 100 to 150 years for large logs to decompose, leaving heavy woody debris on the ground indefinitely.

As shown below in Figure 4-6, hundreds of standing dead and down trees would be intermixed with post-fire hardwood sprouts. In addition, during post-fire activities, hundreds of live and fire-killed trees on National Forest land were felled and left along PG&E Transmission lines, creating additional fire hazard along roads, through stands and adjacent to private property.

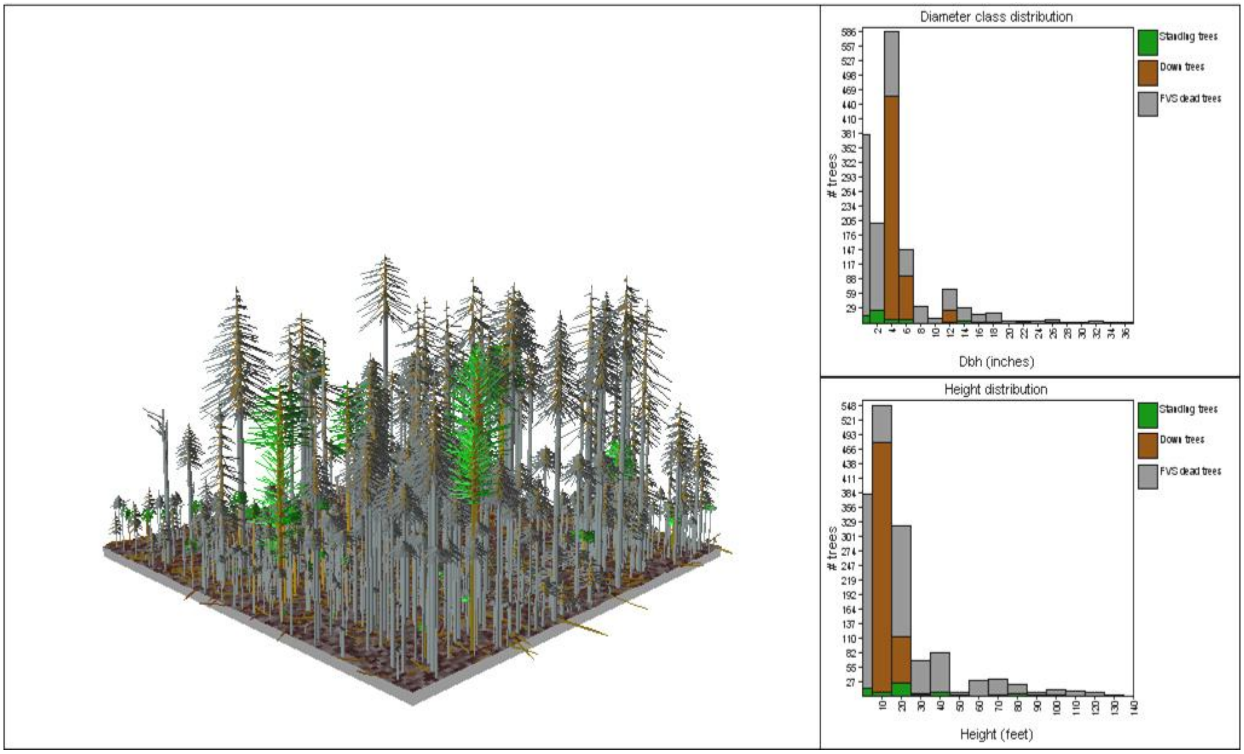


Figure 4-6 Number of Down Logs and Snags per Acre, FVS Simulation, Post-fire

Post-fire brush and tree development in the nearby Concow Fire (1999) are visible examples of the potential future condition for the Concow area- one at risk for severe fire; a near impenetrable thicket of brush and small diameter hardwoods and conifers. In combination with down woody and standing dead material, a potential for high fire risk exists under extreme dry or windy weather conditions that are common to the area. Fire-adapted brush and hardwoods often have resinous leaves or foliage containing volatile oils that may contribute to fire hazard (Webber, 1987). Both *Ceanothus* and *Arctosthapholus* brush species have the physical and chemical characteristics that produce a highly flammable shrub. While in the early stages of succession, these shrubs have relatively low flammability. With shrub maturation, however, plant material dies and dries out, and the dead fuel increases and accumulates (Tappeiner etal, 2007). This overly dense forest condition is not resilient to disturbance from fire.

Figure 4-7 Vegetative recovery following the 1999 Concow Fire

A relatively even aged, very dense thicket of black oak, tanoak, canyon live oak and other hardwoods and brush will develop in 10 to 20 years time, much like that seen above in the 1999 Concow fire. Modeling utilizing FVS (2009) suggests that hundreds of stems of hardwoods could range from 8-20 feet in height and 50-70 percent canopy within 10-20 years. Dense brush fields of *Acrtostapholus and Ceanothus* spp. from 5-8' tall would be interspersed with regenerating hardwoods, patches of remnant conifers, and post-fire conifer seedling recruitment along with down and standing dead trees. Within the Concow area, fire hazard or risk to recovering vegetation is likely to slowly increase overtime as brush matures and becomes decadent, creating a continuous fuel ladder into the re-established hardwood/conifers.

Past experience with areas of severe heavy fuel loading and fire risk indicates that concerns for severe stand replacement fire may be warranted. The Megram fire (1999) followed a severe blow down event that left heavy fuel loading across a wide area. A lightning storm several years later burned through some of that same area, resulting in significant effects to vegetation, wildlife and salmonid habitat (Jimerson and Jones, 2001). A portion of the nearby 2000 Storrie fire experienced a reburn during the BTU Complex fires.

Field observations during the 2008 BTU fire by Resource Advisors (Roskopf, Pers. Comm., 2008) indicated that remnant standing snags and burning logs helped to carry the fire through the brush and ground cover that had become established post-fire, setting back vegetative recovery within portions of the former Storrie fire within the BTU perimeter. The Concow area has experienced several fires and hardwood regrowth over the last decade consumed by the BTU fires, causing devastating results in the loss of life and property. During the next 10-30 years without management, the natural young stands will likely continue to be at increased risk for loss to wildfire.

Defensible Fuel Profile Zone (DFPZ) Maintenance. No DFPZ maintenance activities would be necessary if no planned fuel reduction actions were undertaken.

Alternative A - No-action

Direct and Indirect Effects to Vegetative Resources:

Unburned Areas

Tree Species Composition. In areas outside of the burn perimeter, shade tolerant tree species such as Douglas-fir, white fir, incense cedar and tanoak will continue to develop in the understory. Historically, forests had higher proportions of shade intolerant species such as ponderosa pine and sugar pine than are currently represented. These tree species require full sunlight and open areas with bare mineral soil to become established.

Figure 4-8 Percent Tree Species Composition 2009, FVS

Without disturbance, there would be little opportunity for the naturally dominant pine species to regenerate. Sugar pine and ponderosa pine have declined in numbers, and shade tolerant conifers have increased in numbers. Douglas-fir, tanoak and incense cedar would continue to become a larger proportion of the tree species mixture in the future. Large shade intolerant conifers such a ponderosa and sugar pine may gradually die out of a stand due to lack of natural pine regeneration and increasing competition from overcrowding. Black oak, though seemingly found in high numbers in some stands as shown above, is being gradually shaded out by taller growing conifers.

When averaged across the proposed green treatment units, the number of black oak trees is highest in the seedling and sapling sizes class and low in the larger tree size classes (see table 4-24 below).

Table 4-24 Average number of black oak trees per acre by dbh, unburned areas

Tree Size (diameter 4.5 ft. above ground level)	0-6"	6-12"	12-16"	16-20"	20-24"	24-28"	Treesgreater than 30"	Total Trees Per Acre
Trees per acre (TPA)	303	12	1	1	1	1	1	320

In the absence of disturbance, California black oak is slowly being replaced by understory ponderosa pine and Douglas-fir at low elevations or by ponderosa pine, sugar pine, incense-cedar, and white fir in mid elevation mixed-conifer forests (McDonald, 1980). Some oaks may linger in the subcanopy but never reach full development in shaded conditions. Black oak provides mast as a food source and as a large tree contributes important cover and structure for a variety of wildlife species. Without disturbance or created openings, the number of large black oak in individual stands would continue to decrease and decline in vigor as they are overtopped by conifers.

Forest Health. Within the unburned areas in the Concow Project Area, stand growth will decrease and vigor continue to decline in overstocked dense stands, putting these stands increasingly at risk for insect and disease related mortality. The combination of overly dense stands, continued drought and pathogens will lead to higher levels of tree mortality, especially in the lower crown classes and will act to increase surface fuel loading. In addition, as shade tolerant fir and incense cedar tree species become established, they form a multiple layer or vegetation or ladder fuels.

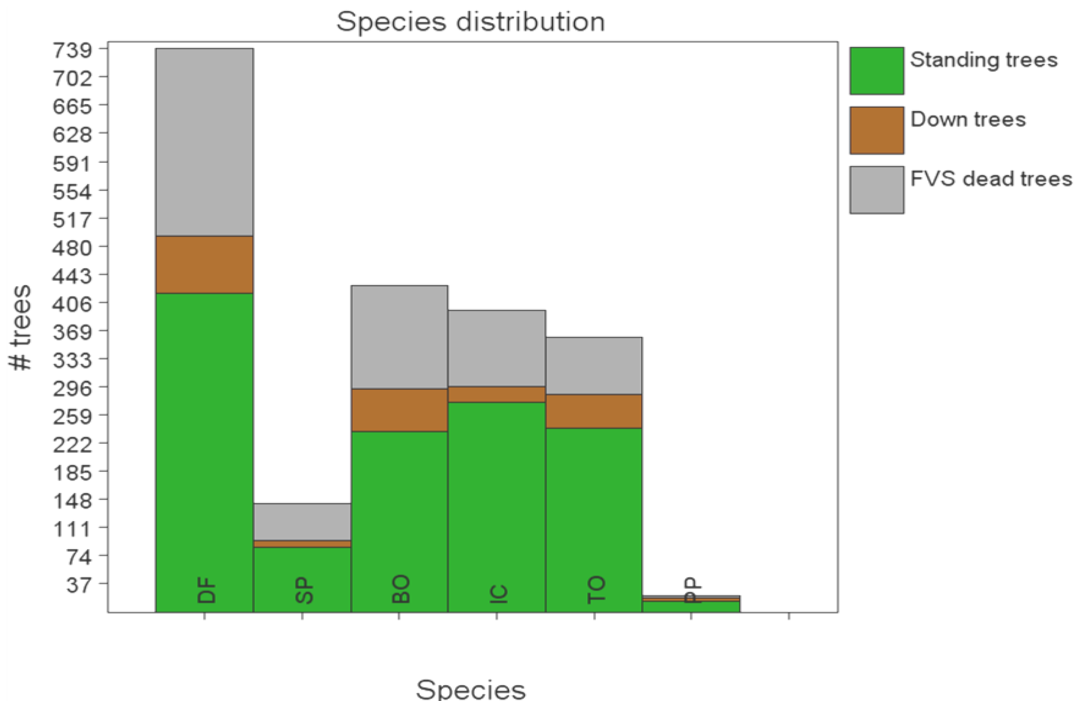


Figure 4-9 Percent Species Composition 2029, Projected by FVS

Forest Resiliency. When low severity fires were allowed to burn through these forests at regular intervals, every 10-15 years or so, shade tolerant species would be kept below the lower reaches of the overstory foliage.

Figure 4-10 Continuity of vertical and horizontal tree fuel layers, FVS Simulation 2029

In the absence of fire or with fire exclusion, surface and ladder fuels would continue to accumulate, adding to an already heavy fuel loading. Note in that Figure 11 above, the vertical and horizontal layering of trees contributes to fuel ladders and increased fire risk. Under extreme weather conditions, these forests would continue to be at risk for insect attack and worse, severe losses to wildfire.

Pine tree species are more resilient to the effects of fire than fir, cedar or tanoak, which are easily killed as young saplings and pole size trees, and retain their lower branches longer, acting as ladder fuels. For these reasons, pine species are more desirable species for retention within DFPZ treatments.

Defensible Fuel Profile Zone (DFPZ) Maintenance. No DFPZ maintenance activities would be necessary if no planned fuel reduction actions were undertaken.

Alternative B

Burned Area

Tree Species Composition - Direct and Indirect Effects

Removal. Removal of dead conifer trees will have no effect on future tree species composition. Removal of dead trees through helicopter and tractor logging methods could damage regenerating hardwoods by felling and skidding trees. The logging system method utilized, either tractor or helicopter, will have little to no effect on future species composition. Areas left untreated within RHCA's for protection or due to inaccessibility will be left to regenerate naturally with hardwoods and brush.

Roadside danger trees found along the road prism would be marked for removal according to Forest Danger Tree Marking guidelines.

Mastication and Chipping. Mastication and chipping of residual live small diameter conifers in low and moderate vegetation burn severity areas would favor the retention of shade intolerant conifers and hardwoods. Thinning by way of mastication would favor retention of healthy individual conifer trees where existing. Mastication of live clumps of sprouting hardwoods will be accomplished to an approximate residual clump spacing of 25 feet, selecting to retain black oak over tanoak where possible and establishing initial DFPZ spacing.

Handcut, handpiling and lop and scatter. Thinning out overstocked and/or damaged small trees would favor retention of pines and black oak outside of RHCAs. Within RHCA's, riparian vegetation would be favored over other species with emphasis on retaining big leaf maple dogwood and California bay laurel over tanoak sprouts.

Underburning and Pile Burning. Underburning is non-selective and is not likely to change species composition in favor of one species over another.

Planting. Three former plantations that were lost during the fire will be replanted with pine species including ponderosa and rust-resistant sugar pine where available. Low density planting will occur in clumps on a 30 foot spacing to mimic natural regeneration. At lower elevations, some Douglas fir may be added to the mixture. After planting, proposed release treatments would favor planted trees over competing hardwoods. Without these post-planting treatments, hardwoods and brush would outcompete and overtop the conifer seedlings.

Oak release. Release of individual black oak stems within sprout clumps will have no effect on species composition.

Forest Health – Direct and Indirect Effects

Removal. Removal of dead trees should have little effect on vegetative health conditions. Some damage may occur to regenerating hardwoods from tree felling, skidding and removal activities, however, the high number of hardwood sprouts should ensure adequate numbers of residual trees.

The logging system method utilized, either tractor or helicopter, will have little effect on forest health. In a tractor only option, areas left untreated within RHCA's due to protection measures or inaccessibility would regenerate naturally with hardwoods and brush.

Mastication and Chipping. In studies conducted by the Pacific Southwest Experiment Station (Kane etal, 2006), several brush and hardwoods areas that were treated with mastication left residues in a range of 0 to10 inches in depth, with the heaviest fuels found where significant tanoak was present. Material left on site in the form of small chips could reduce site productivity in the short-term as significant resources are required to break down woody material.

Handcutting, handpiling and lop and scatter. Hand cutting and piling will remove both small dead and live trees and brush. Effects of thinning or removing small trees may slightly affect species composition where remnant live patches of vegetation exist; intolerant species will be favored over tolerant species.

Underburning and Pile Burning. Burning may result in a higher incidence of fire-stimulated shrubs. Heat from fires may also scorch and kill residual trees. (Knapp et al., 2007). Underburning is non-selective and is not likely to change species composition in favor of one species over another.

Planting. Because the planting of conifers is planned for just a few former plantations effects on forest health will be minor in scale. Some recovery of a multi-stand structure could result if the planted trees survive until they are eventually able to overtop hardwoods and brush. Planting of shade intolerant conifers will enhance species diversity in former plantations now dominated by sprouting hardwoods and brush. Conifer growth would be inhibited by the amount of hardwoods and brush and several release treatments would be needed to ensure survival.

Oak release. Release of individual black oak stems within sprout clumps would focus growth on fewer stems. Reducing oak clumps to 5-7 residual stems would increase diameter growth on remaining stems, allowing for faster development of larger oak trees.

Forest Resiliency - Direct and Indirect Effects

Removal. Recovering forests would be more resilient to fire when heavy fuel accumulations were reduced, avoiding an excess buildup of standing and surface fuels.

Logging system method, either tractor or helicopter, may have different effects on forest resiliency. In a tractor only option, areas left untreated within RHCA's due to inaccessibility would have long-term accumulations of standing dead and down woody debris. The use of tractor in lieu of helicopter in Section 34 of the project area could limit future vegetation management options of the naturally regenerating stand because of excess fuel loading, and could also increase the potential future fire severity in these areas. The helicopter option for Section 34 would allow for more complete treatment of RHCAs and surrounding pockets of vegetation that would be excluded due to inaccessibility.

Mastication and Chipping. Mastication of dead brush and small trees would redistribute surface fuels and provide ground cover. Branches of sprouted hardwood and brush species may incur slight damage but will not be substantially removed. Young stems of hardwoods and brush are pliant and resilient to mastication. Masticated fuel levels will vary from site to site dependent on the vegetation being treated and the type of equipment being used.

These factors are important in determining fuel loading and potential time of soil heating following burning. Recent studies have examined the use of mastication and its effects on soils, residual vegetation and soil organisms. Burning masticated fuels can result in lethal temperatures to roots and soil organisms (Busse et al., 2005). Experimental burning showed that only under very dry soil conditions were lethal temperatures reached for plants. Prescribed burning of masticated fuels when soils are moist is recommended (Busse et al., 2005).

Masticated material may inhibit the establishment of shrubs in some cases; when mastication is followed by burning, it may result in a higher incidence of fire-stimulated shrubs. Heat from fires may also scorch and kill residual trees. (Knapp et al., 2006)

Handcutting, Handpiling, and Lop and Scatter. Hand cutting and piling will remove both small dead and live trees and brush. Effects of thinning or removing small trees should have minor effects on canopy cover, trees per acre and basal area. Lop and scattering of small trees and brush could increase surface fuel loading.

Underburning and Pile Burning. Burning may result in a higher incidence of fire-stimulated shrubs. Heat from fires may also scorch and kill residual trees. (Knapp et al., 2006).

Planting. Planted areas established after the fire will be at some increased risk for fire, however the widely spaced, non-continuous nature of cluster planting will mimic natural seedling establishment of tightly clustered groupings of trees. Young shrubs and hardwoods will likely be present in these planted areas.

Oak release. Oak release and subsequent increased diameter growth would increase forest resiliency in the long-term as mature oaks are more fire resistant than younger oaks as thicker bark develops.

Alternative B

Unburned Area

Tree Species Composition - Direct and Indirect Effects

Radial release and DFPZ thinning. Radial release will reduce the number of shade tolerant conifers such as white fir, Douglas-fir and incense cedar surrounding older larger ponderosa and sugar pine and black oak. Radial release is a thinning technique that reduces the amount of low vigor, often poor quality trees that are considered competition and fuel ladders for larger desirable fire-resistant ponderosa pine, sugar pine and Douglas-fir. Tree species favored for retention in DFPZ are ponderosa pine, black oak, and sugar pine. Shade tolerant Douglas-fir, white fir and incense cedar would be preferentially removed in areas where they may be crowding large diameter pine and black oak. Openings in the canopy, as created by activities, could influence the growth of tanoak (both existing and that of new regeneration) as tanoak would respond to canopy release (McDonald. P., 1980), however, locations of radial release would be selected to avoid tanoak areas where possible.

Radial release of conifers would be conducted around one to three of the largest healthiest growing sugar pine, or ponderosa pine > 24 inches in diameter on a per acre basis. Radial thinning would correlate to tree DBH. For example a 24 inch diameter tree would have a radius thinning of 24 feet. Radial thinning or release would not exceed a 30 foot radius. Undesirable pines less than 24 inches in diameter and all other conifers less than 28 inches in diameter would be removed in the maximum 30' zone of radial release. Black oak trees greater than 6 inches in diameter would be retained during pine radial thinning where operationally feasible. Across an average acre, a potential maximum area of 1/5 of an acre could be affected by radial thinning surrounding 3 large pines if all were greater than 30 inches.

Radial release would be conducted around all living black oak trees 6 inches in diameter or greater, on up to 5 trees per acre. The intent of the release is to promote the health and retention of larger black oak by removing competition while retaining large conifers. Where the presence of larger black oaks is lacking, retention of smaller oaks greater than 6 inches will be recruited for radial release. This will also promote a more fire resilient structure. Treatments are also expected to encourage acorn production for the benefit of a variety of wildlife species and promote the more vigorous growth of individual oak trees. Across an average acre, a potential maximum area of 1/4 of an acre could be affected by radial thinning surrounding up to 5 large oaks per acre.

Where no large pine or black oaks are present, thinning from below to forty percent canopy would occur within the DFPZ.

Mastication and Chipping. Thinning the understory trees through mastication and chipping would favor the retention of underrepresented conifers and hardwoods (sugar pine, ponderosa pine and black oak) over more common conifers such as white fir, Douglas-fir and incense cedar and hardwoods such as tanoak.

Handcut, Handpiling, and Lop and Scatter. Handcut and handpiling would favor retention of under-represented conifers and hardwoods (sugar pine, ponderosa pine and black oak) over more common white fir, Douglas-fir, incense cedar and tanoak.

Underburning and Pile Burning. Underburning is non-selective, and compared to mechanical treatments would not be likely that favored species would be retained. Localized torching from underburning would provide small openings where shade intolerant species may become established and grow.

Forest Health - Direct and Indirect Effects

Radial release and DFPZ thinning. In CWHR Size Class 4 and 5 proposed treatment units, radial release would reduce competition around healthy shade intolerant pine and black oak. The overall effect of thinning will be to temporarily increase the health and vigor of remaining pine and black oak species. Removal of the suppressed, intermediate and a few co-dominant trees surrounding large trees could help to maintain the growth and vigor of the older more mature pine and oak trees. Individual tree mortality could decrease with DFPZ thinning, especially in the lower crown classes. Tree health would be improved by reduced stocking levels, making stands less susceptible to insect attack and moisture stress. Trees with better vigor may pitch out insects with more success than trees that are severely stressed from overstocked conditions (Tappeiner et al., 2007).

Table 4-25 displays the existing stand structure in terms of trees per acre for CWHR Size Class 4 and 5 stands within treatment units. These values are estimated from the Forest Vegetation Simulator (FVS) growth model. The FVS model is a distance independent model where the spatial arrangement or distance between trees are not modeled, therefore, when thinning, the model thins from below until the canopy cover and basal area or tree size requirements have been met.

The change in overall basal area and trees per acre between the No Action and Proposed Action is presented in Tables 4-25 and 4-26 below. Table 4-25 displays the average trees per acre by size class. If radial release and thinning are implemented as proposed in Alternative B, some trees from the medium size classes would be removed. FVS modeling shows the highest proportion of trees removed during radial release and thinning would be from the lower sapling, pole and small tree size classes.

Table 4-25 Average Number of Trees per Acre by Size Class Before and After Treatment

Trees per Acre by Size Class							
		Sapling	Poles	Small Trees	Medium Trees	Large trees	
	Alternatives	0-6 inch dbh	6-11 inch dbh	11-20 inch dbh	20-30 inch dbh	Greater than 30 inch dbh	Total Trees per Acre
CWHR Size Class 4							
Before treatment	A	1530	87	48	22	8	1696
After treatment	B	10	15	36	18	8	88
CWHR Size Class 5							
Before treatment	A	1158	68	81	37	14	1360
After treatment	B	0	0	0	26	15	41

Table 4-26 displays the average stand density of CWHR size class 4 and 5 stands in terms of basal area per acre. Basal area is a measure of the cross-sectional area occupied by individual trees. Basal area following treatment would easily exceed the minimum requirements under the HFQLG guidelines to retain 40 percent of the existing basal area. Reducing stand density would benefit stand health and vigor.

Table 4-26 Average Basal Area per Acre by Size Class Before and After Treatment for Alternative B

Basal Area per Acre by Size Class							
		Sapling	Poles	Small Trees	Medium Trees	Large trees	
	Alternatives	0-6 inch dbh	6-11 inch dbh	11-20 inch dbh	20-30 inch dbh	Greater than 30 inch dbh	Total Basal Area per Acre
CWHR Size Class 4							
Before treatment	A	19	32	56	79	50	235
After treatment	B	1	4	45	78	51	180
CWHR Size Class 5							
Before treatment	A	17	25	99	125	132	399
After treatment	B	0	0	0	89	140	229

Retention of larger hardwoods and protection of large pines through the use of radial release focuses on the removal of shade tolerant fir and cedar occupying the lower size classes. Thinning of conifers surrounding large oak may help ensure the longevity of these structurally important tree species for wildlife, allow for continued height growth and is an important management strategy for maintaining species diversity (Tappeiner et al., 2007, North et al., 2009).

When thinning in mixed species stands, irregular spacing and clumping would likely result, rather than regularly spaced stands due to the retention of less common species as sugar pine and black oak that are found in clusters, and the number of larger size trees greater than 30 inches. Diverse mixed species stands may also be more resilient to natural disturbances from pathogens or insects that affect individual tree species.

Hardwoods will continue to occupy the lower and mid-canopy layers as illustrated in Figure 4-12 below. Viewed from varying perspectives in the FVS simulation below, the variety in size, tree species composition and crown position is maintained through release and DFPZ thinning. Vertical and horizontal heterogeneity would still be provided by protecting large diameter black oak and retaining some of the larger black oak and tanoak clumps found throughout stands.

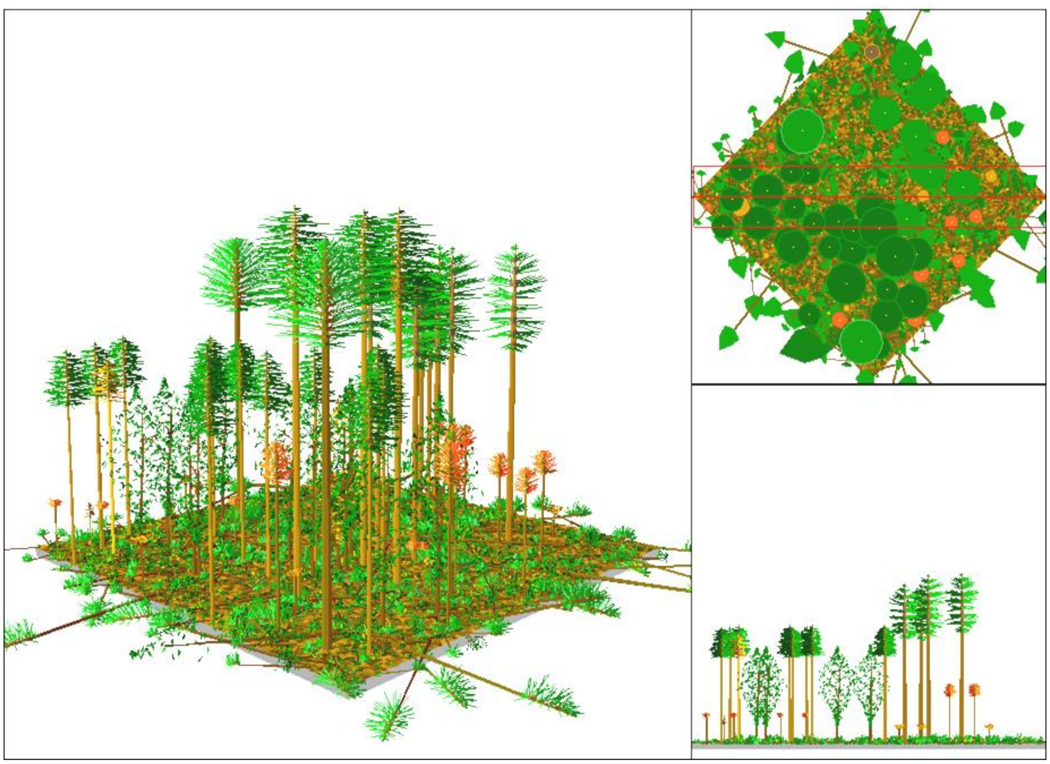


Figure 4-8 Thinning to 40-50 percent canopy cover in typical stand (FVS 2009)

Mastication and Chipping. Treatment of competing conifers and brush through mastication would result in improved tree growth and vigor of remaining conifers. Maintaining health and vigor of conifers would reduce the risk of bark beetle populations increasing and attacking adjacent stands.

Handcut, Handpiling, and Lop and Scatter. Treatment of small trees through handcutting and hand piling would have a beneficial effect on residual small trees, reducing inter-tree competition and result in less mortality in the lower crown classes. Lop and Scattering of small diameter trees and brush should be utililzed where light thinning is necessary and existing surface fuels are not excessive.

Underburning and Pile Burning. Underburning when conducted under the proper conditions would reduce ladder fuels, competition between small trees, reduce brush and could improve growing conditions for residual trees. Some mortality of individual trees could occur.

Forest Resiliency - Direct and Indirect Effects

Treatment of DFPZs should result in a more open stand dominated by larger, fire-tolerant tree species. Post-treatment canopy cover will likely vary between 40 to 60 percent in CWHR 4 and 5 stands respectively.

Radial release would also leave clumps of residual larger diameter pines, black oak and Douglas-fir. The proposed treatment units are heavily utilized by area residents and recreationists, increasing the potential risk of fire ignition near populated areas. Radial thinning and matrix thinning within the DFPZ would enhance forest resiliency to disturbance from fire by reducing the overall canopy density in the Defense Zone of the WUI adjacent to communities. Many intermediate and co-dominant shade tolerant trees (a function of crown position as well as tree size and species) have branches the full length of the bole that can act as ladder fuels into the canopy. This low branching habit is particularly common in white fir, Douglas-fir and incense cedar found in the suppressed, intermediate and some co-dominant crown classes in project area.

In size class 4 stands, the majority of stands proposed for treatment, radial thinning will reduce the mid and lower canopy level immediately surrounding the large pine and oak trees to approximately 30 percent, as displayed in table 4-27. Radial thinning and the surrounding DFPZ thinning from below would leave an average residual canopy of 40 percent when combined with radial thinning. In the one size class 5 stand proposed for radial release and thinning, retention of all trees greater than 30 inches in diameter may result in canopy cover approximating 55-60 percent. Thinning throughout the remainder of the DFPZ, where radial release may not be utilized, would follow the traditional thinning from below to 40 percent canopy cover.

Table 4-27 Existing and Post Treatment Canopy Cover by CWHR Size Class

Treatment Group	Alternative A - No Action Average Canopy Cover	Alternative B –Proposed Action Average Canopy Cover
CWHR Size Class 5 Radial Release - Thin	83 %	60%
CWHR Size Class 4 Radial Release - Thin	80%	40%

Canopy cover was modeled utilizing FVS for thinning from below and radial release of pine and oak. The range of canopy cover retention may be higher than HFQLG guidelines of 40 percent retention due to the number of large diameter trees and the amount of tanoak found in the understory.

In addition, topography, including steep slopes, the high number of Riparian Habitat Conservation Areas (RHCAs), proximity to urban neighborhoods and land access issues that have acted to confine the treatment options in some of the proposed treatment units, leaving a higher canopy cover across the landscape. Additional fuel reduction benefits from radial release and thinning could be realized in the strategically important ridge tops and areas immediately adjacent to communities by the reduction of canopy cover.

Reducing the density of trees in the suppressed, intermediate, and some co-dominant crown classes would decrease the amount of ladder fuels growing underneath the overstory crown canopy, thereby reducing fire hazard. Thinning would generally occur from below to remove ladder and canopy fuels to increase ground to crown canopy height and spacing between trees (See Figure 4-12). Although thinning will occur primarily in the lower crown classes, those trees retained will consist of the intermediate and co-dominant crown classes, and would likely realize improved diameter growth and the eventual development of thicker bark characteristics, improving their resistance to damage from fire.

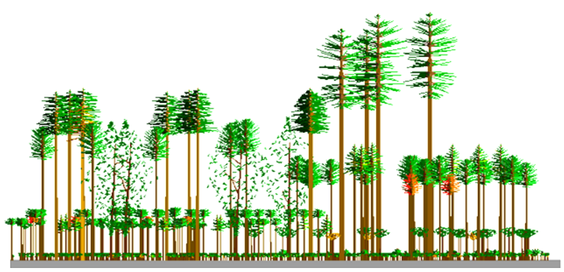


Figure 4-9 Ladder and canopy fuels, FVS 2009

Removal of suppressed and intermediate trees would be emphasized in DFPZs. Some codominant trees would be removed if their crown is beneath and adjacent to a healthier larger tree, particularly where the radial thinning prescription is employed. Crown separation and removal of ladder fuels would act to protect larger pine and oak from fire climbing and spreading into the canopy.

Mastication and Chipping. Mastication would re-arrange fuels by removing fuel ladders, though it would not by itself change total fuel loading.

Handcut, Handpiling, Lop and Scatter. Removal of ladder fuel potential from small diameter trees would be a complementary action to radial release and thinning by lessening the numbers of both live and dead small trees and brush.

Underburning and Pile Burning. Prescribed burning would have the potential to change stand structure by burning the understory vegetation and suppressed and intermediate size trees.

Alternative C

Burned Area

Tree Species Composition - Direct and Indirect Effects

Roadside Danger Tree Felling. Felling of roadside danger trees would have no immediate effect on tree species composition. Damage to regenerating hardwoods could occur during felling operations. Areas of heavy accumulations of large down woody debris along roadsides could limit tree planting and any future timber stand improvement activities in these areas.

Mastication and Chipping. The effects of mastication and chipping of small diameter dead trees and brush would be similar to those found in Alternative B. Treatments would favor the retention of live intolerant conifers and hardwoods where still present at required spacing.

Handcutting and Handpiling. Handcutting and handpiling small diameter live and dead trees could slightly affect species composition of live residual conifers as it would favor retention of surviving intolerant species such as ponderosa pine over tolerant species such as incense cedar and white fir.

Roadside Pruning. Roadside pruning would be limited to remaining residual live trees following handcutting and piling. Pruning would occur to a height of 12 feet or up to 1/3 of the remaining live crown of a tree. There would be no effect to species composition as result of pruning.

Underburning and Pile Burning. The effects of underburning and pile burning in Alternative C would be similar to Alternative B, where scorching and individual tree killing may occur. Underburning is non-selective and is not likely to change tree species composition.

Tree Planting. Tree planting in burned plantations would be similar to that under Alternative B. Seedling planting at varied spacing would mimic natural regeneration patterns. Planting of intolerant conifers will enhance species diversity in former plantations now dominated by sprouting hardwoods and brush. Several hand release treatments would be necessary to ensure survival and growth of planted seedlings.

Oak release. Oak release would have minimal effect on remaining species composition, and would focus growth on residual stems.

Forest Health – Direct and Indirect Effects

Roadside Danger Tree Felling. Leaving the stems of dead trees along the roadside and within the interior of treatment units could contribute to beneficial effects to soils and long-term forest productivity. In terms of soil cover and biologic activity, some retention of coarse woody debris is important to recovering forests (Brown et al., 2003).

In contrast, leaving excessive amounts of standing and down woody debris could present a risk to forest health. Fire burning through large amounts of dead and down material can result in root damage to young developing stands (Monsanto, 2008). With large amounts of standing and down material, future vegetation management methods such as prescribed burning would be an eliminated as a treatment option to managers.

Mastication and Chipping. The effects of mastication and chipping of dead trees would be similar to those found in Alternative B. Mastication of small diameter conifers and brush would minimally affect residual live conifer stocking and density or canopy cover.

Handcutting and Handpiling. The effects of handcutting and handpiling of residual small diameter live trees would be similar to those found in Alternative B. Handcutting and handpiling small diameter live and dead trees would have a limited local effect in a few stands along the Rim road, improving tree growth and vigor.

Roadside Pruning. Roadside pruning, if done properly, should not have any effects on forest health. Pruning would maintain up to two thirds of the live crown of residual conifers and the use proper pruning techniques should minimize any effects to individual trees. Pruning of small diameter live conifers would minimally affect overall canopy cover.

Underburning and Pile Burning. The effects of underburning and pile burning would be the same as those found in Alternative B.

Tree Planting. The effects of tree planting would be the same as those found under Alternative B.

Oak release. The effects of oak release would be the same as those found in Alternative B.

Forest Resiliency – Direct and Indirect Effects

Roadside Danger Tree Felling. Felling and leaving roadside danger trees would likely leave areas of concentrated large woody debris accumulations immediately adjacent to roads. Accumulations of coarse woody debris (CWD) along roads in combination with retention of residual dead trees within the interior of treatment units in this alternative would make future vegetation management activities more difficult and potentially more dangerous to operators.

Similar to the discussion under Alternative A - the No Action Alternative, in Alternative C the potential for re-burn in the Concow area could develop in a short period of time (10-30 years) given the amount and size of small diameter dead material left behind. In this time period regenerating hardwoods and conifers and maturing shrubs in combination with heavy fuel loading could result in re-burn under high to extreme fire burning conditions.

The effects of retained down woody material following wildfire on re-burn severity versus the fuel loading effects of logging post-fire have been widely debated. Brown et al (2003) looked at the influence of a variety of factors to assist in determining the amounts of coarse woody debris (CWD) needed to maintain ecological benefits to wildlife and soils while reducing fuel loading and re-burn severity. This study indicated that both forest type and fire regime played important roles in determining the optimum range of fuel loading in tons per acre; drier ponderosa pine sites within mixed fire regimes had lower required thresholds to meet CWD requirements.

Historical fuel loadings in the lower elevation ponderosa pine type is believed to be low, with frequent fire return intervals (Monsanto, 2008) that likely reduced snag and down logs numbers. Leaving concentrated CWD along roadsides and within treatment units would lower future forest resiliency in the event of fire, and the effects of Alternative C on forest resiliency would more closely resemble those of the No Action Alternative.

Mastication and Chipping. The effects of mastication and chipping would be similar to those found in Alternative B.

Handcutting and Handpiling. The effects of handcutting and handpiling on live residual small diameter trees on forest resiliency would be similar to Alternative B. Some reduction in ladder fuels would be expected in stands along the Rim road.

Roadside Pruning. The effects of roadside pruning on residual live conifers would be minimal as piling and burning of limbs would take place. Some potential scorching to sprouting hardwoods could occur when piles are burned. Minimal effects to forest resiliency would be expected within individual stands due to the limited number of remaining live conifers.

Underburning and Pile Burning. The effects of underbruning and pile burning would be similar to those in Alternative B.

Tree Planting. Conifer tree planting in burned plantations would have a minimal effect on future forest resiliency due to the limited scope of replanting efforts and the widely spaced clumped planting techniques. Young trees are more at risk in the event of fire, especially when found in combination with sprouting shrubs and hardwoods.

Oak release. The effects of oak release on forest resiliency are expected to be the same as those found in Alternative B.

Alternative C

Unburned Area

Tree Species Composition - Direct and Indirect Effects

Roadside Danger Tree Felling. The effects of roadside Danger Tree felling are expected to be very limited in green treatment areas. Some damage to residual live conifers could occur as a result of operations.

Mastication and Chipping. The effects of mastication and chipping would be similar to those found in Alternative B. Mastication treatments would favor underrepresented conifers and remove more common small diameter conifers such as white fir, Douglas-fir, and incense cedar. A reduction in the amount of small diameter black oak and tanoak would also occur when treating the understory through mastication.

Handcutting and Handpiling. Handcutting of small trees does allow for more discrimination when selecting residual conifers and hardwoods when compared to mastication. Intolerant conifers and hardwoods would be selected over other species such as white fir, Douglas-fir, incense cedar and tanoak.

Alternative C would retain more shade tolerant conifers species than Alternative B because of the limitation on the size of material to be cut and removed. Most larger diameter black oak would not be released from overtopping conifers.

Roadside Pruning. Roadside pruning, if done properly should not have any effects on forest health. The effects of roadside pruning on residual live conifers would be minimal as piling and burning of limbs would take place.

Underburning and Pile Burning. The effects of underburning and pile burning would be similar to those found in Alternative B. Some potential for increased scorching to remaining conifers could occur when piles are burned. Underburning is non-selective and could result in some additional conifer mortality.

Forest Health - Direct and Indirect Effects

Roadside Danger Tree Felling. The effects of roadside Danger Tree felling are expected to be very limited in green treatment areas. Some damage to residual live conifers could occur as a result of operations.

Mastication and Chipping. Treatment of small diameter conifers and hardwoods through mastication of the understory would result in limited improved tree growth or vigor of remaining mature conifers. Where aggregations of young conifers exist, the potential exists for a positive effect on tree growth. Mostly suppressed and intermediate trees would be removed in mastication, having a minimal effect on overall tree canopy.

Handcutting and Handpiling. Where aggregations of young conifers exist, the potential exists for thinning and spacing out residual trees. Where stands are dominated by medium and large diameter trees, retention of some pole and all small and medium size trees in Alternative C leaves stands overcrowded, doing little to address forest health conditions such as moisture stress and low vigor. See table 4-29 below.

Table 4-28 Average Number of Trees per Acre by Size Class for all Alternatives

		Trees per Acre by Size Class					
		Sapling	Poles	Small Trees	Medium Trees	Large trees	
	Alternatives	1-6 inch dbh	6-11 inch dbh	11-20 inch dbh	20-30 inch dbh	Greater than 30 inch dbh	Total Trees per Acre
CWHR Size Class 4							
Before treatment	A	1530	87	48	22	8	1696
After treatment	B	10	15	36	18	8	88
After treatment	C	0	36	50	23	7	116
CWHR Size Class 5							
Before treatment	A	1158	68	81	37	14	1360
After treatment	B	0	0	0	26	15	41
After Treatment	C	0	25	81	37	14	157

Canopy cover would be slightly reduced in some stands in Alternative C, particularly where tanoak is a significant portion of the understory. In table 4-30 below, overall canopy cover is minimally reduced in Alternative C as compared to Alternative B due to the difference in size class of tree being removed.

Table 4-29 Existing and Post Treatment Canopy Cover by CWHR Size Class for Each Alternative

Treatment Group	Alternative A - No Action Average Canopy Cover	Alternative B –Proposed Action Average Canopy Cover	Alternative C – CWPP Average Canopy Cover
CWHR Size Class 4 Radial Release - Thin	80%	40%	72%
CWHR Size Class 5 Radial Release - Thin	83 %	60%	70%

Roadside Pruning. Roadside pruning, if done properly, should not have any effects on forest health. The effects of roadside pruning on residual live conifers would be minimal as piling and burning of limbs would take place.

Underburning and Pile Burning. The effects of underburning and pile burning would be the same as those found in Alternative B.

Forest Resiliency – Direct and Indirect Effects.

Roadside Danger Tree Felling. While some danger trees that could pose a problem to operations are expected to be identified, the effects are expected to be very limited in green treatment areas.

Mastication and Chipping. The effects of mastication and chipping would be similar to those found in Alternative B.

Handcutting and Handpiling. Thinning or removal of only small diameter trees would leave some of the intermediate and co-dominant trees that can act as ladder fuels to the overstory canopy. Reduction in the number of small trees in the lower crown classes would reduce some, though not all, ladder fuels.

Note in figure 4-10 below, leaving hardwoods and conifers greater than 8.9 inches in diameter may leave ladder fuels that can carry fire into the canopy. Vertical and horizontal layering of trees is not reduced significantly in Alternative C and under extreme weather conditions, these forests would continue to be a risk for losses to wildfire. Clumps of Douglas-fir, incense cedar, and white fir would remain in the intermediate size classes with branches extending close to the ground, contributing to the ladder fuel effect.

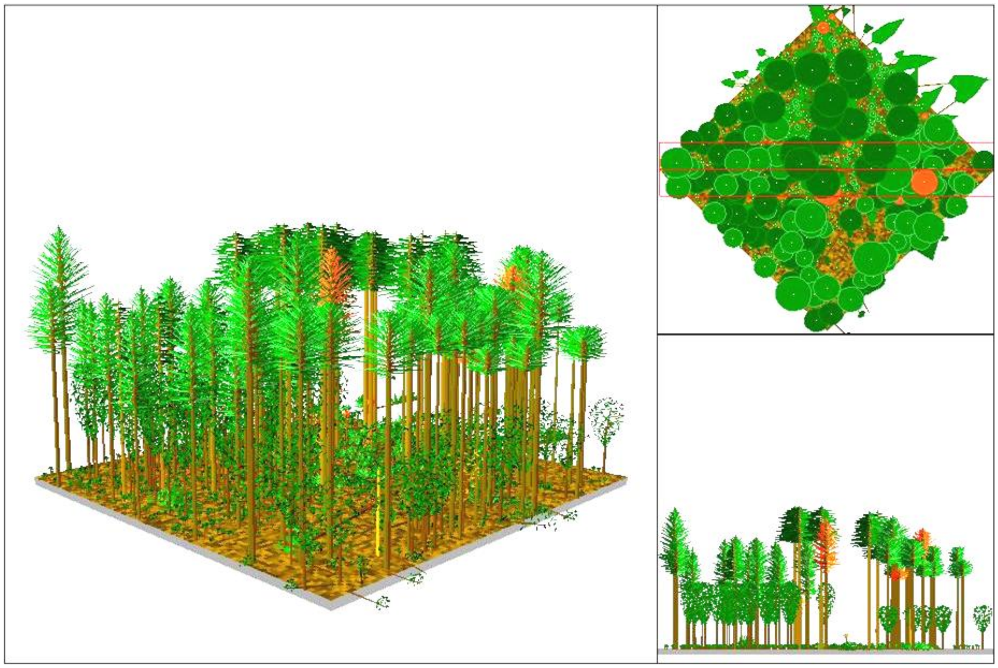


Figure 4-10 Alternative C, 2009 Post Cutting to 8.9 inches dbh (FVS 2009)

Roadside Pruning. Roadside pruning, if done properly, should have a limited positive effect on forest resiliency. Some reduction in ladder fuels would be expected from the removal of lower tree branches that can carry fire. The effects of roadside pruning on residual conifers would be minimal as piling and burning of limbs would take place.

Underburning and Pile Burning. The effects of underburning and pile burning would be the same as those found in Alternative B.

4.7.5 Summary of Effects Analysis Across All Alternatives

Cumulative Effects

Scope of the Analysis. Vegetation management activities have localized effects on vegetation attributes such as canopy cover, tree density, and tree size and are generally confined to the treated area. Therefore cumulative effects analyses of vegetation resources are geographically bounded to the Concow Project area.

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 Defensible Fuel Profile Zone (DFPZ) effectiveness (10 to 20 years).

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

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action by action basis. Focusing on individual actions would be less accurate than looking at individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. By looking at current conditions, the residual effects of past human actions and natural events are captured, regardless of which particular action or event contributed to those effects. The Council on Environmental Quality issued an interpretive memorandum on June 24,2005 regarding analysis of past actions, which states "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions." For these reasons, the analysis of past actions in this section is based on current environmental conditions.

On public and private lands, past harvest activities focused on evenaged management and removal of dominant and co-dominant trees. Small trees less than 10 inches dbh were generally left on site. These harvest systems often used lop and scatter techniques for limb wood and tree tops. The results of these practices left high density stands of small trees with relatively high fuel loads. Many of these stands continue to be conducive to high-mortality fire today. Beginning in 1985, traditional even-aged management has been implemented on public land in the Concow Project Area. In the later 1990's commercial thinning or individual tree selection was utilized to establish fuel treatments. Other public lands, primarily owned by the Bureau of Land Management (BLM), also recently harvested areas burned in 2008 utilizing sanitation salvage.

On surrounding private land, past harvesting has included even-aged management methods including clearcutting, shelterwood prep and removal, and seed tree seed and removal steps. Uneven-aged management methods included group selection and selection. Intermediate treatments utilized included commercial thinning and sanitation salvage. Other methods utilized include transition, rehabilitation and substantially damaged categories of treatments. Following the 2008 wildfires, several thousand acres were cut on private lands utilizing sanitation salvage. Herbicides have been used to control competing brush in conifer plantations on private lands within the Concow project area in the past. A reduction in competing brush may reduce stand-level flammability in plantations and increases survival and rates of tree growth.

Watershed and wildlife projects are not generally implemented at the scale or location to have an influence on landscape-level vegetation or fire behavior and related tree mortality. In general wildlife and watershed projects listed in the Past, Present and Reasonably Foreseeable Future Actions in the FEIS have a negligible effect on stand and landscape level fire behavior and tree mortality. Current road conditions and past road improvements and/or closures to benefit wildlife and hydrology have had a negligible impact on the ability of fire manages to suppress and contain fires in the Concow project area.

Other present and proposed future projects on public lands in the project area include recreation and special use projects. These projects would not be expected to have a measureable effect on forest structure in the project area due to the nature of such projects, with the possible exception of the Plumas National Forest Integrated Noxious Weed Control Program. This program would have a major beneficial effect by controlling the invasion and spread of noxious weeds and maintaining native understory vegetation in the project area. Removal of noxious weeds by any method, mechanical or chemical would have a negligible effect on stand and landscape level fire behavior and related tree mortality.

Christmas tree cutting and firewood collection would likely have an adverse effect on regeneration and snag levels particularly along main roads. These activities have a negligible effect on stand and landscape-level fire behavior. Levels of regeneration and snags outside of the main road corridors are unlikely to be affected. The primary (moderate) adverse effect of past recreation activities, with respect to fire, is increased ignition sources from campfires, vehicles, and other intentional or unintentional ignitions from forest users during summer months.

Future timber management on private lands would include a variety of silvicultural treatments. Projections estimate that approximately 1.5 percent of the total Concow project area would be affected by future timber harvest activities on industrial and non-industrial harvest plans. Tree planting and the use of herbicides in these new plantations created after the fires of 2008 is a reasonably foreseeable action on private land on their severely burned lands, however there is uncertainty about the locations and potential amount of this kind of treatment.

Known activities outside of those in this document proposed on National Forest Land in the foreseeable future include the planting of pine seedlings in the Concow burned area with funds from the Penny Pines Program. Donations from private individuals are utilized for planting on areas immediately surrounding the Concow community. Funds from other sources may be sought to complement the Penny Pines Program contributions. Spot planting of pine seedlings would occur within the viewshed, utilizing widely spaced clumping of native conifer seedlings to mimic natural conditions. There are no foreseeable Danger Tree removal projects on public lands outside the Concow boundary.

Tree planting is a reasonably foreseeable action on their severely burned BLM lands. There is uncertainty about the potential amount of this kind of treatment however.

No-action Alternative

Historically the Concow Project Area had a higher component of shade intolerant conifer species such as ponderosa pine and sugar pine in the overstory. Under the No Action Alternative, the understory would be composed primarily of shade-tolerant species such as Douglas-fir and incense cedar, with very little, if any, future pine regeneration. The cumulative effect of fire suppression and no disturbance would continue the gradual shift in species composition to more shade tolerant conifer species. Overstocked stands would have increased tree mortality due to severe competition for light and nutrients, contributing to additional fuel accumulations and hazardous fire conditions.

Seral Stage Diversity

DFPZ thinning treatments in Alternative B and C would result in minimal changes in seral stage diversity in the Concow Area, compared to the No-action Alternative. See table 4-29 below.

Table 4-30 Acres of CWHR Size Classes for No Action and Action Alternatives on Public Land as a Percent of Total Acres for the Concow Project, Pre and Post-treatment Condition

CWHR Size Class *	CWHR Density **	Post-fire Acres	Post-fire %	Alt. B &C Post-treat Acres	Alt B &C. Post-treat % Acres	% Change
1	Total	2,016	25	2,016	25	0
2	Total	20	<1	20	<1	0
3	Total	1,366	17	1,366	17	0
4	S	87	<1	87	<1	0
	P	127	2	127	2	0
	M	386	5	588	7	+2
	D	1,540	19	1,338	17	-2
5	S	54	<1	83	<1	0
	P	62	<1	33	<1	0
	M	288	4	346	5	+1
	D	941	11	883	10	-1
	Total	6,887		6,887		
Shrub		954	12	954	12	
Other		119	2	119	2	
		7,960	100%	7,960	100%	

CWHR Size Classes *		Canopy Cover **	
Seedling	1 =<1”dbh	S = Sparse	10-24%
Sapling	2 = 1-6” dbh	P = Open	25-39%
Pole	3 = 6-11”dbh	M = Moderate	40-59%
Small Tree	4 = 11-24” dbh	D = Dense	60-100%
Medium/Large Tree	5 = >24” dbh		

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. Alternative C changes CWHR even less than Alternative B, with a percent change in CWHR of less than 1 percent and as such is similar in effects to Alternative B. See table 8 for acres of CWHR size class by Alternative. The desired conditions for maintaining various seral stages or timber strata by vegetation type, size class, and canopy cover (i.e California Wildlife Habitat Relationship) does not include lands from private property. Therefore, harvest or thinning projects on private property would have no cumulative effects on vegetation attributes for the Concow project.

Effects on Live Trees Greater than 30 inches dbh. Analysis of the number of large green trees greater than 30 inches dbh that could be potentially affected by operability needs in Alternative B is less than .26 percent of the total trees greater than 30”dbh within CWHR size class 4 and 5 acres in the project area (See Silviculture Appendix for the number of 30” dbh trees that could be removed for operability). Analysis of potential Danger Treedanger tree removal along roadways from other recent planned timber sales (Sugarberry and Watdog) on the Feather River District averaged less than 1 tree per acre (See Silvculture Appendix A-1). For this reason, effects to live trees are considered minimal in context of operability and danger tree removal for Alternative B. Under Alternative C, no landings or temporary roads would be created; therefore the number of green trees greater than 30 inches dbh within CWHR 4 and 5 acres that could be affected by operability needs or through the reduction of danger trees would be negligible.

Short-Term Use and Long-Term Productivity. After thinning the natural stands and reducing the density of the canopy, there would be a short-term gain in shrubs, brush, and forage for deer and other wildlife. However, once the canopy cover closes again, then there would be a decrease in the amount of understory vegetation.

Alternative B - Defensible Fuel Profile Zone (DFPZ) Maintenance

About 25-30 percent of the Concow project area is vegetated with sprouting hardwoods, manzanita, ceanothus and other shrub species that will re-sprout following initial treatment. Following the initial treatment in burned areas, regrowth could reduce DFPZ effectiveness in approximately 10 years (HFQLG SFEIS, Table 2.1).

Ten year growth projections for hardwoods (FVS) following the BTU fire were 2-9 feet for black oak and 4-13 feet for tanoak. *Ceanothus spp*. could develop to a height of 2-8 feet in 10 years and 70-90 percent cover (Anderson, 2001). These estimates could be somewhat conservative considering the growth response of other areas burned on the District within the last decade, including the areas of the Pendola fire. Initially, young shrubs have higher moisture content and act as heat “sinks”, meaning that they are less flammable than older shrubs because they have more live branches than older shrubs. Young shrubs also absorb heat produced by adjacent burning fuels without igniting thereby retarding fire spread.

Re-entry into the burned area could occur within 4-10 years. Re-entry in the burned area for DFPZ maintenance is not considered an indicator of reduced effectiveness but will be completed to continue to further establish the desired structure and function of the DFPZ, both in terms of vertical and horizontal arrangement of fuels including dominant tree species, canopy cover and desired spacing between trees and shrubs.

Desired DFPZ tree and brush spacing within the burned area is 40-50 percent canopy with approximately 20-25 feet between clumps of hardwoods and brush. Follow-up treatments could include underburning, lop and scatter, handcutting and piling, mastication and oak release on up to 2,080 acres (includes overlapping treatments).

The Final Supplemental Environmental Impact Statement (2003) to the HFQLG Act FEIS and ROD documented the environmental analysis of the effects of alternative management strategies for the maintenance of DFPZs within the HFQLG Pilot Project Area. 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 2 years of the treatment to be effective. By not including the use of herbicides for the Concow project at this time, their use for DFPZ maintenance is essentially precluded. If DFPZ objectives in treatment units are not met, an underburn could 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 treatments such as mastication and grapple pulling and hand treatments. The use of herbicides for DFPZ maintenance within the Concow project is not being proposed at this time.

Natural stands make up the remainder of the project area, and are composed of larger sized trees where the vegetation has not been as affected by fire and not intensively treated. After completion of proposed radial thinning, mastication, and burning activities, some slow to moderate development of manzanita, ceanothus, and other shrubs will occur, and in some area, grasses will become more vigorous. As overstory canopy cover increases, suppression of shrub and hardwoods would begin and shrub cover would decrease. Mastication would not change canopy cover levels in most areas, and therefore understory growth response is expected to be minimal. Natural regeneration of conifers and hardwoods is expected and could reduce DFPZ effectiveness within 10-20 years after initial treatment.

Even if no maintenance is conducted in natural stands in unburned areas, the DFPZ effectiveness should not be seriously reduced for 10-20 years. Within the DFPZs in the burned areas, the DFPZ effectiveness should not be reduced for approximately 10 years. DFPZs will retain beneficial characteristics that will aid in fighting fire and reducing fire intensity, because of the removal of a majority of the accumulated post-fire fuels. Additionally, the Forest Service staff could conduct emergency maintenance and rapidly restore efficacy to the DFPZ in the event of an oncoming wildfire.

Alternative C – Shaded Fuelbreak Maintenance

Within the unburned areas, Alternative C would utilize the same criteria as the DFPZ with regard to when to re-enter for maintenance and general methods of treatments utilized under DFPZ maintenance. With higher canopy cover left under this alternative, understory growth response should be minimal. Natural regeneration of conifers and hardwoods is expected and could reduce DFPZ effectiveness within 10-20 years after initial treatment.

Within the burned areas, it is assumed that within 10 years the shaded fuelbreak would be rendered ineffective with rates of regrowth of shrubs and hardwoods as described above under DFPZ maintenance. Re-entry into most of these shaded fuelbreak areas within the burn would be deferred due to the number of large snags and down logs remaining, leaving areas “unsafe“for maintenance operations.

4.8 Botanical Resources and Noxious Weeds

4.8.1 Introduction

This section summarizes detailed information contained in the Botany Biological Evaluation and the Noxious Weed Risk Assessment (USDA Forest Service Plumas NF Concow, Biological Evaluation & Noxious Weed Risk Assessment 2009). Further information on Plumas National Forest Special Interest Species is contained in the Concow Botany Report (USDA Plumas NF Concow Botany Report 2009 in appendix C of this FEIS). Throughout this section, the term “rare species” is used to refer to Forest Service Region 5 Sensitive vascular plants.

An important part of the mission of the Forest Service (Resource Planning Act of 1974, National Forest Management Act of 1976) is the management of rare species and their associated habitats. Management activities on NFS lands must be planned and implemented so that they do not jeopardize the continued existence of Federally Threatened or Endangered species or lead to a trend toward listing or loss of viability for Forest Service Sensitive species. In addition, management activities should be designed to maintain or improve habitat for rare species and natural plant communities to the degree consistent with the multiple-use objectives established in the amended 1988 Plumas NF Land and Resource Management Plan or “Forest Plan”.

Of the Forest Service Regions, the Pacific Southwest Region contains the largest assemblage of Sensitive plant species in relation to its land base. Of the more than 8,000 vascular plant species that occur in California, well over half have been documented on National Forest System (NFS) lands. In addition, over 100 of these plant species are found only on NFS lands and nowhere else in the world (Powell 2001). This high level of botanical diversity is due in large part to the wide range of environmental conditions (i.e. topography, geology, soils, climate and vegetation) found on National Forests in California.

The Plumas National Forest is situated at the northern end of the Sierra Nevada Mountains. The lower elevation foothills of the forest are characterized by oak woodlands on the south-facing slopes, which are dominated by interior live oak (*Quercus wislizenii*), canyon oak (*Quercus chrysolepis*), manzanita (*Arctostaphylos* spp.) and gray pine (*Pinus sabiniana*). The lower elevation north-facing slopes are characterized by mixed conifer forests with a diverse understory of tanoak (*Lithocarpus densiflorus*), black oak (*Quercus kelloggii*), big leaf maple (*Acer macrophyllum*) and madrone (*Arbutus menziesii*). Moving eastward, the elevation increases and the foothills quickly give way to montane chaparral and mixed conifer forests that line the deep canyons of the North, Middle and South forks of the Feather River and its tributaries.

Within these broader vegetation types of this project are areas of serpentine soil. Serpentine soils are characterized by high levels of magnesium and iron and deficient in the critical element calcium. Serpentine soils also contain high levels of toxic heavy metals including chromium, cobalt, and nickel. Due to the unique soil chemistry, most plants can not survive on serpentine soils (Kruckeberg 2006). However, some plants have the ability to cope with these soils and are only found in these areas. These plants are called “serpentine endemics” and compose a large number of the rare plants in the project area. There are approximately 3,800 acres of serpentine soil in the project area.

The Plumas National Forest is dedicated to the use of integrated management control tactics to control and eradicate noxious infestations in this project area. Noxious weed infestations have been mapped with GPS and data are managed with the use of GIS. During the planning phase of this project, the Botany staff has worked in collaboration with the Silviculture, Fire, and Fuels to design this project with noxious weed concerns in mind. While this project will create some conditions favorable to noxious weed invasion in limited areas, it will also facilitate the treatment of known weeds. Two California Department of Food and Agriculture ‘A’ rated weeds were found during the 2009 surveys, however only one is located within treatment units. Some weed infestations have already been treated with hand pulling. Specific mitigations for noxious weeds and the management strategy for noxious weeds is included in appendix C of this FEIS.

Fuels reduction treatments have the potential to enhance habitat for some rare plants while negatively impacting other rare species and their associated habitats. Effects include, but are not limited to: death or injury to individuals; habitat modification or fragmentation; decreased habitat quality; and increased risk of weed introduction and spread as disclosed below.

4.8.2 Analysis Framework: Statute, Regulation, Forest Plan and Other Direction

Direction relevant to the alternatives as they affect botanical resources includes:

E.O. 13112 Invasive Species 64 FR 6183 (February 8, 1999). To prevent and control the introduction and spread of invasive species. The Forest Service will not authorize, fund or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species unless the agency has determined that the benefits of such actions clearly outweigh the potential harm caused by invasive species and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.

Forest Service Manual and Handbooks (FSM/H 2670). Forest Service Sensitive species are plant species identified by the Regional Forester for which population viability is a concern. The Forest Service develops and implements management practices to ensure that rare plants and animals do not become threatened or endangered and ensure their continued viability on National Forests. It is Forest Service policy to analyze impacts to Sensitive species to ensure management activities do not create a significant trend toward federal listing or loss of viability. This assessment is documented in a Biological Evaluation (BE) and is summarized or referenced in this Chapter.

Sierra Nevada Forest Plan Amendment (SNFPA). The Record of Decision (ROD) for the 2004 Sierra Nevada Forest Plan Amendment identified the following direction applicable to botanical resources:

Noxious weeds management (Standards and Guidelines #36-49). See Noxious Weed section.

Wetland and Meadow Habitat (Standards and Guidelines #70): See Water Resources section.

Riparian Habitat (Standards and Guidelines #92): See Water Resources section.

Bog and Fen Habitat (Standards and Guidelines #118): Prohibit or mitigate ground-disturbing activities that adversely affect hydrologic processes that maintain water flow, water quality or water temperature critical to sustaining bog and fen ecosystems and plant species that depend on these ecosystems.

During project analysis, survey, map and develop measures to protect bogs and fens from such activities as trampling by livestock, pack stock, humans and wheeled vehicles.

Sensitive Plant Surveys (Corrected Errata, April 19, 2005): Conduct field surveys for Threatened, Endangered and Sensitive plant species early enough in the project planning process that the project can be designed to conserve or enhance Threatened, Endangered and Sensitive plants and their habitat. Conduct surveys according to procedures outlined in the Forest Service Handbook (FSH 2609.25.11). If additional field surveys are to be conducted as part of project implementation, survey results must be documented in the project file (Standards and Guidelines #125). The standards and guidelines provide direction for conducting field surveys, minimizing or eliminating direct and indirect impacts from management activities and adherence to the Regional Native Plant Policy (USDA Forest Service 2004).

Plumas National Forest Land and Resource Management Plan (USDA Forest Service 1988). The Forest Plan provides management direction for all Plumas National Forest Sensitive plants; that direction is to "maintain viable populations of sensitive plant species" (USDA Forest Service 1988, page 4-34). The Forest Plan also provides forest-wide standards and guidelines to:

- Protect Sensitive and Special Interest plant species as needed to maintain viability;
- Inventory and monitor Sensitive plant populations on an individual project basis; and
- Develop species Management Guidelines to identify population goals and compatible management activities/prescriptions that will maintain viability.

4.8.3 Effects Analysis Methodology

Geographic Scope of Analysis

One geographic area was chosen to analyze the effects of the proposed activities on botanical resources and noxious weeds. Direct and indirect effects to rare species under the two action alternatives were assessed using the area within the project boundary. This area was selected because direct and indirect effects will be limited to areas within the project boundary. Consequently, cumulative effects will be limited to this geographic area because there must be a direct or indirect impact to even consider the potential of cumulative impacts. None of the plant taxa considered in this analysis are so rare or imperiled to warrant a separate analysis boundary.

Analysis Methodology

The analysis of effects on rare plant species was a three-step process (FSM 2672.43). In the first step, all listed or proposed rare species that were known or were believed to have potential to occur in the analysis area were identified. This list was developed by reviewing the U.S. Fish and Wildlife List for the Plumas National Forest (U.S. Fish and Wildlife Service 2008), USDA Forest Service Region 5 Sensitive Species List (USDA Forest Service 2006), Plumas National Forest rare plant records and vegetation maps and California Natural Diversity Database records (CNDDB 2009).

The second step was field reconnaissance surveys. Botanical field surveys were conducted by USDA Forest Service botanists in 2005, 2006, and 2009 (Flea FRRD Botany Survey report 2005, 2006, Concow Dozer Line surveys 2009).

Field surveys were designed around the flowering period and ecology of the rare plant species identified in step one. For each rare plant site found, information was collected that described the size of the occurrence and habitat characteristics and identified any existing or potential threats. Location information was collected using a Global Positioning System (GPS).

All of this information was used in step three of the analysis—conflict determination. Data were imported into a Geographic Information System (GIS) and used to analyze proximity to treatment units and associated disturbances such as skid routes and landings. Potential benefits and detriments where determined and subsequent mitigations measures were developed.

Data Sources

- Field surveys for rare plants and noxious weeds (2005, 2006, 2009).
- GIS layers of the following data:
- treatment units (Concow_treatment_units)
- Feather River rare plant GIS, (PNF_FRRD_TES_NRIS_NAD83_ALL_12-29-08) habitats, plant communities, soils, geology, meadows, etc.
- CNDDB records
- Scientific literature

Basis for Analysis/ Botanical Indicators

The following botanical indicators were used to assess proposed DFPZ treatment effects on rare plants and habitats:

Direct effects are dependent upon the intensity and timing of disturbance. For example, direct impacts to an annual plant that has already gone to seed would not be as adverse as direct impacts to an annual plant that has not set seed (Ouren et al. 2007). Effects are also dependent upon the number of plants at a specific location and the proportion of the occurrence impacted. Repeated damage to Sensitive species and other native plants can lead to the degradation of habitat and eventually to the replacement of native plant species, including Sensitive plants, with species more adapted to frequent disturbance, such as invasive weeds.

Indirect effects on rare species are effects that are separated from an action in either time or space. Adverse indirect effects are more likely to occur to those species that are intolerant of disturbance. In contrast, species which tolerate or are dependent upon some level of disturbance, may benefit from project related perturbations.

For instance, noxious weeds have the potential to impact rare species indirectly through allelopathy, the production and release of plant compounds that inhibit the growth of other plants. (Bais et al. 2003), as well as through direct competition for nutrients, light and water (Bossard, Randall and Hoshovsky 2000).

A cumulative effect can result from the incremental effect of the current action when added to the effects of past, present and reasonably foreseeable future actions. These effects are considered regardless of what agency or person undertakes the other actions and regardless of land ownership on which the other actions occur. An individual action when considered alone may not have a significant effect, but when its effects are considered in sum with the effects of other past, present and reasonably foreseeable future actions, affects may be significant (40 CFR 1508.7 and 1508.8 and FSH 1909.15 section 15.1).

One crucial step in assessing cumulative impacts on a particular resource is to compare the current condition of the resource (rare plants) and the projected changes as a result of management activities to the natural variability in the resources and processes of concern (MacDonald 2000). This assessment is particularly difficult for rare plant species because long-term data are often lacking. In addition, the habitats in which many rare plant species are presently found have a long history of disturbance, making an undisturbed reference difficult to find. For some rare plants, particularly those that do not tolerate disturbance or are found under dense canopy conditions, minimizing on-site change is an effective way of reducing the potential for larger-scale cumulative impact (MacDonald 2000). If the greatest impact on a rare species is both local and immediate, then this is the scale at which the effect is easiest to detect (MacDonald 2000).

The additive effects of past actions (such as off-highway vehicle use, wildfires, wildfire suppression, timber harvest, mining, nonnative plant introductions and ranching) have shaped the present landscape and corresponding populations of rare plants. However, data describing the past distribution and abundance of rare plant species is extremely limited, making it impossible to quantify the effects of historic activities on the resources and conditions that are present today. Rare plant surveys did not begin until the early 1980s on the PNF. In many cases, even when project-level surveys were conducted, there is very little documentation that describes whether past projects avoided or protected rare plant species during project implementation. In addition to these unknowns, changes have been made to the PNF Sensitive species list. Therefore, in order to incorporate the contribution of past activities into the cumulative effects of the proposed project, this analysis uses the current abundance and distribution of rare plant species as a proxy for the impacts of past actions.

Undeniably, past, present and future activities have and will continue to alter rare plant populations and their habitats to various degrees. The approach taken in this analysis is that, if direct and indirect adverse effects on rare plant species associated with the Concow project are minimal or would not occur, then they would not contribute substantially to cumulative effects on the species.

For purposes of this analysis, botanical effects are defined as follows:

Direct effects occur when plants are physically impacted.

Indirect effects on rare species are effects that are separated from an action in either time or space. Adverse indirect effects are more likely to occur to those species that are intolerant of disturbance. In contrast, species which tolerate or are dependent upon some level of disturbance, may benefit from project related perturbations.

Botanical Resources Methodology by Action

1. **Direct and indirect effects of the fuels reduction treatments including; hand cut, hand cut pile burn, lop and scatter, mastication, radial release, removal, and under burn to botanical resources.**

Short-term timeframe: 1 year.

Spatial boundary: Project area

Long-term timeframe: 20 years.

Indicator(s):

Level of rarity based on California Native Plant Society and global rankings.

Total acres of rare plant sites within analysis area.

Percentage of rare plant sites located within treatment units.

Anticipated rare plant response to the specific project related action.

Methodology: GIS analysis of rare plant locations in relation to proposed treatment units.

1. **Cumulative effects of the fuels reduction treatments including; hand cut, hand cut pile burn, lop and scatter, mastication, radial release, removal, and under burn.**

Short-term timeframe: not applicable; cumulative effects analysis will be done only for the long-term time frame.

Long-term timeframe: 20 years.

Spatial boundary: Plumas National Forest.

Indicator(s):

The presence of lingering negative effects to rare plants.

The negative impact of over 50% of a rare plant population within the analysis area.

Methodology: GIS analysis of rare plant locations in relation to proposed treatment units and expected long term effect.

For purposes of the cumulative effects analysis to botanical resources are defined as follows:

- Cumulative effect can result from the incremental effect of the current action when added to the effects of past, present and reasonably foreseeable future actions to rare plant species.

4.8.4 Environmental Consequences

The following sections provide a discussion of the direct, indirect and cumulative effects of each alternative on Sensitive or rare botanical resources, as required by Forest Service Manual 2672.42; determine if a project may affect any Forest Service Sensitive species or U.S. Fish and Wildlife Service (USFWS) Threatened, Endangered, or Proposed species. The analysis of effects to botanical resources is to ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant, do not hasten the federal listing of any species, and to provide a process and standard through which these species receive full consideration throughout the planning process. Only, rare species known from the project area, based on plant surveys are discussed in detail in this FEIS.

The Effects Determination discussed herein is based on professional experience and judgment, existing information, including existing condition of the analysis area, and the potential impacts of the alternatives. An effects determination is also the culmination of potential direct, indirect, and cumulative effects.

The discussion of effects under Alternatives B and C are grouped together, because the effects to rare plants would be similar. Assumptions regarding impacts and benefits are based on professional experience and observations of permanent photo plots in various fuels reduction treatments.

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

Alternative A – No-action

Direct and Indirect Effects to Botanical Resources:

Alternative A has the greatest negative effect on rare species, listed in tables 4-31and 4-32 below. The largest impact of this alternative is from the gradual decline of rare plant populations in the absence of a historic fire regime. It is impossible to quantify the exact level and rate of Sensitive species decline in the absence of long term monitoring data. However, we do know that the eight species addressed in this analysis have evolved with frequent low intensity fires. Consequently, the lack of fire related disturbance constitutes an indirect negative effect to these rare taxa. The removal of a natural fire regime as a consequence of fire suppression has resulted in the growth of more woody shrubs and dense conifers. These shrubs and conifers reduce available resources for the rare flowering plants and their numbers decline. The author has observed numerous instances of rare plants that no longer flower as a result of dense woody vegetation.

Rare Species within Project Area

Table 4-31 Region 5 Sensitive Vascular Plant Species Within the Project Area that Will be Addressed in this Section

Species	Common Name	PNF Status[1]	Global Rank/ CNPS Rank[2]
Allium jepsonii	Jepson's onion	S	G1 / 1B.2
Calycadenia oppositifolia	Butte County calycadenia	S	G3 / 4.2
Calystegia atriplicifolia* ssp. *buttensis	Butte County morning-glory	S	G5T3 / 1B.2
Clarkia mosquinii	Mosquin's clarkia	S	G1 / 1B.1
Eriogonum umbellatum* var. *ahartii	Ahart's sulphur flower	S	None
Fritillaria eastwoodiae	Butte County fritillary	S	G3Q / 3.2
Packera eurycephala* var. *lewisrosei	cut-leaved ragwort	S	G4T2 / 1B.2
Sedum albomarginatum	Feather River stonecrop	S	G2/1B.2

Status: S – Forest Service Sensitive

Global Rank: G1-Critically Imperiled; G2-Imperiled; G3-Vulnerable; G4-Apparently secure; G5-Secure (NatureServe 2008)/CNPS Rank: 1B- Rare, Threatened or Endangered in California and Elsewhere; 2-Rare, Threatened or Endangered in California, But More Common Elsewhere, 3-About Which We Need More Information, 4-Plants of Limited Distribution (California Native Plant Society 2008).

Table 4-32 Acres of Rare Plants Located Within Treatment Units

Species	Total Acres	Acres in Units	% occurrence treated	% occurrence with likely habitat benefit	% occurrence with potential negative effect
Allium jepsonii	79.2	58.5	73.8	74.0	26.0
Calycadenia oppositifolia	38.1	14.6	38.3	93.7	6.3
Calystegia atriplicifolia* ssp. *buttensis	13.7	12.3	90.0	100	0
Clarkia mosquinii	0.2	0	0	NA	0
Eriogonum umbellatum* var. *ahartii	40.6	32.7	80.5	39.4	40.1
Fritillaria eastwoodiae	48.4	21.7	44.8	93.0	7.0
Packera eurycephala* var. *lewisrosei	846.5	109	12.9	97.2	2.8
Sedum albomarginatum	0.1	0	0	0	0

Rare Vascular Species within the Concow Project. The PNF provides habitat for over 2,000 vascular plant taxa (Clifton 2005), which represents approximately 35 percent of the California flora (Hickman 1993). Of these, 43 are on the PNF Sensitive Species List. There are 7 Sensitive species located within the Concow project area totaling 1067 acres. Under the No-action Alternative, approximately 249 acres of these rare plants area located within treatment areas under Alternatives B and C would remain undisturbed from human activities.

Existing Conditions Related to Direct and Indirect Impacts to Rare Vascular Plants. The wildfires of 2008 appear to have had a positive effect to rare plants located on serpentine soils. Two hikes were conducted in an area of serpentine soils that burned in 2008. The hikes were conducted in the spring and numerous botanists commented on the spectacular bloom in one serpentine area. This may be the result of the removal of competition by woody shrubs and trees and nutrient addition from the burned material. Just as pulling weeds in a garden promotes the desirable flowers, a reduction of woody species makes more resources available for the rare plants located on these serpentine areas. There are areas with quantitative monitoring plots installed, however they did not burn in 2008. Under the No-action Alternative, prescribed burning would not occur.

Rare Bryophytes (Mosses and Lichens). There are no known Sensitive mosses or lichens located within the project area.

Rare Fungi. There are no known Sensitive fungi located within the project area.

Alternative A – No-action

Cumulative Effects to Botanical Resources:

Implementation of Alternative A would not improve conditions for rare species. Many of the PNF Sensitive plants (discussed above) have been degraded or altered by historic human activities as well fire suppression. A consequence of fire suppression is a greater number of dense forests that are dominated by small trees and a reduction in open forest habitat across the landscape. Historic fire created the openings, removed the duff and litter, and reduced woody competition for the rare flowering plants. In the absence of this historic disturbance the rare forbs are replaced by woody species.

Alternatives B and C

Direct, Indirect and Cumulative Effects to Botanical Resources:

The following sections provide a discussion of the direct, indirect and cumulative effects of each alternative on those rare species with the potential to be affected directly or indirectly by the proposed project. These sections also provide information on the abundance, distribution (both on a global and local scale) and habitat specificity for each of the rare species.

Allium jepsonii (Jepson's onion)

This plant is known from 23 occurrences in eastern Butte and Tuolumne Counties in the northern Sierra Nevada (CNDDB 2008). In Butte County, it grows on serpentine soils in foothill woodland or mixed conifer forest. On the PNF, this plant is known from fifteen occurrences that are found on steep, relatively undisturbed, serpentine outcrops between 1,400 and 3,800 feet in elevation in the western portion of the Forest. Most occurrences are small, containing only hundreds of individuals. The trend for this plant on the PNF appears to be stable. However, this observation is not based on quantitative monitoring data. It is based on 30 years of observations by Linnea Hanson, (former Forest Botanist). There are 79 acres of *Allium jepsonii* within the project area. 73% of the occurrences are located with treatment units however underburning is the major treatment. These occurrences are located on relatively rocky, serpentine soils.

Positive Direct and Indirect Effects- There are approximately 38 acres of treatments that will positively affect the Jepson’s onion. These treatments include:

- 1 acre of hand cutting. This will remove competition from woody shrubs and small trees.
- 37 acres of underburning. This will remove competition from woody shrubs and small trees. It is unlikely to have a negative effect because surface fuel loading in areas with Jepson’s onion is typically low because it is located on low productivity, rocky serpentine soils.

  Also, this perennial species has an underground bulb that should protect plants from the fire and the heat pulse will be small due to the low fuel loading.

Negative Direct and Indirect Effects- There are approximately 21 acres of potentially harmful treatments to the Jepson’s onion. 21 acres of hand cutting with pile burning. Pile burning can send a heat pulse into the soil that can kill above and below ground portions of the plant. However, approximately eight acres of high onion concentration will be set aside as control areas where no pile burning will occur. This will greatly reduce negative impacts to the Jepson’s onion and result in an overall benefit to the plant because the habitat will be cleared of unnaturally dense brush that has accumulated as a result of fire suppression.

This rare onion is found on rocky, low productivity, serpentine soils and has not been observed in areas of recent or high disturbance. This species has likely lost individuals and suitable habitat over the past 150 years as a result of ground disturbing activities such as gold and gravel mining, timber harvest, road construction, recreation, and the lack of a historic fire regime. However, cumulative negative effects from this project will be minimal because the majority of the direct effects will be positive. The one negative direct effect will be some localized pile burning. Pile burning impacts will be minimized through the use of control areas to prevent pile burning in concentrated areas. Control areas will be located in units 1037, 1045 and 1067 and equal eight acres. This project will result in a net improvement to Jepson’s onion habitat.

Calycadenia oppositifolia (Butte County calycadenia)

Butte County calycadenia is an annual herb that is restricted to a narrow band of habitat in the foothills of the Sierra Nevada and Cascade Mountain Range in Butte County, California. It is found in grassy openings in woodland, chaparral, and forested habitats below 3,100 feet in elevation. It often occurs on shallow, serpentine soils, but can also be found on volcanic or granitic parent materials. Threats to this species include: road construction and maintenance, off-highway vehicle use and urban development. *Calycadenia oppositifolia* has been observed in disturbed areas; however, the greatest concentrations of the species have been found in undisturbed openings (Pers Comm Lawrence Janeway 2009). There are a total of 38 acres of Butte County calycadenia within the project area and approximately 38% of the occurrences are located within treatment units. These occurrences are located on relatively rocky, serpentine soils.

Positive Direct and Indirect Effect-. The vast majority of the plants that are located within units will likely respond positively from the treatments. Of the 15 acres of plants that are within treatment units, 85% are in units that will likely result in a positive plant response for Butte County calycadenia. These treatments include the following:

- 0.5 Acres of hand cutting will remove competition from woody shrubs and small trees.
- 0.5 Acres of mastication will remove competition from woody shrubs and small trees.
- 12.0 acres of underburning will remove competition from woody shrubs and small trees. It is unlikely to have a negative effect because surface fuel loading in areas with Butte County calycadenia is typically low because it is located on low productivity, rocky serpentine soils. Low intensity fall burns would likely be positive because seeds from this annual plant would be buried in the soil. Spring burns, depending on the timing may kill some seedlings, but seeds would remain in the seed bank.

Potential Direct and Indirect Negative Effect - Two acres or 15% on the Butte County; Calycadenia located within treatment units will be negatively affected by project related activities. These activities include:

- 2 acres of pile burning. However, areas of high plant concentration will be flagged and avoided with pile burning. This will minimize negative effects from this treatment.

Cumulative Effects. Due to the very small direct impacts to the Butte County calycadenia, there will be little to no negative cumulative impacts to this species. The actions associated with this project will likely result in a positive response from the Butte County calycadenia because competition from woody shrubs will be removed with fire and hand cutting. A controlled area will be located in unit 1041 and equal one acre.

Calystegia atriplicifolia ssp. buttensis (Butte County morning glory)

Butte county morning glory is a perennial species that occurs in lower montane habitats in Northern California. It ranges from Butte County in the south to Shasta County in the north. This morning glory is very tolerant of ground disturbance and is frequently observed along roadsides and other open, disturbed areas. According to the California Natural Diversity Data Base (cnddb_Feb2009_nca_plants_untm10_nad83), there are 106 element occurrences. Within the project area there are 14 acres of the morning glory, 12 acres of which are located within treatment units.

Potential Direct and Indirect Negative Effects- This species is not only tolerant to ground disturbance, it likely needs disturbance to maintain openings. Approximately 93% of the area occupied by this species will be positive affected by proposed treatments.

- 8 acres of mastication will remove competing vegetation and promote the morning glory.
- 5 acres of radial release will remove conifers and increase the amount of sunlight available to the morning glory.

Negative Direct and Indirect Effects-

- 2.4 acres of pile burning may kill some plants if piles are located over morning glory plants.

Cumulative Effects. Due to the small direct effects from the pile burning, cumulative effects are expected to be very small.

Clarkia mosquinii (Mosquin's clarkia)

This annual species occurs in the foothill woodland and lower elevation mixed conifer forest of Butte and Plumas Counties. This species was thought to be extinct when the only known location was eliminated with the formation of Lake Oroville. *Clarkia mosquinii* was rediscovered in 1992 by local botanist, Lawrence Janeway. *Clarkia mosquinii* is probably a fire follower and wildfire suppression has likely restricted the amount of suitable habitat for this species. This species often occurs in road cuts and on decomposing granite. To date, 45 occurrences have been documented within the lower elevations of the PNF, while 14 occurrences have been reported from outside of the Forest boundary. There are 0.2 acres of Mosquin’s clarkia within the project area; however, it is not located in any treatment unit.

Direct and Indirect Effects. There will be no direct or indirect effects to Mosquin’s clarkia as a result of either action alternative because it is not in a treatment area.

Cumulative Effects. There are no cumulative effects associated with this project because there are no direct or indirect impacts.

Eriogonum umbellatum var. ahartii (Ahart's sulfur flower)

This newly described sub-shrub species is restricted to Butte, Yuba and Plumas Counties in California. This species occurs on serpentine slopes in open chaparral and mixed conifer forests. The current trend for this species is unknown. Eleven occurrences have been recorded on the PNF and an additional three occurrences are on Lassen NF lands that are administered by the PNF. There are a total of 41 acres of Ahart's sulfur flower located within the project area. Approximately 81% of these plants are located within treatment units. The treatments are evenly split between beneficial and detrimental treatments.

Positive Direct and Indirect Effects:

- 3 acres of hand cutting treatments will manually remove shrubby competition.
- 3 acres of mastication will mechanically remove woody competition.
- 11 acres of prescribed fire will reduce competition from woody perennial shrubs and will likely promote Ahart's sulfur flower.

Negative Direct and Indirect Effects

- 16 acres of treatments with pile burning would kill plants located below the piles. Control areas of no pile burning will be placed in areas of high concentration of sulfur flower, protecting six acres. Control areas will be located in units 1037, 1041, 1045, and 1060.

Cumulative Effects. Little is known about the past distribution and abundance of this newly described species, making it difficult to determine the effects of past management activities. As is the case with many of the serpentine species, *Eriogonum umbellatum var. ahartii* has most likely been affected by historic ground disturbing activities, such as off-highway vehicle use, mining, logging and road building. Due to the small amount of area that will be negatively impacted with the placement of burn piles, the cumulative effects for this species are expected to be negligible. Also, control areas will be placed in areas of high plant concentration.

Fritillaria eastwoodiae (Butte County fritillary)

There are75 known occurrences on the Plumas NF and 7 on the Tahoe NF. There are at least 2 locally known, though undocumented, occurrences on the Shasta-Trinity NF. It is also known from private lands in the foothills. Some of the foothill occurrences have been obliterated with development. There are 160 element occurrences recorded in the California Natural Diversity Data Base (cnddb_Feb2009_nca_plants_untm10_nad83). Despite this large number of occurrences, most are small and the individuals can be easily counted. Some of the historical occurrences on the Plumas National Forest have not been relocated where the canopy has closed in and covered the ground with litter. Some of the plants on the Plumas are not reproducing.

The habitat of this species is not particularly specific. This species has been found on serpentine substrate, however it is not restricted to serpentine and has been found on a variety of volcanic and granitic soils. It is typically found on dry slopes in open canopied mixed conifer forest, or semi-shaded chaparral in foothill woodland. The main habitat indicator appears to be a partly-open canopy with moderate litter.

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 and only basal leaves are present. It appears that plants need some canopy openings to maintain viability.

Positive Direct and Indirect Effects- There are a total of 49 acres of Butte County fritillary located within the project area, 45% of these occurrences are located within treatment units. However, the majority of the treatments will be beneficial to the fritillary. Beginning in 2004, the Feather River Ranger District installed permanent photo plots to monitor the effects of fuels reduction treatments. Photo plots have been installed in mastication, and underburn units. There has been no apparent decrease in fritillary numbers following the implementation of these treatments. This is likely because the plant grows from an underground bulb that is protected from above ground disturbance.

- 1 acre of hand cutting will reduce competition from small diameter trees and shrubs.
- 9 acres of mastication will reduce competition from small diameter trees and shrubs.
- 9 acres of underburning will reduce competition from small diameter trees and shrubs.

Negative Direct and Indirect Effects. The 3 acres of pile burning will kill the fritillary in localized areas where piles are located. However, areas with high concentrations of fritillary will be avoided with burn piles on 0.25 acres. Control areas will be established prior to the construction of piles in unit 1071.

Cumulative Effects. It is unlikely that the implementation of either action alternative for this project will result in negative cumulative effects to the Butte County fritillary. This is because the majority of direct and indirect effects associated with this project will be beneficial. Negative effects from pile burning will be minimized with the establishment of control areas in areas of high fritillary concentration which will minimize plant death. Furthermore, the long term benefit from the hand cutting and thinning associated with the pile burning will be beneficial to the fritillary.

Packera eurycephala var. lewisroseii (Cut-leaved ragwort)

Cut-leaved ragwort is specifically found in the Feather River drainage in eastern Butte County and western Plumas County, CA. There are 30 known occurrences, ranging in numbers from under 5 plants in a few square feet to thousands of individuals dispersed over hundreds of acres. Twenty six occurrences are on the Plumas NF with five on private land found in two different bands of serpentine. Also, three occurrences are known from adjacent Lassen National Forest, and one from BLM. Within the project area, there are 846 acres of the cut-leaved ragwort and approximately 13% of these plants are located within treatment units. The majority of the treatments will be positive.

Positive Direct and Indirect Effects- 79% of the acres of ragwort will benefit from the proposed treatments.

- 2 acres of hand cutting will remove competition from small shrubs and small trees.
- 59 acres of underburning will reduce shrubby competition and promote the ragwort.

Negative Direct and Indirect Effects- 24 acres of pile burning treatments will kill some plants located below piles. Control areas will be established in areas of high Packera concentration to prevent pile location on plants. Control areas will be established in units 1041, 1043, and 1067 and equals four acres.

Cumulative Effects. The implementation of either action alternative is unlikely to create negative cumulative effects for the cut leaved ragwort because the majority of the treatments will result in positive effects for this rare plant. Also, the Packera is tolerant of some disturbance. This is evident because it is seen in along road cuts and was observed in a newly constructed dozer line from the Butte lightning Complex.

Sedum albomarginatum (Feather River stonecrop)

Sedum albomarginatum is found scattered in serpentine areas in Butte and Plumas counties in the northern Sierra Nevada. The majority of occurrences are found in the Feather River drainage on the Plumas National Forest. All but one of the known occurrences are found on USFS lands. This species is presently known from 14 occurrences. There are 12 documented occurrences on the Plumas National Forest, one on private land, and one on the southwestern edge of the Lassen National Forest. The size of occurrences on the Plumas NF range from a few individuals occupying less than 10 ft^2 to hundreds of individuals scattered over 170 acres. The occurrence on the Lassen NF covers approximately 20 acres and contains an estimated 1,000 plants.

Direct and Indirect Effects. There will be no direct or indirect effects to Feather River stonecrop as a result of either action alternative because it is not in a treatment unit.

Cumulative Effects. There are no cumulative effects associated with this project because there are no direct or indirect impacts.

Phaecollybia olivacea

Direct and Indirect Effects. Project effects to *Phaeocollybia olivacea*, an R5 sensitive fungal species with potential habitat in the project area was assessed using a potential habitat model. This model was developed by Vegetation Management Solutions (O'Hanlon VMS 2006), to aid in the identification of potential habitat for selected R5 sensitive fungi. The model is based on the professional experience of Dr. Dennis E. Desjardin (Professor of Mycology San Francisco State University) and his understanding of fungal biology. The two main variables that were shown to correspond with known population locations are tree canopy cover and tree species. The model delineates habitat quality into low, medium, medium-high, and high quality habitat. There are approximately 1,140 acres of medium to medium-high quality habitat within the project area. There are no areas of high quality habitat. Of these 1,140 acres of habitat, less than one acre will be treated with this project. Approximately 0.001% of the potential habitat will be treated.

It is known that some silviculture practices can be detrimental to some fungal species while beneficial to others. It is believed that *P. olivacea* is associated with older mature stands with a hardwood tree component. It is also known that large clear cuts are more detrimental than small openings. Also, actions that break up the underground network of mycelia and compacts the soil are detrimental.

Direct and Indirect Effects:

- 18 acres of low (grid value 480.1-540) quality potential habitat will be treated with this project. The treatments will not result in the creation of large openings nor will they result in soil compaction due to the implementation of Best Management practices for soil conservation (see appendix F of FEIS for soils mitigations).

- 36 acres of medium (grid value 540.1-630) quality potential habitat will be treated with this project. The treatments will not result in the creation of large openings nor will they result in soil compaction due to the implementation of Best Management practices for soil conservation (see appendix F of FEIS for soils mitigations).

Cumulative Effects. Based on the potential habitat model, there is no high quality habitat found within the project area consequently, there will be no detrimental effects from this project to high quality habitat. The proposed project will treat approximately 5% of the low and medium quality potential habitat for this rare mushroom. Standards and guidelines will help maintain habitat by preserving snags and downed logs. Also, this project will not create large clear-cut openings. Also, overstory shade will be maintained, host trees (oaks >6”) will be preserved, and soil disturbance will be avoided. Consequently, this project will not result in negative cumulative effects for this rare fungus.

4.8.5 Summary of Effects Analysis Across All Alternatives

There are no federally listed Threatened, Endangered, or species proposed for federal listing located within this project area. There are a total of eight Region 5 Sensitive species located within the project area, occupying approximately 1,500 acres. These eight species have evolved with periodic, low intensity fires. This project has been designed with treatments to promote these rare species. Many of the proposed activities have been designed to meet fuel reduction objectives while promoting specific habitat attributes for rare plants, such as the removal of woody plant competition and strategic placement of piles for burning. Consequently, the effects from this project will likely be beneficial to the rare plants in this area. There are 11 control areas of no pile burning to prevent impacts to R5 sensitive plants.

The effects determination in this document concludes that:

- There would be no effect to Threatened, Endangered, or Proposed plant species (all alternatives),

- The no action alternative would not have a negative affect on sensitive plant species and,

- All action alternatives may affect individuals but are not likely to cause a trend toward federal listing or loss of viability to sensitive plant species.

Table 4-33 compares by alternative the number of acres of rare plants that will be detrimentally and positively affected. Under Alternative A, there are 183 acres of detrimental impacts due to the lack of treatments such as prescribed fire that will likely promote specific rare plants.

Table 4-33 Summary of Rare Species Indicator Measures for Alternative 1 (No-action)

Indicator Measure	Alt A	Alt B & C
Acres of rare plants detrimentally impacted.	183 acres	66 acres
Acres of rare plants positively impacted.	66 acres	183 acres

Alternative A – No-action

This alternative has the greatest negative effect on rare species and habitats, primarily due to lack of management activities that will promote rare plants specifically the lack of prescribed fire. This alternative:

- Will May impact individuals but not likely to cause a trend toward federal listing or loss of viability to: *Allium jepsonii, Calystegia atriplicifolia* ssp. *buttensis, Calycadenia oppositifolia, Clarkia mosquinii, Eriogonum umbellatum var. ahartii, Fritillaria eastwoodiae, Packera eurycephala* var. *lewisrosei, Phaeocollybia olivacea.*

Alternatives B and C

Will not affect: *Arabis constancei, Balsamorhiza macrolepis var. macrolepis, Clarkia mildrediae ssp. mildrediae, Hydrotheria venosa, and Packera layneae.*

Reasons:

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

May impact individuals but not likely to cause a trend toward federal listing or loss of viability to: *Allium jepsonii, Calystegia atriplicifolia* ssp. *buttensis, Calycadenia oppositifolia, Clarkia mosquinii, Eriogonum umbellatum var. ahartii, Fritillaria eastwoodiae, Packera eurycephala* var. *lewisrosei, Phaeocollybia olivacea*

Reasons:

1. Adequate surveys have been performed in the project area.
2. The project has been designed to exclude concentrations of serpentine endemic species from project impacts.

There are no federally listed Threatened, Endangered, or taxa proposed for federal listing located within this project area. The effects from this project will be largely beneficial to the rare plants. Many of the proposed activities have been designed with rare plant populations in mind and these treatments will remove competing brush and trees. There are 11 controlled areas, totaling approximately 16 acres, of no pile burning to prevent death of Sensitive plants.

Although, there may be some loss of some small patches of rare plants, the spatial distribution of all eight taxa will be preserved. Furthermore, the overall benefit to the various rare plant populations from project activates outweigh the loss of individuals within the population.

Noxious Weeds

Current Habitat Vulnerability

Vulnerability to noxious weed invasion and establishment is greatly influenced by plant cover, soil cover, and over-story shade. Areas become more susceptible to noxious weed invasion when these components are removed. Wild-land fire and logging are sources of disturbance that can greatly alter vulnerability to noxious weed invasion. However, once the native vegetation reestablishes, the conditions that favor noxious weed establishment are no longer present.

There are numerous past, current and future timber sales on private land within the analysis area. These activities increase the overall vulnerability of the area to noxious weed invasion. Much of the project area burned in 2008. Approximately 2,200 acres burned at an intensity that resulted in 75-95% mortality of the overstory vegetation. Also, there are 230 miles of roads within the project area which create areas prone to noxious weed establishment. Roads facilitate the movement of weeds into uninfested areas. There is also a high degree of logging on private ground within the analysis area. See table 4-34 for a summary of known noxious weeds within the project area.

Table 4-34 Table 4 Known Noxious Weeds Within Treatment Areas and Within Analysis Area

Common Name & CDFA rating	Species	Total Infestation area (acres)	Infestation area (acres) in treatment units
Rush skeleton weed (A)	*Chondrilla juncea*	0.2	0.2
Barb goatgrass (B)	*Aegilops triuncialis*	0.01	0.01
French broom (C)	*Genista monspessulana*	1.4	1.0
Klamathweed (C)	*Hypericum perforatum*	Common	Common
Yellow starthistle (C)	*Centaurea solstitialis*	7.0	1.7
Spanish broom (none)	*Spartium junceum*	0.040	0.03
Bull thistle (none)	*Cirsium vulgare*	Common	Common

Habitat Alteration Expected as a Result of Project Implementation

Alternatives B and C

Underburn: Prescribed burns are designed to reduce excess live and dead vegetation and move the area towards the desired fuel condition. This type of burning is initiated when fuel moistures are low enough to safely carry fire and meet resource objectives. Firelines constructed by hand are scraped to mineral soil to a minimum of two feet wide and vegetation cleared to a minimum width of six feet. Dead fuel will be scattered away from the mineral soil scrape to reduce fire intensity along the fire line. Machine lines, constructed with mechanized equipment, would be scraped to mineral soil a minimum of six feet and vegetation cleared to a minimum of ten feet.

Underburning in the project areas associated with this project is not expected to create environmental conditions favorable to noxious weed invasion. 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 nor 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 2002), 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. A goal of this project is to reduce the unnaturally high fuel loads that will support a high intensity wildfire that would result in favorable conditions to noxious weed invasion. Furthermore, it has been shown that treatments that reduce surface fuels such as prescribed fire can result in a profound reduction on fire intensity and can be effective for up to 10 years post treatment (Omi et al. 2006).

Mastication: Masticate woody shrubs/trees with mechanical ground based equipment. Masticate trees less than 10” diameter breast height (dbh) unless needed for proper spacing, and masticate shrubs. Most trees masticated would be less then 6” dbh. Spacing of residual conifers would range from 18 feet (± 25%) in smaller tree size aggregations to approximately 25 feet (± 25%) 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. Depending on surface fuel loading, masticators create a mulch layer <1 – 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. Mechanized thinning and biomass removal followed by underburning: Thinning would occur from below to remove ladder and canopy fuels to increase ground to crown height, spacing between trees and spacing between tree crowns. Soil disturbance associated with mechanized thinning and fire-line construction may create conditions that favor the establishment of early seral i.e. pioneer species. Many noxious weeds are adapted to such environments. Also, many native species such as *Lupinus* spp., *Ceanothus* spp., *Clarkia* spp., and many grasses readily establish in disturbed areas. Consequently, the creation of a disturbed area does not necessarily translate into the creation of habitat that will only be populated noxious weeds.

A second important element in noxious species establishment is sunlight. Keeley (2002) explains that most alien species are highly intolerant of shading. haded fuel breaks will maintain approximately 40% canopy cover. This will help prevent the establishment of many invasive species that require high levels of sunlight.

Manual hand cut trees and shrubs, pile and burn piles: There will be minimal disturbance associated with manually treating the vegetation in these units. Pile burning will create a disturbance which will create favorable habitat for noxious weed invasion.

Hand thinning and piling within Riparian Habitat Conservation Areas (RHCAs): Hand-thinning will be used in certain RHCAs where mechanical equipment is excluded. In such areas, conifers from 3' in height to 6" in diameter will be hand-thinned to a spacing of 15'. Wherever possible, hand piles would be located away from riparian vegetation to prevent scorching.

4.9 Terrestrial/Avian Wildlife

4.9.1 Introduction

Management of species habitat, and maintenance of a diversity of animal communities, is an important part of the mission of the Forest Service (Resource Planning Act of 1974, National Forest Management Act of 1976). Management activities on National Forest System (NFS) lands are planned and implemented so that they do not jeopardize the continued existence of threatened or endangered species, proposed, candidate or lead to a trend toward listing or loss of viability of Forest Service Sensitive or Management Indicator Species (MIS), specified in the 1982 Planning Rule (36 CFR 219).
The Wildlife Biological Evaluation/Biological Assessment (Roberts and Arroyo 2009), the Migratory Birds Report (Roberts 2009), and the MIS Report (Roberts 2009), prepared to determine the effects of proposed projects on species listed by the USFWS and National Marine Fisheries Service (NMFS) in accordance with Section 7 of the Endangered Species Act (19 U.S.C. 1536 {c}), 50 CFR 402, and the MIS standards established in Forest Service Manual (FSM) direction (FSM 2672.42), for possible effects on regionally listed Forest Service Sensitive species (including invertebrates, amphibians, reptiles, birds, and mammals).

The Plumas National Forest utilizes the U.S. Fish & Wildlife Service 2008 Birds of Conservation Concern for the Sierra Nevada as its framework for analyzing effects to migratory birds. The conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales and ensuring that bird conservation is addressed when planning for land management activities. The 2000 USDA Forest Service Landbird Conservation Strategic Plan, 2001 Executive Order 13186, and the Partners in Flight (PIF) Conservation Plans for birds and the 2004 PIF North American Landbird Conservation Plan, all reference goals and objectives for integrating bird conservation into forest management and planning.

The Concow Planning Area supports a diverse mixture of live and recently burned terrestrial habitats ranging from low-elevation oak woodlands types (classified as Montane hardwood-conifer, Montane hardwood and shrub dominated mixed chaparral and grassland habitat types), to mid-elevation patches of interspersed Sierran mixed conifer, Douglas-fir, and Ponderosa pine dominated forests (Welles 2009); some habitats lie within deeply-incised canyons.

Within the Planning Area, habitat distribution and quality of the 16 isolated NFS parcels, ranging from roughly 40 to 640 acres in size, are managed within the context of checkerboard public and private land use patterns of surrounding high density neighborhoods in the wildland urban interface, infrastructures (roads, reservoirs, power lines) and timber industrial lands. Many species tend to be more common where the density of humans and human disturbances are low. Management decisions related to establishing and maintaining Defensible Fuel Profile Zones (DFPZs) can further affect terrestrial species and habitats.

The burned area of the Concow Project suffered high severity burns from the Butte Lightning Complex wildfire which resulted in long-term unsuitable habitat. Following the fire, the existing vegetation has shifted from a conifer dominated landscape to one more completely dominated by hardwoods. Nearly all conifer types found within the analysis area had an existing hardwood understory prior to the fire. While the majority of conifers have been killed in high fire severity areas, hardwoods have re-sprouted profusely, creating an increase in acreage of montane hardwood and black oak forest types.

Prior to the fire, Forest Service land within the analysis area contained the full spectrum of forest seral stages. Small and medium to large trees dominated the landscape, and early seral (seedlings, saplings and pole size trees) was minimally represented. The unburned areas around the towns of Paradise and Magalia were not affected by the wildfire and its habitat components are vastly different from that of the burned areas. The area in the green is expected to continuing growing, although not at an accelerated rate. Incremental changes occurring to the habitat are slow due to the lack of succession.

Although the following species are found on the Plumas National Forest, within the Concow Planning Area there is no known habitat and/or no observations and/or out of the elevational range and/or no effect from proposed activities predicted under the action alternatives (B and C). Therefore, potential effects to the following species will not be discussed further in this FEIS: (1) Great Grey Owl, (2) American marten, (3) California wolverine, (4) Carson wandering skipper, (5) Greater sandhill crane, (6) Sierra Nevada red fox, (7) Swainson's hawk, (8) Valley elderberry longhorn beetle, (9) Pacific Fisher, (10) Willow flycatcher, (11) Townsend big-eared bat, (12) Pacific tree frog, (13) Mountain quail, (14) Sooty Grouse, (15) Yellow warbler, and (16) Fox sparrow.

The following species are found on the Feather River Ranger District of the Plumas National Forest and there is potentially suitable habitat within the Concow Project analysis area: (1) Bald Eagle, (2) California spotted owl, (3) Northern goshawk, (4) Pallid bat, and (5) Western red-bat. The determination for each species and how the project may effects the habitat is described below. The MIS whose habitat would be either directly or indirectly affected by the Concow Project, identified as Category 3 are carried forward and are evaluated based on the Proposed Action on the habitat of these MIS: (1) Mule Deer, (2) Northern flying squirrel, (3) Hairy woodpecker, (4) Black-back woodpecker.
Within the National Forests, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales and ensuring that bird conservation is addressed when planning for land management activities. See the Migratory Birds on the Plumas National Forest Concow Fuels Reduction Project report (Roberts 2009).

4.9.2 Analysis Framework: Statute, Regulation, Forest Plan, and Other Direction

Direction relevant to the proposed action as it affects terrestrial wildlife species and habitats includes:

Endangered Species Act (ESA). The Endangered Species Act of 1973 (16 USC 1531 et seq.) requires that any action authorized by a federal agency not be likely to jeopardize the continued existence of a threatened or endangered (TE) species, or result in the destruction or adverse modification of habitat of such species that is determined to be critical. Section 7 of the ESA, as amended, requires the responsible federal agency to consult the USFWS and the National Marine Fisheries Service concerning TE species under their jurisdiction. It is Forest Service policy to analyze impacts to TE species to ensure management activities are not be likely to jeopardize the continued existence of a TE species, or result in the destruction or adverse modification of habitat of such species that is determined to be critical. This assessment is documented in a Biological Assessment (BA) and is summarized or referenced in this Chapter.

Forest Service Manual and Handbooks (FSM/FSH 2670.31). The Forest Service Manual and Handbook 2607.31 places top priority on conservation and recovery of Endangered, Threatened, and Proposed species and their habitats through relevant National Forest System, State and Private Forestry, and Research activities and programs. Avoid all adverse impacts on Threatened and Endangered species and their habitat except when it is possible to compensate adverse effect totally through alternatives identified in a biological opinion rendered by the U.S. Fish and Wildlife Service (USFWS); when an exemption has been granted under the act, or when the USFWS biological opinion recognizes an incidental taking. Initiate consultation or conference with the USFWS when the Forest Service determines that proposed activities may have an adverse effect on Threatened, Endangered, or Proposed Species or when Forest Service projects are for the specific benefit of a Threatened or Endangered species. Identify and prescribe measures to prevent adverse modification or destruction of critical habitat and other habitats essential for the conservation of Endangered, Threatened, and Proposed species. Protect individual organisms or populations from harm or harassment as appropriate.

Forest Service Manual and Handbooks (FSM/FSH 2670.32). As part of the National Environmental Policy Act process, review programs and activities, through a biological evaluation, to determine their potential effect on sensitive species and avoid or minimize impacts to species whose viability has been identified as a concern. If impacts cannot be avoided, analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole. Establish management objectives in cooperation with the States when a project on National Forest System lands may have a significant effect on sensitive species population numbers or distribution.

Forest Service Manual and Handbooks (FSM/FSH 2670) - Forest Service Sensitive (FSS) species are animal species identified by the Regional Forester for which population viability is a concern. The Forest Service develops and implements management practices to ensure that rare animals do not become threatened or endangered and ensure their continued viability on national forests. It is Forest Service policy to analyze impacts to sensitive species to ensure management activities do not create a significant trend toward federal listing or loss of viability. This assessment is documented in a Biological Evaluation (BE) and is summarized or referenced in this Chapter.

Management Indicator Species - Guidance regarding MIS set forth in the 1988 Plumas LRMP as amended by the 2007 SNF MIS Amendment ROD directs Forest Service resource managers to (1) at project scale, analyze the effects of proposed projects on the habitat of each MIS affected by such projects, and (2) at the bioregional scale, monitor populations and/or habitat trends of MIS, as identified in the 1988 LRMP as amended.

Migratory Neotropical Bird- In late 2008, a *Memorandum of Understanding between the USDA Forest Service and the US Fish and Wildlife Service to Promote the Conservation of Migratory Birds* was signed. Under the National Forest Management Act (NFMA), the Forest Service is directed to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives." (P.L. 94-588, Sec 6 (g) (3) (B)).

Sierra Nevada Forest Plan Amendment (SNFPA). The Record of Decision (ROD) for the 2004 Sierra Nevada Forest Plan Amendment provides direction for project level effects analysis on habitat for Management Indicator Species (MIS), based on guidelines in the "Sierra Nevada Forests Management Indicator Species Amendment FEIS", December 2007.

Relevant standard and guidelines in the project area are:

Hardwoods - Establish and maintain sufficient quality and quantity of hardwood ecosystems to provide important habitat elements for wildlife and native species (FSEIS ROD pages 35 & 53).

Snags - When determining snag retention levels and locations, consider land allocation, desired condition, landscape position, potential prescribed burning and fire suppression line locations and site conditions, avoiding uniformity across large areas. Fore Westside mixed (FSEIS ROD 51).

Large Down wood - The Forest Plan Standard & Guidelines incorporated into the Concow Project ensure the maintenance of key habitat components (e.g. snags, large downed wood) are appropriately addressed (FSEIS ROD 51).

4.9.3 Effects Analysis Methodology

Geographic Scope of Analysis

The geographic analysis area used to analyze potential effects to wildlife includes the Feather River Ranger District of the Plumas National Forest (PNF), portions of the Lassen National Forest administered by the PNF, and private lands (composing 74 percent of the analysis area), which lie within the Concow Planning Area. The wildlife analysis provides the appropriate context for reasonable determination of the effects related to treatments, as treatments relate to species and their habitat. The analyses area for each species was selected based on their home range, proximity to project, treatment locations, private land, urban development and the natural topography.

In addition, this 30,917 acre geographic area encompasses a wide variety of habitats used by these species; from low elevation mature oak woodlands partially transformed by recent wildfire near Concow Reservoir; presently characterized by up to waist high young basal or tree root sprouts, to riparian and mid-elevation, mixed conifer (large tree) forests. Nearly 60 % of the analysis area was burned by wildfire in 2008; with an estimated 34 % affected by high severity fire on public lands (Welles 2009). The geographic zone of influence for determining potential direct animal mortality or injury and indirect effects associated with modifying behavior and vegetative composition of terrestrial wildlife habitats encompasses the 1,510 acre proposed treatment areas, as described under the Proposed Action (Alternative B).

Project-level effects on MIS habitat are analyzed and disclosed as part of environmental analysis under the National Environmental Policy Act (NEPA). These project-level impacts to habitat are then related to broader scale (bioregional) population and/or habitat trends. The appropriate approach for relating project-level impacts to broader scale trends depends on available distribution population monitoring data; for the purpose of this FEIS analysis the best scientific data is available at the bioregional scale (1988 Plumas National Forest (PNF) LRMP, as amended by the SNF MIS Amendment ROD).The USFS also manages habitat for Management Indicator Species and Neotropical Migratory Birds (NTMB).

The geographic analysis area for analyzing potential effects to migratory birds is based on Critical Habitat components or threats, as defined by Sierra Nevada Bird Conservation Plan (Partners in Flight- PIF) and known established sites that are very localized and limited in extent on the Plumas NF.

Assumptions specific to wildlife resources analysis:

1. Habitat is already impacted in the short-term in the burned area. In the long-term, ecological diversity of post-fire wildlife habitats is maintained; natural recovery processes (passive restoration) and proposed federal land management (active restoration) influence vegetative structure, plant species diversity, and the live to dead tree ratio to influence the distribution and quality of habitats to some degree.

2. The majority of the high severity burned areas are considered unsuitable habitat for species requiring a large tree component and high tree canopy cover, specifically the spotted owl; assumption is burned areas would remain unsuitable habitat for 125+ years. The 125 years is a base-line approximation of the burned areas ability to provide old growth forest structure. It is not intended to suggest that a species would not utilize the habitat at various stages of recovery.

3. Intact unburned islands of suitable habitat, such as the large maples and cottonwoods [along riparian corridors], tree-form oaks and dogwoods [that survived the fires] along with mosaic clumps of mixed conifers spared from high severity fire behavior, provide hiding cover, forage and other important habitat features.

4. Intact habitat located within the isolated unburned parcels of public land around the towns of Paradise and Magalia (outside the 2008 Butte Lightning Complex fire perimeter), favor species tolerant of urbanization related disturbances and vegetative modifications.

5. Habitat monitoring at the bioregional scale for MIS species is identified for habitats and ecosystem components within the analysis area.

6. The cumulative effects are typically based on components starting with the understanding of the general status and trends of trying to predict how the activity would influence the natural workings of the habitat. For the purpose of the cumulative effects analysis, it is assumed that the current unburned and burned vegetation conditions reflect the sum of all past human-caused and natural disturbances within the planning area.

Data Sources

Several types of data were compiled to provide the basis for understanding the nature and extent of wildlife resources within analysis area, and the potential effects of establishing and maintaining Defensible Fuel Profile Zones (DFPZs) on this resource:

1. Archival and literature sources have been reviewed and data from Forest Service wildlife resource records, maps and geographic information system (GIS) layers compiled to provide a historic overview of species status at a bio-regional geographic region, identify major localized use and natural disturbance events, and to provide information on previous field survey inventories, and to determine data confidence or accuracy.

2. Data collection was focused on characterizing the type, nature and severity of effects, as discussed below.

- Bald Eagle – Available scientific literature, associated habitat using CWHR data, available water sources (i.e. lake), and visual nest sightings through surveys, and ongoing surveys (2006-2009).

- California Spotted Owl - Available scientific literature, associated habitat (CWHR 4M, 4D.5M, 5D), surveys (2005-2006), historic Protected Activity Centers (PAC) and Home Range Core Areas (HRCA).

- Northern Goshawk - Available scientific literature, associated habitat (CWHR 4M, 4D, 5M, 5D, 3M, 3P, 4P, 5P), surveys (2005-2006), Protected Activity Centers (PAC). 4.

- Pallid Bat – Available scientific literature, associated habitat (rock crevices, tree hollows, mines, caves, and a variety of anthropogenic structures, including vacant and occupied buildings).

- Western Red Bat – Available scientific literature, associated habitat,(conifer and hardwood stands (under the bark of trees, live and dead), and roost in rocky areas, tree hollows, leaf litter, or mine/cave openings as well as structures such as buildings).

- Management Indicator Species - Available scientific literature, associated habitat using CWHR data, Habitat Factor(s) for the Analysis included: (1) Acres of late seral closed canopy coniferous forest, (2) Acres with changes in canopy closure, and (3) Acres with changes in large down logs per acre or large snags per acre.

- Neotropical Migratory Birds - Applying CWHR data to critical habitat components as defined by the Sierra Nevada Bird Conservation Plan (Partners in Flight).

Basis for Analysis/Wildlife Resources Indicators

Management decisions related to establishing and maintaining Defensible Fuel Profile Zones (DFPZs) can further affect terrestrial species by causing animal mortality or injury, modifying habitat and/or changing behavior due to operational-related disturbances, such as loud equipment noise or smoke from prescribed burning (Gaines et al. 2003, Trombulek and Frissell 2000, USDA Forest Service 2000). Behavior modifications can include changes or shifts in home range, changes in movement patterns, loss of reproductive success, flight or escape response, and changes in physiological condition. Some wildlife species are more sensitive to disturbances then others.

The following sections provide a description of potential effects of the Proposed Action (Alternative B) and Alternatives to the proposed action (Alternatives A and C), organized by major species groups including: (1) Federally-listed an and candidate, (5) Forest Service sensitive species, (6) Forest Service Management Indicator Species (MIS) and (7) Forest Service neotropical migratory species.

The following wildlife resources indicators were used to assess effects:

Degree to which the quality of wildlife habitats are diminished; shifts in California Wildlife Habitat Relationship (CWHR) types as a relative indicator to evaluate potential direct effects of proposed DFPZ treatment to wildlife habitats (A Guide to Wildlife Habitats of California 1988)(Welles 2009).

Forest stand development as modeled by Forest Vegetation Simulator (FVS) as a relative indicator of terrestrial vegetative habitat recovery trends in the burned area to identify potential indirect and cumulative effects to potential and occupied suitable habitat.

Bioregional population and/or habitat trends as a relative indicator to evaluate potential indirect and cumulative effect to management indicator species (MIS) and migratory bird species and habitats; relative to a broader scale.

For purposes of this analysis, wildlife resources effects are defined as follows:

1. Direct Effects are or could be caused by proposed Defensible Fuel Profile Zone (DFPZ) hazardous fuels reduction and vegetative treatments or the consequences of such operations, including animal or bird mortality or injury, altered behavior (displacement) and habitat modifications in the short-term.

2. Indirect Effects are or could be associated to shifts in vegetative conditions (CWHR types) to alter behavior or habitat modifications in the long-term.

Wildlife Resources Methodology by Action

1. Direct/Indirect/Cumulative effects of DFPZ hazardous fuels reduction and vegetative treatments to wildlife resources.

The establishment and maintenance of proposed Defensible Fuel Profile Zones in the project area has the potential for both adverse and beneficial effects on wildlife resources in both the short term and long term. Identifying important habitat components helps to identify potential effects to wildlife species. Determining the direct effects to potential and occupied suitable habitat was evaluated for spatially overlapping treatment areas, proposed under Alternative B.

Determining indirect effects of DFPZ treatments can be problematical, because responses vary between species. The variation in responses is based upon the type of disturbance and its duration, frequency, the magnitude, location, the species life history characteristics, habitat type, season, activity at time of exposure, and whether other environmental stresses are occurring coincident during exposure to disturbances. Havlick (2002) documented numerous studies that show wildlife, including birds, reptiles, and large ungulates (deer), respond to disturbances with accelerated heart rate and metabolic function, and suffer from increased levels of stress. These factors can lead to displacement, mortality, and reproductive failure. Wildlife was also reported to avoid areas with high levels of disturbance.

Busnel 1978 In: Radle 2002, Steidl and Powell 2006 indicate effects of noise can cause physiological responses in wildlife including increased heart rate and altering metabolism and hormone balance. Behavioral responses can include head raising, body shifting, short distance movements, flapping of wings (birds), and escape behavior. Together these effects potentially can lead to bodily injury, energy loss, decrease in food intake, habitat avoidance and abandonment, and reproductive loss.

The establishment and maintenance of DFPZs may enhance and decrease habitat for wildlife; depending on the unique, species-specific habitat requirements. For instance, some species occupy edge habitats (habitat which lie between open meadows, rocky or barren areas and interior closed-canopy forests), others are habitat generalists, (e.g., coyote, deer and mice and some songbird species), and several are habitat specialized species, requiring interior dwellings in intact, undisturbed patches of large tree habitats (e.g., California spotted owl).

Short-term timeframe: 1 year.

Spatial boundary: Proposed treatment areas, Concow Planning Area including burned and unburned areas, BLM administered lands and private industry.

Indicator(s): (1) CWHR types (2) Amount of spatially overlapping treatment areas and potential and occupied suitable habitats.

Long-term timeframe: 25 years, 125 years.

Indicator: (1) FVS forest stand development: 20 year projections (Welles 2009), (2) A base-line approximation of the burned area providing old growth forest structure: 125 year projections, and (3) Bio-regional population and/or habitat trends (PIF).

Methodology: Direct effects include immediate changes in habitat conditions and disturbance or harassment of individual animals, including direct mortality or injury during operations including: (1) Tree felling, (2) Use of heavy ground-based equipment linked to tree removal, mastication and chipping of surface fuels (crushing and/or displacement), and (3) prescribed burning (smoke or heat associated).

Indirect effects include changes that occur later in time, such as long-term changes in habitat structure, or changes in human uses within the project area. Indirect effects can also include effects to a species' prey base.

Rationale: Indirect impacts as defined by the CEQ regulations are those impacts which proposed action and are later in time or farther removed in distance but still a reasonable foreseeable (40 CFR 1508.8).

Short-term timeframe: 1 year.

Long-term timeframe: 25 years, 125 years.

Spatial boundary: Planning Area (including all ownerships), Sierra Nevada bio-regional.

Indicator(s): (1) FVS forest stand development: 25 year projections (Welles 2009), (2) A base-line approximation of the burned area providing old growth forest structure. It is not intended to suggest that a species would not utilize the habitat at various stages of tree growth, and (3) Bio-regional population and/or habitat trends (PIF).

Methodology: Species vary greatly in abundance and distribution, from very abundant and widespread to extremely rare or locally distributed, and all combinations in between. Management indicators are used to evaluate key wildlife habitat components including vegetative types, conditions and/or structural features and any special habitat elements (i.e. snags, streams or riparian areas) associated with a particular species.

This assessment included: (1) identify wildlife species and habitats; (2) identify spatially overlapping DFPZ treatments on potential and occupied suitable burned and unburned habitats by species; (3) apply GIS and FVS predictive models to evaluate habitat recovery on each species; and (4) analyze the effects of the proposed alternatives based on the model outputs and analyses.

From a temporal perspective, cumulative effects to wildlife habitat are dependent on the time needed to recover suitable habitat. From a spatial perspective, cumulative effects are linked to an individual's movement habitats or to the dynamics of a population. Given the current fires, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action.

Rationale: The cumulative effects analysis involved comparing the past, present, the combined effect of the project, wildfire, and clear cuts in the immediate area with the capacity of the resource and ecosystem to withstand stress to particular wildlife species. In a holistic approach the cumulative analysis entails using indicators (1) ecological condition (e.g. the species and their environment) and (2) landscape scale measures (e.g. habitat or resource patch meaningful at a particular scale to a specific species). The conceptual model [the site investigation and/or ecological risk assessment providing the bases from which a study is designed] considers multiple actions gathers information about the wide range of actions, and then identifies risks to the species in the area.

4.9.4 Environmental Consequences

Alternative A - No-action

Direct and Indirect Effects to the Bald Eagle, California Spotted Owl, Northern Goshawk, Western-red bat and Pallid bat.

Bald Eagle. There would be no direct/indirect effects to individuals as a result of the No Action Alternative.

There presently are no known Bald Eagle territories or Bald Eagle management areas within the project or analysis area. There are no known Bald Eagle roosts and perch trees within the project or analysis area.

California Spotted Owl. There would be no direct/indirect effects to California spotted owls as a result of the No Action Alternative.

The fire eliminated what may have been potential habitat, although the area was not considered optimal nesting habitat prior to the fire. As the vegetation within the burn begins to recover the area can be expected to return to foraging levels for the owls. However, the area especially in the unburned areas is highly urbanized which is not desirable to spotted owls.

Northern Goshawk. There would be no direct/indirect effects to Northern goshawk as a result of the No Action Alternative. . The fire eliminated what may have been potential habitat, although the area was not considered optimal nesting habitat prior to the fire, but was considered suitable foraging habitat. As the vegetation within the burn begins to recover the area can be expected to return to foraging levels for goshawks.

Western-red bat. There would be no direct/indirect effects to California Western red-bat as a result of the No-action Alternative.

Pallid bat. There would be no direct/indirect effects to Pallid bat as a result of the No Action Alternative.

Management Indicator Species (MIS):

Mule deer, Northern flying squirrel, Hairy woodpecker and the Black-backed woodpecker.

- The mule deer was selected as the MIS for oak-associated hardwood and hardwood/conifer in the Sierra Nevada, comprised of montane hardwood (MHW) and montane hardwood-conifer (MHC) as defined by the California Wildlife Habitat Relationships System (CWHR; CDFG 2005).
- Northern flying squirrel was selected as an MIS for late seral closed canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat in the Sierra Nevada.
- The Hairy woodpecker was selected as the MIS for the ecosystem component of Snags in Green Forests Ecosystem Component.
- The Black-backed woodpecker was selected as the MIS for the ecosystem component of Snags in Burned Forests Ecosystem Component.

Alternative A - No-action

Direct and Indirect Effects to MIS:

Mule Deer. The No Action Alternative would not alter the existing trend in the habitat, nor would it lead to a change in the distribution of mule deer across the Sierra Nevada bioregion.

Northern flying squirrel. The No Action Alternative would not alter habitat for the Northern flying squirrel.

Hairy woodpecker. No Action Alternative would not change the existing number of snags in the unburned area. No treatment activities would occur, so there would be no direct or indirect effects on existing snag levels. There would also not be an effect on medium (15-30” dbh) and large (greater than 30” dbh) green trees which are potential recruitment snags. The unburned area of the Concow Project area supports the minimum snag requirements; four snags per acre, greater than 15” dbh.

Black-backed woodpecker. Implementation of Alternative A the No Action Alternative would not change the "Snags in Burned Forest (medium and large snags in burned forest)" which define the habitat or ecosystem component represented for the Black-backed woodpecker and other burned forest dependent species. No treatment activities would occur, so there would be no direct or indirect effects on existing snag levels.

Alternatives B and C

Direct and Indirect Effects: Bald Eagle, California Spotted Owl, Northern Goshawk, Western-red bat and Pallid bat

Bald Eagle. Direct effects are not expected. Presently, there are no active Bald Eagles nests on Forest Service Lands in the Concow Project wildlife/aquatic analysis area. The area continues to be monitored for any eagle presence. Within the analysis area there are two bodies of water; Paradise and Concow Reservoirs. A Bald Eagle pair has been nesting at Magalia Reservoir for the past two years, 2008 and 2009. The pair successfully fledged one young in 2009.
Magalia Reservoir is just outside the analysis area boundary and is privately owned by the Paradise Irrigation District. The project would not impact any habitat component required by this species.
Indirect effects are not expected. Indirect effects to foraging habitat are not expected. The project would not impact any habitat component required by this species. The treatments would not impact foraging potential for the eagles.

California Spotted Owl. No direct effects for the California spotted owl are expected. No owls were detected in the Concow analysis areas. From the original Flea Project analysis area which includes the Concow Project analysis area no California spotted owls were observed during two seasons of surveys (2005-2006). The one PAC found in the analysis area has had no known activity documented (within PAC BU026) since 1990. The PAC, BU026 (404 acres), has an associate HRCA (631 acres).

The 404 acres of BU026 were not affected by the wildfire; however large portions of the HRCA were affected. One hundredeighty three acres of the HRCA sustained ≥ 90% mortality. Those acres are proposed for treatment in Alternative B. The remaining acres are not proposed for treatments. Alternative C would not treat HRCA acres. The 404 acre PAC is 1) low suitable habitat with scattered patches of moderate/high quality habitat as only 131 acres are typed out as suitable habitat (4M, 4D, 5M and 5D), 2) PAC is within an isolated 404 acre FS parcel surrounded by private lands, and 3) at the edge of what is considered the elevation range for the California Spotted Owl.

No indirect effects for the California spotted owl are expected. Fire-effected tree removal would not result in any additional unsuitable spotted owl habitat above what was removed due to wildfire. Trees removed in the unburnedarea would not remove suitable owl habitat. The isolated FS parcels adjacent to populated communities are fragmented and not desirable habitat for spotted owls.

Within the Concow Project there is approximately 7,960 acres of Forest Service land, including 3% BLM land. The majority of these parcels are small, isolated and surrounded by private lands. Pre-fire, there were 4,782 acres of FS/BLM land considered suitable spotted owl nesting/foraging habitat (CWHR 5D, 5M, 4D, and 4M). Post-fire there is approximately 3,359 acres of FS/BLM lands that are considered nesting/foraging habitat. The suitable typed habitat is scattered across the FS lands within the analysis area. Refer to table 4-35 below.

Table 4-35 CWHR 4M, 4D, 4M, and 5M within Forest Service and BLM Lands in the Concow Project Analysis Area, Including Treatment Areas

CWHR type	Pre-Fire (*acres)	Post-Fire (*acres)
4M	516	610
4D	2,609	1,397
subtotal	3,125	2,007
5M	304	491
5D	1,353	861
subtotal	1,657	1,352
Total	**4,782**	**3,359**

* Acres are rounded

The Concow Project proposes to treat 1,510 acres: 1,136 acres in the Concow (burned) area and 374 acres in the unburnedarea. Treatments consist of a mix of removal/thinning, mastication, hand-cut/pile and burn, hand-cut/lop and scatter, and underburn.

The Home Range Core Area (HRCA) associated with PAC BU026 is 631 acres which overlaps with the HRCA for PAC BU025 due to limited FS lands in the area. In the Concow (burned) area, within Section 34, approximately 183 acres of the HRCA for BU026 were reduced to CWHR 1 by the wildfire. The remaining 448 acres of the HRCA would not be treated. Those 183 acres sustained ≥ 90% mortality and are proposed for treatment. The treatments in Alternative B are designed for fuels reduction and would remove large fire-effected trees. There are no treatments proposed in Section 34 for Alternative C.

Northern Goshawk.. No direct effects for the Northern goshawk are expected. There are no goshawks PACs within the project area. No goshawks have been observed in the two year survey for the Flea Project analysis area which includes the proposed Concow Project analysis area. The effects of the treatments on the habitat of the green areas would not reduce goshawks occupancy, distribution, or goshawk populations.

No indirect effects are expected for the Northern goshawk. Goshawks are more likely to be foraging, not nesting, in the proposed project area. It is unlikely to find goshawks nesting in urban areas. Goshawks may be able to utilize the burned area for foraging purposes as prey species populations establish following the fire (Franklin et al. 2000). For the first 2 to 3 years prey species populations are expected to be low within the burned area.

If goshawks are foraging in the area the proposed action could impact prey species short term, however the acres affected by the proposed project would not diminish the prey base beyond recovery. Proposed treatments would disturb the developing vegetation, which may serve as cover for small mammals. Loss of these habitat elements may negatively impact some small mammal species. Small mammal species vary in habitat preference and their respond to biomass removal. Species that prefer open habitat can benefit for food provided by fruit-producing shrubs, grasses, and forbs that may establish after fuel treatments. Small mammals seem to re-colonize disturbed areas quickly, although diversity and species dominance differ as succession progresses. For example, absent after a fire are truffles which affect small mammals such as chipmunks and squirrels that feed on these fungi.

Within the Concow Project there is approximately 7,960 acres of Forest Service and BLM land. The majority of these parcels are small, isolated and surrounded by private lands. Pre-fire, there were 6,568 (4,782+1,786) acres of FS and BLM land classified as suitable goshawk habitat and post-fire there is 4,924 (3,359+1,565) acres. Suitable nesting habitat for the Northern goshawk is CWHR 5D, 5M, 4D, and 4M. Pre-fire, there were 4,782 acres classified as suitable nesting and Post-fire there is 3,359 acres. Suitable foraging habitat for the Northern goshawk is CWHR 3M, 3D 4P and 5P. Pre-fire, there were 1,786 acres classified as suitable foraging and Post-fire there is 1,565 acres. Habitat classified as suitable is scattered across the FS lands within the analysis area.

Nesting pairs typically use habitat consisting of CWHR classes 4M, 4D, 5M, and 5D mature to old growth forest, mixed conifer, with well developed under story and a moderate number of snags and large logs. Suitable foraging habitat consists of CWHR classes 3M, 3D, 4P, 5P and 6 and typically requires an open understory. There is no designated goshawk PACs within the Concow Project area. Refer to tables 4-36 to 4-43 below.

Table 4-36 Concow Project Analysis Area: CWHR types 4M, 4D, 5M, 5D, Pre- and Post-fire acres for private lands.

CWHR type	Pre-Fire (*acres)	Post-Fire (*acres)
4M	1,370	1,093
4D	8,673	5,156
5M	243	207
5D	1,652	797
Total	**11,938**	**7,253**

*acres are rounded

Table 4-37 Concow Project Analysis Area: CWHR types 4M, 4D, 5M, 5D, Pre- and Post-fire acres (*FS lands, not including FS proposed treatment acres)*

CWHR type	Pre-Fire (*acres)	Post-Fire (*acres)
4M	452	398
4D	1,854	1,200
5M	304	387
5D	1,085	762
Total	**3,695**	**2,747**

*acres are rounded.

Table 4-38 Concow Project Analysis Area: CWHR types 4M, 4D, 5M, 5D, Pre- and Post-fire acres (*FS proposed treatment acres only)*

CWHR type	Pre-Fire (*acres)	Post-Fire (*acres)
4M	64	212
4D	755	197
5M	0	104
5D	268	99
Total	**1,087**	**612**

*acres are rounded.

Table 4-39 Concow Project Analysis Area: CWHR types 3M, 3D, 4P, 5P, Pre- and Post-fire acres (*on private lands*)

CWHR type	Pre-Fire (*acres)	Post-Fire (*acres)
3M	379	373
3D	2,090	1,404
4P	248	289
5P	77	78
Total	**2,794**	**2,144**

*acres are rounded.

Table 4-40 Concow Project Analysis Area: CWHR types 3M, 3D, 4P, 5P, Pre- and Post-fire acres (Forest Service land, excluding proposed treatment acres)

CWHR type	Pre-Fire (*acres)	Post-Fire (*acres)
3M	163	150
3D	1,233	1,006
4P	116	124
5P	69	54
Total	**1,581**	**1,334**

*acres are rounded.

Table 4-41 Concow Project Analysis Area: CWHR types 3M, 3D, 4P, 5P, Pre- and Post-fire acres (only proposed FS treatment acres)

CWHR type	Pre-Fire (*acres)	Post-Fire (*acres)
3M	76	76
3D	40	40
4P	89	61
5P	0	54
Total	**205**	**231**

*acres are rounded.

Table 4-42 Concow Project Analysis Area: CWHR 4M, 4D, 4M, 5M (Northern goshawk nesting) habitat, Pre- and Post-fire acres (Forest Service and BLM Lands)

CWHR type	Pre-Fire (*acres)	Post-Fire (*acres)
4M	516	610
4D	2,609	1,397
5M	304	491
5D	1,353	861
Total	**4,782**	**3,359**

*acres are rounded.

Table 4-43 Concow Project Analysis Area: CWHR types 3M, 3D, 4P, 5P (Northern goshawk foraging) Pre- and Post-fire acres (Forest Service and BLM lands)

CWHR type	Pre-Fire (*acres)	Post-Fire (*acres)
3M	239	226
3D	1,273	1,046
4P	205	185
5P	69	108
Total	**1,786**	**1,565**

*acres are rounded.

The Concow Project proposes to treat 1,510 acres: 1,136 acres in the burned area and 374 acres in the unburned area. Treatments in Alternative B consist of a mix of removal/thinning, mastication, hand-cut/pile and burn, hand-cut/lop and scatter, and underburn. Treatments in Alternative C consist of a mix of mastication, hand-cut/pile and burn, and hand-cut/lop and scatter.

The burned area, of the Concow Project, suffered high severity burns from the Butte Lightning Complex wildfire which resulted in long-term unsuitable habitat. Treatments are proposed on **1,136 acres** (1,104 acres FS + 32 acres BLM) (617acres + 519 acres**)** within the burned area. Treatments include removal, hand cut-pile or lop and scatter, masticate and underburn.

The high severity burns by the wildfire converted 617 acres to CWHR 1 deforested stands. Of the 617 acres, 450 acres of CWHR 4M/D and 5M/D are considered goshawk nesting habitat and 28 acres of CWHR 4P and 3M are considered goshawk foraging habitat that were converted to CWHR 1 deforested stands. Primary treatment proposed for these areas is removal in Alternative B. Primary treatment proposed for these areas is mastication and HCPB in Alternative C.

The high severity burned areas are considered unsuitable habitat for species requiring a large tree component and probably would remain unsuitable habitat for 125+ years. Many of the CWHR 1 stands are converting back to mixed hardwood habitat (MHW). Re-growth of Black Oak habitat will be promoted for these lands. Refer to the Black Oak discussions. Only a few units will be planted with trees. Alternative C would retain medium and large snags.

The low or moderate severity burns by the wildfire affected another 519 acres of forested stands. Of the 519 acres, 246 acres of CWHR 4M/D and 5M/D suitable nesting habitat was affected. Primary treatments proposed are thinning, handcut/pile/burn, masticate and/or underburn. Only 9 acres of the 246 acres will be reduced in suitability based on CWHR classification but will still remain suitable: radial release and thinning is proposed for 9 acres (Unit 1059), for which CWHR classification goes from a 4D to a 4M. This unit is directly alongside a residential area. Of the 519 acres, 178 acres of CWHR 5P, 4P and 3D suitable goshawk foraging habitat will be reduced but remain suitable. Removal is proposed for 57 acres (Unit 1021 and 1044), which remain a 5P and 4P. The proposed treatments are expected to improve habitat conditions for the Northern goshawk and/or its habitat by opening up the understory and promoting tree growth.

The unburned area, of the Concow Project, was not burned in the Butte Lightning Complex wildfire. Treatments are proposed on 374 acres within the unburned area. The habitat around the towns of Paradise and Magalia consists of a high number of trees per acre in the small diameter classes, which are a result of fire exclusion and past management practices. These small trees that make up the lower canopy classes are referred to as shade-tolerant trees (white fir, tanoak, and incense cedar); trees that are able to grow in the shade of other conifers.

Treatments are proposed to reduce the fuels for the area. Primary treatments in Alternative B include thinning (removal and radial release; 215 acres), hand-cut lop and scatter or pile and burn (118 acres), masticate (28 acres) and underburn (13 acres).

Of the 374 acres proposed for treatment: 355 acres are classified as suitable Northern goshawk nesting habitat, CWHR 4M/D and 5M/D. Under Alternative B, suitable goshawk nesting habitat would be reduced in density on 224 acres but the habitat would still remain suitable: 31 acres of 5D would be reduced to 5M and 193 acres of 4D would be reduced to 4M. Refer to Table 3d above. Also, 469 live trees over 30"dbh would be removed as hazards or new temporary road and landing construction. In the long-term the habitat could benefit as a result of the thinning by reducing competition and allowing the remaining trees to grow, opening up the understory and reducing the risk of fire.

Approximate numbers of trees greater than 30 inches dbh in the unburned area in CWHR size class 5 are 14 trees per acre and CWHR size class 4 are 8 trees per acre. All trees 30 inches dbh or larger would be retained, unless removal is required for operability (e.g., new skid trails, landings, or temporary roads). Estimated trees greater than 30 inches to be removed for operability is 74 (0.26%) across the treatment units. This does not include any potential Danger Treedanger trees. There are an additional 374 large live trees over 30"dbh that could be removed as Danger Treedanger trees.

Thinning out the stands may prevent habitat loss should another wildfire occur and would promote tree growth. Also, the lands are probably more suitable for Northern goshawk habitat and removing some of the understory would improve habitat for the goshawk. Northern goshawks prefer habitat with large trees and open understories.

Western-red and Pallid bat. Any potential direct or indirect effects to bats is less likely in Alternative C, compared to Alternative B, which proposes thinning from below and would not remove large live trees and would retain burned forest (snag) habitat.

The wildfire could have resulted in long term harmful effects to pallid bats and Western red bats habitat due to reduction in the existing large tree component, reduction in oak and riparian habitat (areas along streams). Pallid bats as well as Western bats could take advantage of the increase in snag component for roosting sites and early seral shrub habitat and down woody material for prey availability. The analysis area supports numerous rock outcrops with associated crevices; hollow trees and snags occur within the project area are scattered throughout in limited amounts within the stands to be treated. Incidental fire-effected black oak trees are scattered throughout the western portion of the analysis area. Refer to the Snag discussion in the MIS Report. Snags (dead trees) are an important habitat component as roosts for bats.

Potential direct effects could also include removal of fire-effected or Danger Treedanger trees, and downed woody fuel. Dead or Danger Tree removal would not change the CWHR type within any stand as dead trees do not contribute to canopy closure. The proposed dead tree removal would have no effect on the residual live tree size, canopy cover or live-tree basal area. Alternative B proposes to remove burned forest (snags) which are utilized by pallid bats as roosts. Alternative C does propose to remove snags but only up to 13"dbh.

Potential direct effects could also include removal of live green trees within the unburned area. Pallid bats are also known to use live trees greater than 20"dbh for roosting. Alternative B would remove trees greater than 20 inch in the unburned area. The removal of trees in the area would change the overall canopy cover percentage in Alternative B. Under Alternative C only the lower canopy cover is affected and only green trees up to 13" dbh are proposed for removal, thereby decreasing the ladder fuels but retaining the overstory canopy. Refer to the habitat discussion under the Ca. spotted owl.

Effects to bats from the proposed actions could occur if they are in the project area. Possible effects include destruction of active roosts through felling or removal of dead trees with hollows could displace or harm individual bats. Chain saw activity or the use of heavy equipment causing ground vibrations may cause noise and tremor disturbance significant enough to cause temporary or permanent roost abandonment resulting in lowered reproductive success. These effects would be most severe during the breeding season when the potential exists for disturbance to active breeding females and maternity colonies. Activities conducted during the winter months can potentially disturb hibernacula sites (winter shelters), causing species arousal and use of crucial energy reserves, although, most activities occur when the soils are dry and not during the winter months.

Indirectly the machinery, movement of equipment, and/or removal of trees could impact individuals as trees or snags are removed, felled or bumped; however the project is not expected to impact any particular habitat component required by these species viability. Indirect effects to bats from the proposed treatments could occur more so in Alternative B than Alternative C.

Alternatives B and C

Direct and Indirect Effects to Management Indicator Species (MIS) and Habitat Resources

Mule deer, Northern flying squirrel, Hairy woodpecker and the Black-backed woodpecker.

Mule Deer. There is a positive direct and indirect effect to enhancing CWHR types MHC and MHW by promoting hardwood (oak) habitat. Both action alternatives propose the release of 355 acres of black oak. Alternative B does more to enhance black oak habitat as a result of treatments which will open up the understory but the proposed action may impact deer as a result of new temporary roads and landings, especially in Section 34. Under Alternative B temporary road construction and landings are proposed within the Concow Key area, a fawning and holding area for the Bucks Mountain Deer herd. Alternative C does less to enhance black oak habitat as a result of reduced thinning (removal and release) treatments but at the same time does not propose new temporary road construction and landings in an area with existing high road density. Alternative C also promotes tan oak habitat by maintaining tan oaks 6 inches and greater, as well as black oak. Section 34 treatments were dropped due to watershed concerns. Recovery has occurred at such a fast rate that treatments would do more to harm than good for the watershed. However, handcut/pile/burn can proceed to enhance hardwoods (oaks and maples) as a separate action from the Concow Project with benefits to the hardwood habitat as well as the watershed.

Northern flying squirrel. The direct and indirect effects of the Concow Project would not change the amount and distribution of late seral closed canopy coniferous forest within the analysis area. The wildfires resulted in a loss of late seral closed canopy coniferous forest habitat that will not recover for over 125 years. Refer to the analysis for the California spotted owl within the Biological Evaluation, 2009 for the Concow Hazardous Fuels Reduction Project.

Hairy woodpecker. Under Alternative B there would be direct effects on “Snags in Green Forest Habitat” which could directly or indirectly effect species dependent on those snags such as the Hairy Woodpecker. Under Alternative C there would not be direct effects on “Snags in Green Forest Habitat” and therefore no direct or indirect effect on species dependent on those snags such as the Hairy Woodpecker.

Black-backed woodpecker. Alternative C would minimally effect burned forest habitat and therefore minimal potential effect on Black-backed woodpecker. Although 320 acres of burned forest are proposed for removal under Alternative B the impact that this could have on the Black-backed woodpecker is expected to be minimal primarily because the project area is predominately below the lower 4,000' elevational range for the species. Additional reasons for low impacts is based on the following: 1) the amount of removal is limited to 320 acres; 2) snags are being retained (refer to the discussion above under habitat effects: 3) the FS parcels are relatively small: 4) the FS parcels are isolated surrounded by heavily managed forests; 5) private industry has harvested the majority of their moderate-high severity burned forest; and 6) there were no incidental observations of Black-backed woodpecker by CaDFG or FS employees (however there were detections of hairy woodpeckers).

There would be a reduction in burned forest habitat supporting snags thus potentially reducing habitat that could support cavity nesting species but low likelihood of impacting the BBWO. The potential for the analysis area to support cavity nesters including woodpeckers species declines post project with implementation of the action alternative. However, overall the analysis area still provides habitat (snags in burned forest) that would support higher densities of cavity nesters over 2008 levels.

The Concow Project, under all alternatives, would not alter the existing trend in the "Snags in Burned Forest" ecosystem component, nor would it lead to a change in the distribution of black-backed woodpecker across the Sierra Nevada bioregion.

Alternatives B and C

Cumulative Effects to Bald Eagle, California Spotted Owl, Northern Goshawk, Western-red bat and Pallid bat

Bald Eagle. The Bald Eagle falls under "The Bald and Golden Eagle Protection Act" therefore early involvement for the Bald Eagle was initiated with the U.S. Fish and Wildlife Service (USFWS) on June 04, 2007.

A site visit for the Bald Eagle nest with the U. S. Fish & Wildlife Service (FWS) has determined that treatments proposed would not adversely affect the Bald Eagle for the following reason; if a Bald Eagle and/or nest are found within the project the Forest Service is mandated to follow The Bald and Golden Eagle Protection Act and Forest Guidelines for its protection. The Federal Register released on July 9, 2007, advised that the Bald Eagle be managed under HFQLG as amended by the Sierra Nevada Forest Plan and administered by the Plumas National Forest. There would be no direct or indirect effects on known Bald Eagle territories as a result of implementing the Concow Project; therefore there are no cumulative effects to the Bald Eagles or Bald Eagle habitat.

California Spotted Owl. There are no direct or indirect affects; therefore there are no cumulative effects. There were no spotted owls detected during surveys and it is highly unlikely that owls would nest in the project area. There is no evidence that supports that spotted owls are foraging in the Concow (burned) or unburned areas. Fires with high severity seemed to adversely affect occupancy in some owl territories while in other territories affected by the same fire severity do not affect occupancy and the owls remain and continued to reproduce (Bond et al. 2004, Jenness et al 2004). It is hypothesized that fire could increase prey abundance, and access to prey by creating patchy openings (Franklin et al. 2000). Although, studies confirm owls have high site fidelity, the caveat is that owls were nesting/nested before the fire and that the habitat would be somewhat intact.

Although Alternative C is less impactful for the recovery of the natural, rejuvenating role of fire across the landscape, for spotted owls there would be not cumulative effects based on the changes to habitat expected from the fire-effected and Danger Tree removal and subsequent reforestation of Alternatives B or C.

The effects of the treatments on the habitat of the green areas would not reduce owl PAC/HRCA occupancy, distribution, or spotted owl populations [as there are no owls known to nest in the area]. Current canopy cover in the green areas of the treatment units is approximately 75 percent. Fifty five percent is in size classes 0-11 inch trees. That canopy cover is not the high canopy cover usually described as suitable nesting and foraging habitat for owls. Desired future condition for the habitat in the green areas is to maintain a DFPZ with an open understory. In Alternative B the canopy cover would be maintained to approximately a 40 to 50 % in the California Wildlife Habitat Relationships (CWHR) system Size Class 4 stands (trees 11–24 inches diameter at breast height [dbh]) and Size Class 5 stands (greater than 24 inches dbh) where it presently exceeds that amount. In Alternative C the tree top canopy cover would remain relatively the same.

Northern Goshawk. The proposed treatments on public land would not cumulatively add the harvested acres on private land. Removal of fire-effected trees would not affect the foraging capabilities if goshawks are using the area to forage.

Western-red and Pallid bat. There would be no cumulative effects on the Pallid bat and the Western bats habitat. Post-fire the landscape is recuperating and the recovery of vegetation along with the presence of waterways provides an abundance of insects for bats to forage.

Little is known about bat's responses to fire. It is likely any roost sites were destroyed by the fire preventing their return to burned areas. Even if roost sites were not destroyed the energetic demands of flying to locate foraging sites greatly reduce their ability to survive or reproduce in burned areas. There is potential to disturb roost sites in the green areas the disturbance to roost sites would be from the project itself. To a great extent the habitat in the project area prior to the fire with its mixed hardwoods and conifer trees was moderate or good habitat for the red bat. Post-fire the habitat is considered non suitable as the red bat is sometime referred to as "tree bats" because they roost only in the foliage of trees. They prefer trees with cover above and that are open below, not the snag component that is left after the fire.

There are areas that may provide "islands" of suitable habitat, such as the large cottonwoods [along riparian corridors], the dogwood [that survived the fires] along with the multiple edges produced by the mosaic burn pattern, as well as the fire perimeter. It is expected that the project could impact individuals as trees or snags are removed. Although it is less likely that removing snags would affect **red bats**. Western red bats red bats are primarily found in riparian areas where treatments consist of hand treatments effects would be minimal.

Pallid bats have different habitat requirements than Western red bats in that they use open habitats. During the 2006-2007 surveys on the Plumas NF Pallid bats were located in open grassy areas. Although Pallid bats have foraging potential in the burned area due to insects invading dead trees it is unlikely because the Pallid bats capture their prey on the ground. Plus as the montane chaparral matures and forms dense brush fields, foraging habitat quality would decline for the pallid bats. Although, pallid bats are insectivorous and can feed on airborne as well as ground-dwelling arthropods, they are known more for gleaning its prey from vegetation or the ground.

Pallid bats are known to roost in rock crevices, tree hollows, mines, caves, and a variety of anthropogenic structures, including vacant and occupied buildings. However, tree roosting has also been documented in large conifer snags (e.g. ponderosa pine) inside basal hollows of redwoods and giant sequoias, and bole cavities in oaks. Cavities in broken branches of black oak are very important, and there is a strong association with black oak for roosting (pers. comm. Pierson 1996). Whether they will roost in large burned areas is unknown.

Cumulative Effects to Mule deer, Northern flying squirrel, Hairy woodpecker, Black-backed woodpecker.

Mule Deer. It is anticipated that implementation of the action alternatives, in combination with past, present and reasonably foreseeable future actions would improve carrying capacity in the analysis area and deer numbers would respond to the habitat changes such that there would be some upward trend in the Bucks Mountain Deer Herd population for the next 10-20 years.

Summer range would be improved by opening up stands through thinning, prescribed burning and or mastication, all actions providing additional high quality forage and improving trend in habitat suitability. Forage will increase as a result of conducting activities that promote healthy black oak, big-leaf maple, tan oak, shrubs and grass/forb habitat. Improving carrying capacity on National Forest land would contribute to maintaining a stable population on Plumas National Forest land.

On private lands, Montaine Hardwood Conifer (MHC) increased from 44 acres to 2,305 acre and Montaine Hardwood (MHW) increased from 4,942 acres to 8,894 acres as a result of the wildfire. It is expected that the majority the increase of MHW and MHC is due to the wildfire removing conifers and the black oak trees surviving or stump sprouting. It is unknown how private is treating the acres that were converted to hardwood as a result of the wildfire.

Northern flying squirrel. The cumulative effects of the Concow Project would not change the amount and distribution of late seral closed canopy coniferous forest within the analysis area. The wildfires resulted in a loss of late seral closed canopy coniferous forest habitat that will not recover for over 125 years. Therefore the change in the amount of late seral closed canopy coniferous forest as a result of the Butte Lightning Complex fire may alter the existing trend in the habitat and local distribution of spotted owls locally, but not lead to a change in the distribution of the California spotted owl and Northern flying squirrel across the Sierra Nevada bioregion.

Hairy woodpecker. Post project treatments there would be an average of 2-4 snags per acre on 223.5 acres. Other treatment units would average greater than 2-4 snags per acre. Numbers are based on modeled data (see the "Fire and Fuels" section in this chapter and appendix B in this FEIS for predicted snags per acre by unit at year 1, 5, 10 and 20).

Snags can be found outside of treatment units in varying degrees. The analysis area is defined as the 30,917 acre area (7,154 acres or 23% Forest Service lands). Areas burned at high severity and other areas in low severity. Of the 18,720 acres that burned within the Concow Project analysis area 7,862 acres (42%) burned with high severity, 3,370 acres (18percent) burned with moderate severity and 7,488 acres (40%) burned with low severity. The projects 1,510 acres would affect snag densities in some areas, excluding RHCA's (riparian areas) and inaccessible areas (i.e. rock outcrops). However, the remaining acres outside treatment units on Forest Service lands would remain untouched.

Black-backed woodpecker. Implementation of fire-killed tree (snag) removal on 320 acres of the 1,136 acres proposed for treatment on the 7,960 acres of FS and BLM lands as designed, in combination with past, present and reasonably foreseeable future actions is expected to result in a decline of burned forest habitat availability in the immediate area. However there is still an increase in burned forest as a result of the 2008 Butte lightning Complex wildfire that is not proposed to be treated.

There is 6,450 acres of varying degrees of burned forest on FS and BLM lands within the Concow Project analysis area that are not proposed for treatment. There is also FS lands bordering the Concow project analysis area to the east, such as the Rocky (south of Flea), Flea, Dogwood, Camp and Lockerman subwatersheds that suffered low to moderate severity burns with patches of non-burned areas that are not scheduled for harvest. These lands provide burned forest habitat for the Black-backed woodpecker.

4.9.5 Summary of Effects Analysis Across All Alternatives

The following provides a summary of effect determinations to federal-listed and proposed, Forest Service sensitive, management indicator species and migratory birds (refer to table 4-44 below).

Determinations:

The following are determinations for TES species based on current data available and on the following assumptions: Compliance with the Pumas National Forest—Land and Resource Management Plan, and all applicable amendments, including HFQLG FEIS/ROD and SNFPA FEIS/ROD. If any federally listed species are found at a later date, or if any new information relevant to potential effects of the project on these species becomes available, the project would be stopped and the Section 7 Consultation process would be initiated.

Alternatives B and C would not impact the following species:

Bald Eagle: A pair of reproductively active Eagles currently resides around Magalia Reservoir, on private land. Presently, there are no Bald Eagles nesting on Forest Service Lands in the Concow Project analysis area.

California spotted owl: The habitat prior to the wildfire was described at best moderate to low suitability. Spotted owls were not detected during surveys in the project area. It is possible an owl may utilize the area post-fire for foraging due to the lack and/or reduced suitable habitat in the surrounding area (Clark 2007 et al. and Franklin et al. 2000). Based on direct and indirect affects the proposed action would not remove habitat above what an owl could potentially utilize as foraging habitat.

The green areas consists primarily of small diameter trees, sprawl of homes, and the density of roads which creates an undesirable habitat for California spotted owls, however the green areas like wise could be utilized by owls for foraging. Based on direct and indirect affects the proposed action would not remove habitat above what an owl could potentially utilize as foraging habitat.

Northern goshawk: Northern goshawks were not detected during surveys. Possible reasons for the goshawks absence could include the lack of habitat and/or that the area has a high concentration activity from communities, roads and private forest management. Typically, goshawks are sensitive to human activity and prefer large stretches of undisturbed, mature woodland for nesting and hunting (Kenward 2006). There is limited information about goshawks nesting in areas other than indicated as typical habitat. The proposed action would not hinder potential foraging opportunities for the goshawk.

It has been determined that the project may impact habitat for the following species:

Western red-bat: The project could impact individuals as trees or snags are removed. The habitat used by this species is a small percentage of the proposed treatment units. This is because red-bat is often referred to as “tree bats” because they roost only in the foliage of trees and are found along creeks and seeps. Most foraging takes place over slow moving, or standing areas of water.

Pallid bat: The felling and removal of trees could impact individuals. SNFPA FEIS, Volume 3, Chapter 3, Part 4.4, page 55 states the following under Risks Factors “Pallid bats appear to be more prevalent within edges, open stands, particularly hardwoods, and open areas without trees. The reduction of hardwoods, both from manual removal and competition from conifers, reduces foraging habitat for pallid bats”. “Tree roosting has been documented in large conifer snags and bole cavities in oaks” (HFQLG FEIS BA/BE (p158)) Cavities in broken branches of black oak are very important, and there is a strong association with black oak for roosting (pers. comm. Pierson 1996). Whether they will roost in burned areas is unknown.

If any federally listed species are found at a later date, or if any new information relevant to potential effects of the project on these species becomes available, the project would be stopped and the Section 7 Consultation process would be initiated.

U.S. Forest Service Sensitive Species

Alternative B. It is our determination that the proposed activities within the Concow Project analysis area will not affect the following Forest Service Sensitive species: Bald Eagle, California spotted owl, and Northern goshawk. It is our determination that the proposed activities within the Concow Project analysis 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: Western red-bat and Pallid bat.

Alternative C. It is our determination that the proposed activities within the Concow Project analysis area will not affect the following Forest Service Sensitive species: Bald Eagle, California spotted owl, and Northern goshawk. It is our determination that the proposed activities within the Concow Project analysis 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: Western red-bat and, Pallid bat.

Table 4-44 Summary of Effects of Proposed Action for Threatened, Endangered, Proposed, and Sensitive Animal Species that Potentially Occur Within the Concow Project Analysis Area or May Be Affected by Implementation of the Concow Project.

SPECIES	ALTERNATIVES		
	A	B	C
BIRDS			
Bald Eagle (*Haliaeetus leucocephalus)*	WNA	WNA	WNA
Northern goshawk (*Accipiter gentilis*)	WNA	WNA	WNA
California spotted owl (*Strix occidentalis occidentalis*)	WNA	WNA	WNA
MAMMALS			
Pallid bat (*Antrozous pallidus*)	WNA	MAI	WNA
Western red bat (*Lasiurus blossevillii*)	WNA	MAI	WNA

WNA = Will Not Affect, MAI = May Affect Individuals, but in not likely to result in a trend toward Federal listing or loss of viability

4.10 Aquatic Wildlife Species and Habitats

4.10.1 Introduction

Management of aquatic dependent species and habitat, including maintenance of diverse animal communities, is an important part of the mission of the Forest Service (Resource Planning Act of 1974, National Forest Management Act of 1976). Management activities on National Forest System (NFS) lands must be planned and implemented so that they do not jeopardize the continued existence of threatened or endangered species or lead to a trend toward listing or loss of viability of Forest Service Sensitive species.

Management decisions related to hazardous fuels reduction and vegetative treatments can affect aquatic species by direct physical contact, causing changes in behavior due to disturbance, and habitat modification (Gaines et al. 2003, Trombulek and Frissell 2000, USDA Forest Service 2000). It is Forest Service policy to minimize damage to vegetation, avoid harassment to wildlife, and avoid significant disruption of wildlife habitat while fulfilling other legislated mandates, such as implementing the Herger Feinstein Quincy Library Group (HFQLG) Act. Therefore, management decisions related to establishing and maintaining Defensible Fuel Profile Zones (DFPZ) on NFS lands must consider potential effects to aquatic wildlife and their habitat.

The Biological Assessment (BA) is prepared to determine the effects of proposed projects on species listed by the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service as Endangered, Threatened or Proposed for listing. It is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (19 U.S.C. 1536 {c}), 50 CFR 402, and standards established in Forest Service Manual (FSM) direction (FSM 2672.42). The Biological Evaluation (BE) provides a process to review all Forest Service planned, funded, executed, or permitted programs and activities for possible effects on regionally listed Forest Service Sensitive species (FSM 2672.42). The Management Indicator Species (MIS) report documents potential effects from the proposed action and alternatives on the habitat of selected MIS.

The following fish species are not known to be located on the Plumas National Forest: winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Delta smelt, Central Valley steelhead, and Lahontan cutthroat trout. Although present on the Plumas National Forest, there is no known habitat in the Concow Project Area: for Sierra Nevada (Mountain) yellow-legged frog. Because they do not occur in the Project Area, potential effects to these species will not be discussed further in this FEIS.

The following Federally listed species and Forest Service Sensitive Species, were analyzed based on their potential to be affected by the alternatives: (1) California red-legged frog, (2) Foothill yellow-legged frog, (3) Western pond turtle, (4) Hardhead minnow.

The following aquatic Management Indicator Species (MIS) and their habitat were analyzed based on their potential to be affected by the alternatives: (1) aquatic macroinvertebrates.

Table 4-42 provides a list of all the special status species and MIS discussed in this document. Additional information relevant to aquatic habitat features are presented in this FEIS, Chapter 4: Soil and Watershed Resources section (Whitsett and Angulo 2009).

4.10.2 Analysis Framework: Statute, Regulation, Forest Plan, and Other Direction

Direction relevant to the action alternatives (B and C) as they affect aquatic wildlife species and habitat includes:

Endangered Species Act (ESA). The Endangered Species Act of 1973 (16 USC 1531 et seq.) requires that any action authorized by a federal agency not be likely to jeopardize the continued existence of a threatened or endangered (TE) species, or result in the destruction or adverse modification of habitat of such species that is determined to be critical. Section 7 of the ESA, as amended, requires the responsible federal agency to consult the USFWS and the National Marine Fisheries Service concerning TE species under their jurisdiction. It is the Forest Service's policy to analyze impacts to TE species to ensure management activities are not be likely to jeopardize the continued existence of a TE species, or result in the destruction or adverse modification of habitat of such species that is determined to be critical. This assessment is documented in a Biological Assessment (BA) for Fish and Wildlife and is summarized or referenced in this Chapter (Alvarez 2009).

Consultation: The California red-legged frog is a listed threatened species (May 23, 1996) (Federal Register 61: 25813-25833) and is fully protected under the Endangered Species Act of 1973, as amended (16 U.S.U. 1531 et seq.). Critical Habitat has been designated for California red-legged Frog (CRLF) (Federal Register March 17, 2010, Vol. 75, No. 51, 12816-12876). USFWS has designated two Critical Habitat units within the PNF. The Concow Project is not within designated Critical Habitat or Recovery area. The analysis area is approximately 3 miles west of a core area as designated by the USFWS in the Recovery Plan (USFWS 2002) and a Critical Habitat unit (Federal Register 2010). All of the Concow Project aquatic analysis area is below 4,500 feet in elevation and within suitable elevational habitat range for CRLF. There are several reservoirs and ponds within the analysis area; however, many of these ponds and reservoirs are unsuitable habitat for CRLF primarily due to the presence of predatory species (bass species, trout, and bullfrogs). The Forest began early involvement with USFWS for the pre-fire Flea Project on July 5, 2007. Implementation of project design features, mitigations, protection measures, site assessments, surveys, and Best Management Practices will result in no adverse effects to California red-legged frogs.

Sierra Nevada Forest Plan Amendment (SNFPA). The Record of Decision (ROD) for the 2004 Sierra Nevada Forest Plan Amendment identified the following standards and guidelines applicable to hazardous fuels and vegetative management and aquatic resources, which were considered during the analysis process:

1. Riparian Habitat (Management Standard and Guideline 92): see discussion under Water Resources.

2. Ensure that management activities do not adversely affect water temperatures necessary for local aquatic and riparian dependent species assemblages (Management Standard and Guideline 96).

3. Ensure that vegetative management activities including fuels reduction actions proposed within Riparian Habitat Conservation Areas (RHCAs) and Critical Aquatic Refuges (CARs) enhance or maintain physical and biological characteristics associated with aquatic/riparian dependent species. As appropriate, assess and document aquatic conditions following the Regional Stream Condition Inventory protocol prior to implementing ground disturbing activities.

4. California Red-Legged Frog specific standards and guides are identified below:

   - Defensible Fuel Profile Zone (DFPZs) treatments, and associated equipment trails and operational log and biomass landings, do not have the potential to capture or release sediment laden surface run-off into any streams associated with California red-legged frog habitat.

   - Avoid all potential suitable habitat for the California red-legged frog, while minimizing the potential for adverse effects within Riparian Conservation Areas and Riparian Habitat Conservation Areas (as defined in the 1999 HFQLG FEIS and ROD), except where necessary to cross streams to gain access.

   - Critical Aquatic Refuge standards and guidelines do not apply to this project, since no treatments areas are within Critical Aquatic Refuges (CARs) for California red-legged frog.

The Herger-Feinstein Quincy Library Group Forest Recovery Act and Record of Decision (HFQLG Act and ROD) direct the Forest Service to apply the Scientific Analysis Team guidelines for riparian system protection to all resource management activities specified by the Act. The prescribed minimum widths of “interim boundaries” of Riparian Habitat Conservation Areas (RHCAs) are relative to the stream classification as follows: (1) 300 feet either side of perennial fish-bearing streams and lakes (2) 150 feet either side of perennial non-fish-bearing streams, ponds, wetlands greater than 1 acre, and lakes; and (3) 100 feet either side of intermittent and ephemeral streams, wetlands less than 1 acre. RHCA’s are to be managed consistent with Riparian Management Objectives (RMO’s) and associated standards and guidelines (HFQLG Act and ROD). Riparian Management Objectives were developed to manage ecosystems by pulling together individual system components and evaluating all important influences, interconnections, and interactions. A discussion of how the Concow Project meets RMO’s and associated standards and guidelines can be found in Appendix I of the Concow Project Biological Assessment and Biological Evaluation for Fish and Wildlife (Alvarez 2009).

Forest Service Sensitive species are designated by the Regional Forester to address species with known or suspected viability problems due to (1) significant current or predicted downward trends in population numbers or density, and/or (2) significant current or predicted downward trends in habitat capability that would reduce a species’ existing distribution. The Forest Service considers the long-term conservation needs of sensitive species in order to avoid future population declines and the need for federal listing (FSM 2672.42). This assessment is documented in the Biological Evaluation (BE) for Fish and Wildlife and is summarized or referenced in this Chapter (Alvarez 2009).

The Forest Service Handbook (FSH: 25009.22, USDA Forest Service 1990a) requires a Cumulative Watershed Effects (CWE) analysis to include known information that produces an objective, reproducible, and professional assessment of the combined effects of all past, present, and reasonably foreseeable future management actions on downstream beneficial uses. Chapter 20 of the FSH describes the cumulative CWE assessment procedure used on National Forest System lands and in Region 5. It further defines CWE to include all effects on beneficial uses of water that occur away from the locations of actual land use which are transmitted through the fluvial system. Effects can be either beneficial or adverse and result from the synergistic or additive effects of multiple activities within a watershed. Beneficial uses include the protection and enhancement of fish, wildlife, and other aquatic resources or preserves. For this reason, the aquatic analysis incorporates calculated "Equivalent Roaded Areas" (ERAs) as compared to a Threshold of Concerns (TOC) at a Hydrologic Unit Code (HUC)-6 watershed (subwatershed) scale, as a measure of potential cumulative effects to species and habitats. Equivalent Roaded Areas (ERA) of watersheds are compared to the TOC, and reported as percent disturbed and percent of TOC.

Management Indicator Species (MIS) are animal species identified in the Sierra Nevada Forests MIS Amendment (SNF MIS Amendment) Record of Decision signed December 14, 2007. This Record of Decision (ROD) was developed under the 1982 National Forest System Land and Resource Management Planning Rule (1982 Planning Rule) (36 CFR 219). The current rule applicable to project decisions is the 2004 Interpretive Rule, which states “Projects implementing land management plans…must be developed considering the best available science in accordance with §219.36(a)…and must be consistent with the provisions of the governing plan.” (Appendix B to §219.35). Guidance regarding MIS set forth in the 1988 Plumas National Forest Land and Resource Management Plan (PNF LRMP) as amended by the 2007 SNF MIS Amendment ROD directs Forest Service resource managers to: (1) at project scale, analyze the effects of proposed projects on the habitat of each MIS affected by such projects, and (2) at the bioregional scale, monitor populations and/or habitat trends of MIS, as identified in the PNF LRMP (1988) as amended. This assessment is documented in a separate Management Indicator Species Report and is summarized or referenced in this Chapter (Alvarez 2009).

4.10.3 Effects Analysis Methodology

Geographic Scope of Analysis

The aquatic analysis area for determining direct, indirect, and cumulative effects on fisheries and aquatic habitat-dependent wildlife includes 6,520 acres of National Forest System lands, 768 acres of other federal lands, and 20,226 acres of private land for a total area of 27,515 acres. The aquatic analysis area is comprised of 15 subwatersheds ranging from 544 to 3,223 acres each, and is the same as the Cumulative Watershed Effects analysis area described in the “Soils” and “Hydrology” sections to follow. A watershed is a naturally-occurring and easily distinguishable division of landscapes. It is particularly well-suited as a spatial analysis unit when considering direct, indirect, and cumulative effects on aquatic species because these effects generally will not extend beyond the physical boundary of the watershed. The aquatic analysis area includes all subwatersheds within which Concow Project activities are proposed.

Assumptions Specific to the Aquatic Species and Habitat Analysis:

1. Aquatic species spend all or significant portions of their life cycles either in or moving through aquatic and/or riparian habitats.

2. Habitat is already impacted in the short-term by past human activities and natural disturbances, such as high severity wildfire (most recently in 2008). However, ecological diversity of aquatic and riparian habitats is maintained by natural disturbances, including fire and fire-related flooding, debris flows, and landslides (Burton 2005, Dwire and Kauffman 2003, Keane et al. 2008).

3. Native species have adapted to survive and thrive following natural disturbances, including wildfire (Keane et al. 2008).

4. Aquatic habitats and associated stream systems can tolerate given levels of land disturbance; however, widespread or intense land disturbances applied in sensitive areas such as RHCAs can substantially impact downstream channel stability and water quality.

5. Occupancy is assumed in all non-surveyed, potentially suitable habitat for the California Red-Legged Frog (CRLF).

6. Concow Reservoir dam currently serves as a fish barrier to fish from West Branch of the North Fork Feather; therefore, it is very unlikely that hardhead minnow currently inhabit or utilize for spawning any perennial streams upstream of Concow Reservoir.

7. All subwatersheds currently at or predicted to exceed the Threshold of Concern will have the greatest potential for off-site sediment delivery into streams and water bodies (see the "Hydrology" section in this FEIS).

8. DFPZ treatments requiring mechanized ground-based equipment will result in the same amount of disturbance effect on aquatic dependent species and habitats, as measured at a subwatershed scale.

9. All DFPZ treatments applied manually will result in the same amount of disturbance effect on aquatic dependent species and habitats, as measured at a subwatershed scale.

Data Sources:

Several types of data were compiled to provide the basis for understanding the nature and extent of aquatic resources within Project Area, and the potential effects of proposed hazardous fuels reduction and vegetative treatments on this resource:

1. Archival and literature sources including prior fish, amphibian, reptile, and stream survey data from Forest Service aquatic resource records.

2. GIS layers of the following information: spatial identification of streams, ponds, wetlands, wet meadows, Riverine (RIV) and Lacustrine (LAC) habitats; and 'designated' or important aquatic areas (e.g., RHCAs).

3. Site-specific amphibian surveys conducted in 2009 using the Fellers and Freel (1995) protocol.

4. Site assessments for potentially suitable habitat following the 2007 USFWS CRLF protocol.

5. Stream Condition Inventory (SCI) data for an unnamed tributary to Concow Creek, in the burned area (post 2008 Butte Lightning Complex).

6. Resource expert field reconnaissance and observations conducted in 2009.

7. Equivalent Roaded Area (ERAs) as compared to Threshold of Concern (TOC) calculations at analyzed at a subwatershed scale (Whitsett and Angulo 2009).

Basis for Analysis/Aquatic Resources Indicators:

California Red-Legged Frog, Foothill Yellow-Legged Frog, Western Pond Turtle and Hardhead Minnow

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). 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, irrigation, or habitat for fish and wildlife. Stream channels can deteriorate to the extent that riparian and meadowland areas become severely damaged. Equivalent Roaded Areas (ERA) of watersheds are compared to the TOC, and reported as percent disturbed and percent of TOC. If the percent of TOC is 80-99%, then the watershed condition is approaching the TOC. If the percent of TOC is 100% then the watershed condition is at the threshold of concern, and if it is greater than 100% then the watershed condition is over the threshold of concern. The threshold of concern does not represent an exact level of disturbance where cumulative watershed effects will occur. Rather, it serves as a "yellow flag" indicator of increased risk of significant adverse cumulative effects occurring within a watershed.

The treatment type and operational methods were evaluated to determine and compare predicted overall direct and indirect effects associated with the action alternatives. Also, potential cumulative effects to aquatic habitat were evaluated for the 15 subwatersheds in which treatments are proposed. Percent of Threshold of Concern (TOC) provides a relative index to quantify the potential indirect effects to aquatic habitat associated with risks of disturbance to streams and water bodies which potentially affect aquatic species. Thresholds for species viable sedimentation levels have not been established, however, percent of TOC provides a relative way to compare the effects of the alternatives. These indicators represent the proportion of a species habitat that could be affected by treatments:

Percent of Threshold of Concern (Percent TOC); “Hydrology and Soils” sections in this FEIS).

Management Indicatior Species (MIS)

Benthic Macroinvertebrates (BMI) were selected as the MIS for riverine and lacustrine habitat in the Sierra Nevada. BMI have been demonstrated to be very useful as indicators of water quality and aquatic habitat condition (Resh and Price 1984; Karr et al. 1986; Hughes and Larsen 1987; Resh and Rosenberg 1989). They are sensitive to changes in water chemistry, temperature, and physical habitat. Factors of particular importance are flow, sedimentation, and water surface shade.

Table 4-45. Special Status Aquatic Species, MIS, and Habitat analyzed in Concow Project Wildlife and Fish BA/BE and Aquatic MIS report.

Species Name	Elevation Range (feet)	Habitat	Potential Threats	Suitable Habitat w/in Analysis Area	Sighting w/in Analysis Area	Rationale for Inclusion
Amphibians						
Rana aurora draytonii **CALIFORNIA RED-LEGGED FROG** **Federally listed Threatened**	0-4,500	Low gradient streams with deep pools and emergent vegetation, natural ponds, man-made ponds or impoundments	Destruction degradation & fragmentation of riparian habitat. Exotic predators & competitors	Yes	No	Suitable habitat within analysis area. Analyzed in text.
Rana boylii **FOOTHILL YELLOW-LEGGED FROG** **Forest Service R5 Sensitive** **Federal Species of Concern**	< 6,400	Breed in shallow, slow flowing water with at least some pebble and cobble substrate. Found in riffles and pools with some shading (>20%) in riparian habitats, and moderately vegetated backwaters, isolated pools, and slow moving rivers with mud substrate. Rarely found far from permanent water.	Altered stream flow regimes and introduced exotic predators (fish & bullfrogs), grazing, mining, and recreation.	Yes	Yes	Suitable habitat within analysis area. Analyzed in text.
Reptiles						
Clemmys marmorata marmorata **NORTHWESTERN POND TURTLE** **Forest Service R5 Sensitive** **Federal Species of Concern**	< 4,700	Aquatic habitat in spring and summer. Adjacent upland habitat in fall and winter. In rivers, needs slow flowing areas with deep underwater refugia and emergent basking sites. Migration, hibernation, and nesting occur on land up to 0.25 miles (400 meters) from riparian area.	Non-native fauna, non-native turtles through competition and diseas, bullfrogs and predatory fish, vehicles, timber harvest, mining, fire, grazing, water alteration and diversions, and fishing	Yes	No	Suitable habitat within analysis area. Analyzed in text.
Fish						
Mylopharodon conocephalus **HARDHEAD** **MINNOW** **Forest Service R5 Sensitive**	< 6,000	Low to mid-elevation streams along the west slope of Sierra Nevada. Prefer deep pools with low velocity and rocky substrate.	Population isolation, hydro-electric power, predation by smallmouth bass.	Yes	Yes	Analyzed in text.
Management Indicator Species						
Aquatic Macroinvertebrates **Management Indicator Species**	***n/a***	**CWHR habitat type Riverine and Lacustrine**	**Changes in habitat component which would impair species**	**Yes**	**Yes**	**Analyzed in text.**

Aquatic Species and Habitat Methodology by Action

1. **Direct/indirect effects to Aquatic Resources.**

Considerations. Potential effects common to all aquatic species and habitats are discussed for action alternatives, including passive recovery under the No-action Alternative. Different species utilize habitat in different ways. Therefore, implementation of an action alternative may affect species differently, or not at all. Treatment associated effects are also discussed specifically for each of the following aquatic species and their potentially suitable habitat within the analysis area: (1) California red-legged frog, (2) Foothill yellow-legged frog, (3) Western pond turtle, and (4) Hardhead minnow.

Short-term timeframe: 1 year.

Long-term timeframe: 20 years.

Spatial boundary: The aquatic analysis includes the sub-watersheds affected by the proposed action; identical to the cumulative watershed effects (CWE) analysis area in the "Hydrology" section of this FEIS.

Indicator(s): Indicators used to analyze the effects of the proposed Concow Project on habitat are Equivalent Roaded Area (ERA) and Threshold of Concern (TOC) values by HUC 6 sub watersheds. In addition, Stream Condition Inventory measurements were evaluated to determine the current habitat condition.

Table 4-46 Indicators and Measures

SPECIES	INDICATORS	MEASURES
All Aquatic Species	Large Trees	Number of trees 30" dbh and greater
	Snags	Number of snags 15" dbh and greater
	Large Down Wood	10-15 tons per acre 10' length and 20" diameter
	Oaks	Number of 12" dbh trees Average 25-35' basal area
Foothill Yellow Legged Frog, Red Legged Frog	Subwatersheds below the TOC	Acres
	Subwatersheds approaching the TOC	Acres
	Watersheds at the TOC (100% of TOC)	Acres
	Watersheds above the TOC (>100% of TOC)	Acres
Pacific Fisher	Nesting habitat CWHR 5D and 4D Med-large trees, dense canopy	Acres
	Foraging habitat CWHR 5M and 4M Medium-large trees, moderate canopy	Acres
Pallid Bat Western Red-Bat	Medium to Large Trees	Number of trees 20"dbh and greater
	Snags	Number of snags 15"dbh and greater.
	Large Down Wood	10-15 tons per acre, 10' length and 20" diameter.
	Oaks	Number of 12" dbh trees. Average 25-35' basal area.

Rationale: The Plumas National Forest Land and Resource Management Plan (LRMP) provides Forest specific information on how TES species will be managed. 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 4-32). The most recent management direction can be found in the PNF-LRMP, as amended by the Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLGFRA EIS: Appendix D), as amended by SNFPA FSEIS ROD (2004), for Wildlife, Fish, Riparian Ecosystems and riparian-dependent wildlife species.

2. Cumulative Effects to Aquatic Resources

Considerations: Cumulative effects should be discussed in reference to the No-action and the action alternatives. Cumulative effects discussion for all alternatives should combine all direct/indirect effects of the alternatives with past/present, and reasonably foreseeable future actions.

For aquatic dependent species, the direct, indirect, and cumulative effects of each alternative are analyzed. Direct and Indirect effects can be assessed together and should be assessed in both the short-term (within 1 year) and the long-term (approximately 20 years). Cumulative effects are assessed only in the long-term (approximately 25 years) and incorporate past/present (the current situation) and reasonably foreseeable future actions potentially affecting these species (e.g., timber sales, grazing, other recreational uses, etc.).

Short-term timeframe: not applicable; cumulative effects analysis will be done only for the long-term time frame.

Long-term timeframe: 25 years.

Spatial boundary: The aquatic analysis includes the sub-watershed affected by the proposed action; identical to the cumulative watershed effects (CWE) analysis area (Whitsett and Angulo 2009).

Indicator: Percent of TOC

Methodology: GIS analysis of past/current, added, and future actions in relation to habitat and important/sensitive aquatic areas. When utilizing the ERA model, all landscape disturbances are evaluated in comparison to a completely impervious or roaded surface. Road surfaces are considered to represent maximum hydrologic disturbance and rainfall-runoff potential. Other ground-disturbing activities assessed in the Concow Hazardous Fuels Reduction Project cumulative off-site watershed effects (CWE) analysis area include timber harvest and related silvicultural treatments on private and public lands, residential development, mines, wildfire, prescribed burning, and off-highway vehicle (OHV) trails.

Rationale: Where human land management and natural disturbance occurs in relation to habitat can affect aquatic species through mortality, disturbance, and habitat modification (Trombulek and Frissell 2000, USDA Forest Service 2000).

4.10.4 Environmental Consequences

Alternative A – No Action

Direct, Indirect and Cumulative Effects to California red-legged frog, Foothill yellow-legged frog, Western pond turtle, Hardhead minnow

There would be no direct, indirect, or cumulative effects to species or habitat from treatments, as no treatments would occur. Riparian and aquatic habitat in the burned area would continue to recover from the fire. Riparian and aquatic habitat in the unburned area would remain the same. There would be no change to the TOC/ERA values by the implementation of alternative A, except in Subwatersheds 1 and 2. This change in TOC is due to future foreseeable actions on private timber land.

Direct, Indirect and Cumulative Effects to MIS (Aquatic Macroinvertebrates) habitat

As a result of the fire, it is expected that stream temperatures, stream flows, sediment, and nutrient levels will all increase in the short term (Roby & Azuma 1995, Minshall 2003). Over the long term, it is expected that sediment production and deposition will decrease, and that there will be a shift in the type and amounts of leaf litter available to Benthic Macroinvertebrates (BMIs). The response of the macroinvertebrate community will be similar: partial recovery will occur quickly (1-5 years), species diversity will be higher than pre-fire but species richness would be lower, and long term recovery of the macroinvertebrate community may take from 10 to over 50 years. Rapid recovery of stream macroinvertebrates is associated with the more rapid recovery of the riparian vegetation (Minshall 2003).

In the burned area, sedimentation is expected to increase as a result of the wildfire, until ground cover is re-established (Soils and Water Resources Report, Whitsett 2009). However, this sedimentation would be within the range of natural variability. Post-fire response by riparian plant species will help recover surface water shade within 2-5 years, based on field observations. Changes in flow, water surface shade will be too small to be measured. Timeframes for recovery of in-stream habitat will be less compared to action alternative. There would be no logging on National Forest System Lands, thus the risk of additional sediment delivery to the riverine and lacustrine systems is minimal.

Alternatives B and C

Direct, Indirect and Cumulative Effects to California red-legged frog (CRLF)

There would be no direct or indirect effects to individuals or habitat by implementations of Alternatives B or C. Although within the historic range of CRLF, there have been no historic or recent CRLF records within the aquatic analysis area. There is no potential breeding habitat for CRLF within treatment areas, except for Paradise Lake. California Department of Fish and Game conducted site assessments of Paradise Lake and concluded that it was not suitable breeding habitat; USFWS concurred with this conclusion (C. Garman, personal communication).

Other reservoirs within the aquatic analysis area, downstream and adjacent to treatment areas, have not been surveyed nor undergone site assessments for CRLF. Because they have not been surveyed, presence of CRLF is assumed. Treatment areas upstream and adjacent to unsurveyed reservoirs are assumed to have potential dispersal habitat for CRLF. Dispersal habitat, especially in those areas which burned in the Butte Fire Complex, is assumed to be riparian corridors.

Riparian corridors in the burned area have the necessary structure to provide shade, moisture, and cooler temperatures necessary for dispersing and sheltering frogs. Alternative B was designed to fully protect habitat and individuals. Alternative C does not include treatment along streams upstream of unsurveyed reservoirs except for six treatment units. These treatment units will have no mechanical treatment. Alternative C was designed to fully protect habitat and individuals.

There would be no cumulative effects to individuals or habitat by implementation of Alternatives B or C, as there would be no direct or indirect impacts to individuals or suitable habitat. Treatment areas upstream of unsurveyed reservoirs are assumed to have potential dispersal habitat. The potential for project-related sediment delivery to channels in treatment areas is small (Concow Project Soils and Water Resources Report, Angulo and Whitsett 2009). Although there may be increased sedimentation to streams and downstream reservoirs from treatment, sedimentation will not affect shade, moisture, or cooler temperatures in riparian corridors important for dispersing or sheltering frogs. Increased sedimentation will not affect frogs using riparian corridors for dispersal. There will be no effect from sedimentation to potential breeding habitat, because there is no breeding habitat within or adjacent to treatment areas.

Direct, Indirect and Cumulative Effects to Foothill Yellow-legged Frog (FYLF)

There would be no direct effects to individuals or habitat by implementation of Alternatives B or C. FYLF are found nearly exclusively within bankfull width of streams. A study of an inland population of FYLF found that the average distance of FYLF from stream edge was less than three meters (Bourque 2008). Riparian buffers for mechanical treatments will fully protect FYLF from direct effects.

There could be indirect effects to individuals or habitat under Alternative B. There is a potential for increased sedimentation in the burn area by implementation of Alternative B (Soil and Water Resources Report, Whitsett 2009). Increased sedimentation may indirectly affect habitat for FYLF by altering breeding areas. FYLF have high breeding-site fidelity, returning to the same areas annually (Bourque 2008, Wheeler 2007). Current breeding areas may fill in with sediment, though new potential breeding areas could also be created. Increased sedimentation is already occurring in the project area due to the 2008 wildfire. Further sedimentation from action alternatives would be small with implementation of mitigations, protection measures and BMP’s.

There would be no indirect effects to FYLF from implementation of Alternative C. Alternative C has fewer treatment units adjacent to streams with known FYLF populations. Alternative C treatment units adjacent to streams with known FYLF populations will have no mechanical treatments. Disturbance to the ground will be minimal and the chance of increased sedimentation will be less than Alternative B.

Cumulative effects to habitat or individuals by implementation of Alternatives B should be minor. Although there may be increased sedimentation from treatments, it is expected to be small in scale with mitigation. There should be no cumulative effects to habitat or individuals from implementation of Alternative C, unless upslope mitigations fail from an extreme storm event.

Direct, Indirect and Cumulative Effects to Western pond turtle (WPT)

There may be direct or indirect effects to individuals or habitat by implementation of Alternatives B or C. In the project area, western pond turtles are likely only found in Paradise Reservoir. Female western pond turtles travel up to a quarter mile from aquatic habitat to suitable upland nesting sites during the summer months (Rathburn et al. 1992). In Alternative B, 52 acres will be treated around Paradise Reservoir; 40 acres will be treated in Alternative C. Treatments in both action alternatives include hand cutting, piling, and burning of trees less than nine inches in diameter, and mastication or chipping of larger diameter trees. The number of acres masticated is the same under Alternatives B and C. There are no chipping treatments in Alternative C. Treatments will occur 300 feet from reservoir and may affect female western pond turtles seeking to nest in upland habitat. Project operating periods will occur during western pond turtle nesting season. Direct and indirect effects could include injury to individuals searching for nest sites, disturbance of nesting females, and disturbance of nests and/or nest sites. Direct and indirect effects to western pond turtles will be short term and limited to the duration of operations.

Hatchlings either seek out aquatic habitat in the fall, or overwinter in the underground nest and depart the following spring (Feldman 1982). Emerging hatchlings should be fully protected by limited operating periods. Limiting operating periods and Best Management Practices will minimize effects to western pond turtles.

Mastication and chipping leave soil covered with woodchips, up to 1.5 feet in depth. It can take years for masticated material to decompose. It is unknown how this will affect western pond turtle upland nesting sites. Alternative B includes mastication treatments as maintenance five and 10 years from initial treatment. This could cumulatively affect nesting habitat for western pond turtles.

Direct, Indirect and Cumulative Effects to Hardhead minnow (HM)

There would be no direct or indirect effects to individuals or habitat by implementation of Alternatives B or C. Hardhead are found in the West Branch NF Feather and NF Feather Rivers. TOC will not change with implementation of Alternatives B or C in subwatershed 15 (North Fork Feather River). In subwatershed 3 (West Branch Feather River), change in percent TOC will be minor and is well below TOC (24-26% of TOC) (Concow Soils and Water Resources Report 2010). Implementation of mitigations, protection measures, and BMP’s will fully protect habitat and individuals. There will be no cumulative effects to hardhead or their habitat by implementation of Alternatives B or C.

Direct, Indirect, and Cumulative Effects to MIS (Aquatic Macroinvertebrates) Habitat

There would be no direct or indirect effects to stream flow from implementing Alternatives B or C. There would be no changes in stream flow above the levels in the burned area that may have increased due to vegetative removal by fire.

There could be direct and indirect effects to temperature from implementing Alternatives B or C. The wildfire consumed both riparian and conifer vegetation that provide surface water shade. Dead trees provide some shade, and the removal of dead trees in RHCA’s by hand-cutting will reduce shade somewhat. Although the amount of shade is much less than prior to the fire, it is unknown how influential in terms of water temperatures the removal of this structural shade will be. No live vegetation currently providing shade would be removed by the action alternatives in the burned area.

Under existing conditions, shade measurements in the unnamed tributary to Concow Creek averaged 38 percent. Post-fire vegetative response by riparian species will help recover surface water shade within 2-5 years, based on field observation. In the unburned area, hand cutting of conifers would be allowed within RHCA's, which could reduce water shade.

There would be some direct and indirect effects to large woody debris available for stream habitats. Sufficient large woody recruitment would remain within RHCAs of all streams. There would be a loss of available large woody debris in upslope treatment areas from fuel reductions. All streams in the burned treatment areas will likely have a large flush of woody material over the next 10 years and then less recruitment for the next 50+ years. Untreated areas upstream in the burned areas will continue to provide large woody debris recruitment to treated areas downstream.

Table 4-47 includes the final results of the Cumulative Watershed Effects (CWE) analysis of each subwatershed, represented as percent of TOC for the subwatershed as a whole. The total ERA score had a minor increase as a result of the action alternatives. Alternative B will have more of an increase than Alternative C, but overall increases in ERA are minor when compared to other disturbances in these subwatersheds for both action alternatives. There may a slight short term increase in sediment from treatments; however, implementation of mitigations, protection measures, and Best Management Practices should minimize effects. The subwatersheds over the threshold of concern due to the Butte Lighting Complex are expected to below TOC with 5 years. Typically in this landscape, full vegetation recovery (i.e., soil cover) returns within 5 years post fire.

The direct, indirect, and cumulative effects of dead tree removal in the burned area would not change the existing amount of riverine or lacustrine habitat, would not change the amount of riparian habitat present in the project area, would not result in any reduction in deciduous canopy closure, nor result in a change in size class of existing riparian vegetation. In the unburned area, proposed treatments would not change the existing amount of riverine or lacustrine habitat, would not change the amount of riparian habitat present in the project area, or result in a change in size class of existing riparian vegetation. There could be a reduction in canopy closure, as hand cutting will be allowed in RHCA's.

Alternatives B and C

Cumulative Effects to Aquatic Riparian

Implementation of Alternatives B or C could cause an increase in sedimentation in project area streams. Modeling of percent of Threshold of Concern (TOC) showed a minor increase with implementation of the action alternatives. The largest increase caused by implementation of Alternative B would occur in Subwatershed 2 with 11percent of the change in total TOC. The largest increase caused by the implementation of Alternative C would occur in Subwatershed 5 with 8% of the change in total TOC (table 4-47). The overall increase is minor compared to other disturbances in these subwatersheds. The primary reasons for increased TOC are private land timber harvesting activities, roads, and the Butte Lighting Complex. The subwatersheds over TOC due to the Butte Lighting Complex are expected to fall below TOC with 5 years.

Typically in this landscape, full vegetation recovery returns within 5 years post fire (refer to the “Soils” and “Hydrology” section to follow in this chapter and table 4-47 below). If sedimentation is controlled through implementation of Best Management Practices (BMP’s), the potential for project related sediment delivery to the immediate channel and channels downstream would be small. It is possible that extreme water yields resulting from abnormally high intensity, magnitude, and duration storm events could cause impacts to water quality in the project area if mitigation measures fail.

Table 4-47 Percent Total Threshold of Concern (TOC) by Subwatershed and Alternative for the Concow Hazardous Fuels Reduction Project

Subwatershed number	Percentage National Forest System Lands	Existing Condition	Alternative A	Alternative B	Alt B 5yr	Alt B 10 yr	Alternative C
1	2.6	76%	103%	107%	97%	80%	105%
2	12.3	82%	83%	98%	97%	87%	92%
3	15.6	24%	24%	26%	24%	23%	25%
4	34.3	54%	54%	60%	58%	50%	60%
5	40.0	87%	87%	94%	53%	43%	94%
6	6.8	167%	167%	167%	99%	78%	167%
7	28.2	143%	143%	147%	96%	77%	145%
8	0.0	169%	169%	169%	132%	104%	169%
9	14.3	144%	144%	151%	97%	81%	149%
10	14.5	78%	78%	78%	57%	54%	78%
11	27.5	112%	112%	122%	64%	54%	117%
12	21.3	164%	164%	173%	114%	91%	167%
13	27.8	162%	162%	180%	139%	114%	172%
14	67.7	97%	97%	101%	47%	41%	100%
15	58.9	80%	80%	80%	55%	50%	80%

Different species utilize habitat in different ways. Therefore, implementation of an action alternative may affect species differently, or not at all. Specific effects from action alternatives to each species are discussed below.

As discussed in the “Hydrology” section in this FEIS, the results of the Cumulative Watershed Effects (CWE) analysis for the action alternatives include the sum of Equivalent Roaded Area (ERA) values for the existing condition, reasonable foreseeable future activities, and for the action alternatives. The ERA for each project related disturbance, a total ERA summation, and a comparison of the ERA to the TOC are included in the CWE analysis.Table 4-47 (above) includes the final results of each subwatershed, represented as percent of TOC for the subwatershed as a whole. The total ERA score had a minor increase as a result of the action alternatives.

Alternative B would have more of an increase than Alternative C, but overall increases in ERA are minor when compared to other disturbances in these subwatersheds for both action alternatives. The subwatersheds over the threshold of concern due to the Butte Lighting Complex are expected to below TOC with 5 years. Typically in this landscape, full vegetation recovery (i.e., soil cover) returns within 5 years post fire.

4.10.5 Summary of Effects Analysis Across All Alternatives

Determinations

The following are determinations for TES species based on current data available and on the following assumptions: full implementation of identified mitigations and complete compliance with the Plumas National Forest—Land and Resource Management Plan, and all applicable amendments, including HFQLG FEIS/ROD and SNFPA FEIS/ROD (see table 4-48).

These species could possibly occur within the project area and/or are species for which surveys have not yet been completed, but for which Resource Protection Measures, BMPs, establishment of SAT guidelines and associated RHCAs and RMOs, adherence to applicable HFQLG and SNFPA ROD Standards and Guidelines, and other measures are anticipated to minimize any potential effect.

If any federally listed species are found at a later date, or if any new information relevant to potential effects of the project on these species becomes available, the project would be stopped and the Section 7 Consultation process would be initiated.

Table 4-48 Summary of Effects of Proposed Action for Threatened, Endangered, Proposed, and Sensitive Animal Species that potentially occur within the Concow Project Analysis Area or May be Effected by Implementation of the Concow Project.

SPECIES	ALTERNATIVES		
	A	B	C
FISH			
Hardhead minnow (*Mylopharodon conocephalus*)	WNA	WNA	WNA
AMPHIBIANS			
California red-legged frog (*Rana aurora draytonii*)	WNA	WNA	WNA
Foothill yellow-legged frog (*Rana boylii*)	WNA	MAI	WNA
REPTILES			
Western pond turtle (*Clemmys marmorata marmorata*)	WNA	MAI	MAI

WNA = Will Not Affect, MAI = May Affect Individuals, but is not likely to result in a trend toward Federal listing or loss of viability

Summary of Aquatic Macroinvertebrate Status and Trend at the Bioregional Scale

The Plumas NF LRMP (as amended by the SNF MIS Amendment) requires bioregional-scale Index of Biological Integrity and Habitat monitoring for aquatic macroinvertebrates. The sections below summarize the Biological Integrity and Habitat status and trend data for aquatic macroinvertebrates. This information is drawn from the detailed information on habitat and population trends in the Sierra Nevada Forests Bioregional MIS Report (USDA Forest Service 2008), which is hereby incorporated by reference.

Habitat and Index of Biological Integrity Status and Trend: Aquatic habitat has been assessed using Stream Condition Inventory (SCI) data collected since 1994 (Frazier et al. 2005) and habitat status information from the Sierra Nevada Ecosystem Project (SNEP) (Moyle and Randall 1996). Index of Biological Integrity is assessed using the River Invertebrate Prediction and Classification System (RIVPACS) and macroinvertebrate data collected since 2000 (Table 4, and USDA Forest Service 2008). These data indicate that the status and trend in the RIVPACS scores are stable.

Relationship of Project-level Habitat Impacts to Bioregional-scale Aquatic Macroinvertebrates Habitat Trend: In the short term, based on the direct, indirect, and cumulative effects of the action alternatives as well as the no action alternative, the status and trend of in-stream habitat and the macroinvertebrate community would be negatively impacted for the short term, but long term restoration and recovery would occur 10-50 years out. This impact could occur in approximately 35 miles of perennial streams within the project area. These short term impacts at the project level are too small to have any affect at the larger scale and thus will not alter the existing trend in the habitat or aquatic macroinvertebrates across the Sierra Nevada bioregion.

Regional Trend: Overall, the collection of condition scores reveals that there are many sites in very good-to-excellent condition, since their O/E scores indicate the number of species observed at sampled sites closely matches the number of species expected to occur at unimpaired sites (i.e., O/E scores are close to 1.0). The sites sampled were specifically chosen because they generally represented the best sites available on each forest; data from these sites cannot necessarily be related confidently to broader scales for assessment of condition and trend. However, continuing to take samples at these sites in future years should allow us to assess condition and trend at scales from stream reach up to watersheds.

Table 4-49 Summary of existing BMI bioassessment data from Sierra Nevada

Forest	Number of Sites	Years Samples Collected	Mean Watershed Area (acres)	Range in Watershed Areas (acres)	Mean RIVPACS O/E Score	Range in RIVPACS O/E Scores
Eldorado	10	2000-01	4,426	670 - 13,523	1.04	0.76 – 1.24
Inyo	9	2000-02	4,112	1,429 – 8,192	0.95	0.87 – 1.12
Lassen	18	2000	9,996	215 – 67,748	1.02	0.61 – 1.27
LTBMU	17	2000-01	3,054	263 – 10,905	0.89	0.58 – 1.16
Modoc	14	2000-01	82,176	1 – 913,982	0.81	0.67 – 1.34
Plumas	14	2000-05	67,244	1,262 – 564,652	0.92	0.57 – 1.26
Sequoia	8	2000	3,009	3 – 5,506	1.05	0.77 – 1.20
Sierra	10	2000-01	22,135	640 – 167,029	0.93	0.78 – 1.30
Stanislaus	14	2000-01	21,535	585 – 92,806	0.90	0.77 – 1.23
Tahoe	15	2000-01	11,429	480 – 87,939	0.93	0.59 – 1.26
Total	**130**	**2000-05**	**23,686**	**1 – 913,982**	**0.95**	**0.57 – 1.34**

Population Status and Trend Summary for the Sierra Nevada National Forests: Current data from the Sierra Nevada indicate that status and trend in the RIVPACS scores are stable.

4.11 Soils Resources

4.11.1 Introduction

The National Forest Management Act of 1976 and other acts recognized the fundamental need to protect, and where appropriate improve, the quality of soil. The soil resource provides many essential functions for national forest lands. It sustains plant growth that provides forage, fiber, wildlife habitat and watershed protection. It absorbs precipitation, stores water for plant growth, and gradually releases surplus water which attenuates runoff rates. It sustains microorganisms which recycle nutrients for continued plant growth.

The Concow Hazardous Fuels Reduction Project area lies within the Sierra Nevada geologic and geomorphic province. The geology of the Concow area consist of decomposing granite and soils having a high content of sand and closer to Paradise and Magalia area there are soils with a high clay content. Also within in the analysis area is serpentine belts. The geomorphology or terrain in the Concow area is a bowl shape (with the Concow Reservoir at the bottom of the bowl) and within the bowl the terrain is benchy (short pitches of steep slope, then a flat bench). Within the burned areas, rutting and rilling is generally associated with legacy roads, temporary roads and skid trails. Within the unburned areas, hillslopes in the forested areas have dense vegetation and a high content of fine organic matter covering the soil. Soil erosion tends to occur as a result of legacy roads.

The Forest Service Region 5 Soil Management Handbook Supplement (R5 FSH Supplement 2509.18-95-1) establishes regional soil quality analysis standards and provides threshold values that indicate when changes in soil properties and soil conditions would likely result in a significant change or impairment. The analysis standards address three basic elements for the Soil Resource: (1) soil productivity (including soil loss, porosity; and organic matter), (2) soil hydrologic function, and (3) soil buffering capacity. The land management activities proposed under this project have the potential to affect soil resources in a beneficial, indifferent, or adverse manner, either through direct, indirect, and cumulative effects, described in detail below.

4.11.2 Analysis Framework: Statute, Regulation, Forest Plan, and Other Direction

Direction relevant and specific to the Proposed Action and the Alternatives as they affect soil resources includes:

National Forest Management Act of 1976

The National Forest Management Act (NFMA) of 1976 mandates that land management plans be prepared for each National Forest (See Plumas National Forest Land Resource Management Plan below), and that guidelines be specified that will: “Insure research on and (based on continuous monitoring and assessment in the field) evaluation of the effects of each management system to the end that it will not produce substantial and permanent impairment of the productivity of the land.” And “Insure that timber will be harvested from National Forest System lands only where - "(i) soil, slope, or other watershed conditions will not be irreversibly damaged.”

National Soil Management Handbook

(FSM/H 2500 Watershed and Air Management Chapter 2550 Soil Management February 12, 2009)

The Soil Management Handbook is a national soils handbook that's objective is to "maintain or improve soil quality on National Forest System lands to sustain ecological processes and function so that desired ecosystem services are provided in perpetuity".

The handbook establishes the management framework for sustaining soil quality and hydrologic function while providing goods and services outlined in forest and grassland land management plans. The management framework that applies to the Concow Hazardous Fuels Reduction Project includes:

Manage forest ecosystems to maintain or improve soil quality.

1. Collect and manage information about the properties, distribution, capabilities, condition, suitabilities, and limitations of soils associated with national Forest system lands in accordance with Agency wide inventory and data management policies.
2. Participate in watershed condition and assessment approaches and plans and incorporate evaluation of soil chemical, physical, and biological qualities in addition to other watershed functions when assessing watershed health.
3. Utilize soils information to assess condition and analyze project effects when planning and implementing activities to ensure sustainable delivery of goods and services without impairing the productivity of the land.
4. Monitor and evaluate soil resources at regular intervals to detect changes in soil properties resulting from the implementation of land management plans.
5. Use adaptive management (FSM 1905) to design and implement land management activities in a manner that achieves desired soil conditions identified in the applicable land management plan.
6. Monitor resource management activities and soil conditions to ensure that soil and water conservation practices are implemented and effective.
7. Assess the current condition of soil resources.

The handbook defines desired soil condition, quality, and productivity:

1. Desired Soil Condition: Soil physical, chemical, and biological properties that support the productive capacity of the land, its ecological processes, that is, hydrological function of watersheds, and the ecosystem services identified in land management plans.
2. Dynamic soil quality: That aspect of soil quality relating to soil properties that changes as a result of soil use and management or over the human time scale.
3. Inherent soil quality: That aspect of soil quality relating to a soil's natural composition and properties as influenced by the factors and processes of soil formation, in the absence of human impacts.
4. Permanent Soil Impairment: Detrimental changes in soil properties (physical, chemical, or biological) that result in the loss of the inherent ecological capacity or hydrologic function of the soil resource that lasts beyond a silviculture rotation or land management planning period.
5. Substantial Soil Impairment: Detrimental changes in soil properties (physical, chemical, or biological) that result in the loss of the inherent ecological capacity or hydrologic function of the soil resource that lasts beyond the scope, scale, or duration of the project causing the change.
6. Soil Productivity: The inherent capacity of the soil resource to support appropriate site-specific biological resource management objectives, which includes the growth of specified plants, plant communities, or a sequence of plant communities to support multiple land uses.

7. Soil Quality: The capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation and ecosystem health. There are two aspects of the definition: inherent soil quality and dynamic soil quality.

Forest Service Manual and Handbooks

(FSM/H 2509.18-91-1 Soil Management Handbook September 1991)

The Soil Management Handbook is a national soils handbook which defines soil productivity and components of soil productivity, establishes guidance for measuring soil productivity, and establishes thresholds to assist in forest planning. The handbook contains the following definitions:

1. Significant changes in productivity of the land are indicated in soil properties that are expected to result in a reduced productive capacity over the planning horizon. Based on available research and current technology, a guideline of 15 percent reduction in inherent soil productivity potential will be used as a basis for setting threshold values for measurable or observable properties or conditions. The threshold values, along with the areal extent limits, will serve as an early warning signal of reduced productive capacity. A more stringent basis than 15 percent can be used where appropriate and documented. The allowable areal extent of significantly changed soil is to be established as part of soil quality standards.
2. Soil compaction is a physical change in soil properties that results in a decrease in porosity and an increase in soil bulk density and soil strength.
3. Soil compaction is more than a 15% increase in bulk density, or a 10% reduction in total porosity.
4. Soil displacement is the movement of the forest floor (litter, duff, and humus layers) and surface soil from one place to another by mechanical forces such as a blade used in piling or windrowing. Mixing of surface soil layers by disking, chopping, or bedding operation, are not considered displacement.
5. Surface erosion is the detachment and transport of individual soil particles by wind, water, or gravity.
6. Detrimental soil disturbance is the condition where established threshold values of soil properties are exceeded and result in significant changes.

The following are the Soil Management Handbook recommendations for the establishment of soil quality standards to use during forest planning:

1. Base threshold values on soil properties and soil conditions that are observable or measurable and that correspond to significant change. When setting threshold values for soil properties or conditions, use the estimated 15 percent reduction in soil productivity as a guideline for determining when the change becomes detrimental or significant.
2. When changes in soil properties reflect an estimated 15 percent or more reduction in productive capacity, a warning is indicated to adjust practices to prevent significant impairment. The 15 percent guideline is to be used as a judgment.
3. Use compaction, displacement, erosion, puddling, protective plant cover, and burning as applicable to categorize soil disturbances.

Region 5 Soil Management Handbook Supplement

(Region 5 FSH Supplement 2509.18-95-1)

The Forest Service Region 5 Soil Management Handbook Supplement establishes regional soil quality analysis standards and provides threshold values that indicate when changes in soil properties and soil conditions would potentially result in a significant change or impairment of the soil productivity potential (including soil loss, porosity; and organic matter), hydrologic function, or buffering capacity of the soil (USDA Forest Service 1995). When these threshold values are exceeded the result is considered detrimental soil disturbance.

The handbook states that the extent of detrimental soil disturbance that affects soil productivity, shall not be of a size or pattern that would result in a significant change in production potential for the activity area. The Region 5 soil quality analysis guidelines apply only to those areas dedicated to growing vegetation. They are not applied to other dedicated uses, such as system roads and developed campgrounds.

The following list includes soil properties, conditions, and associated threshold values to avoid detrimental soil disturbance and to evaluate management effects on soil productivity, soil hydrologic function, and soil buffering capacity:

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. Prescribe surface organic matter in amounts that would not elevate wildfire risk or severity to the point that desired organic matter for nutrient cycling cannot be achieved or maintained because of increased wildfire risk potential. If there is no viable alternative for providing surface organic matter without elevating wildfire risk, prescribe an amount that does not significantly increase wildfire risk and monitor soil nutrient status. Apply mitigation measures if decreased nutrient supply has the potential to affect ecosystem health, diversity or productivity. The prescribed amount shall not reduce the amount needed for soil cover to prevent accelerated erosion. Use the kinds and amounts of organic matter identified below.

   A. Soil organic matter in the upper 12 inches of soil is at least 85 percent of the total soil organic matter found under natural conditions for the same or similar soils. Soil organic matter is used as an indicator of soil displacement effects on nutrient and soil moisture supply.

   B. Surface organic matter is present in the following forms and amounts:

      a. Fine organic matter occurs over at least 50 percent of the area. Fine organic matter includes plant litter, duff, and woody material less than 3 inches in diameter. The dry weight of fine organic matter without woody material is about 0.2 to 3 tons per acre. 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. The preference is for fine organic matter to be undisturbed, but if disturbed, the quantity and quality should avoid detrimental short and long-term nutrient cycle deficits.

b. Large woody material is at least 5 well distributed logs per acre representing the range of decomposition classes defined in Exhibit 02 of the Soil Management Handbook. To alleviate the risk of adverse fire effects, dry weight should be less than about 3 tons per acre. Desired logs are at least 20 inches in diameter and 10 feet long. Protect logs in decomposition classes 3 through 5 from mechanical disturbance. Do not count logs less than 12 inches in diameter or stumps as large woody material. The amount of large woody material that is recommended should consider the potential for the ecological type in the project area to generate large woody material and also the fuel management objectives for the area.

c. Fine organic matter and large woody material together should amount to less than about 6 tons per acre dry weight to alleviate the risk of potential detrimental wildfire effects. Other surface organic matter (3 inches to 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.

d. Soil Moisture Regime is unchanged where productivity or potential natural plant community is dependent upon specific soil drainage classes.

3. Soil Hydrologic Function - Avoid accelerated surface runoff, infiltration and permeability reduction of ratings to 6 or 8 as defined in the Region 5 Erosion Hazard Rating system.

4. Soil Buffering Capacity - Materials added to the soil must not alter soil reaction class, buffering or exchange capacities, or microorganism populations to the degree that significantly affects soil productivity, bioremediation potential, soil hydrologic function, or the health of humans or animals.

Regional Forester’s Letter (Dated Feb 5, 2007)

This letter provided clarification to Forest Supervisors on the appropriate use of the Region 5 Soil Management Handbook Supplement (Region 5 FSH Supplement 2509.18-95-1). It states in part:

“Analysis or evaluation of soil condition is the intended use of the thresholds and indicators in Region 5 FSH Supplement 2509.18-95-1. They are not a set of mandatory standards or requirements. They should not be referred to as binding or mandatory requirements in National Environmental Policy Act (NEPA) documents. Standards and guidelines in Forest Land and Resource Management Plans provide the relevant substantive standards to comply with NFMA.”

The thresholds and indicators represent desired conditions for the soil resource. Utilization of the thresholds and indicators provides a consistent method to analyze, describe and report on soil condition throughout the Region.

Plumas National Forest Land Management Resource Plan (USDA Forest Service 1988)

The 1988 Forest Plan establishes standards and guides to prevent significant or permanent impairment of soil productivity on page 4-44 (USDA 1988). The analysis standards are to be used for areas dedicated to growing vegetation. They are not applied to lands with other dedicated uses, such as developed campgrounds, administrative facilities. These standards and guidelines are:

1. Prevent significant or permanent impairment of soil productivity.
    - A. During project activities, minimize excessive loss of organic matter and limit soil disturbance according to the Erosion Hazard Rating (EHR) as follows:
        - a. EHR 4-8: Conduct normal activities
        - b. EHR 9-10: Minimize or modify use of soil-disturbing activities
        - c. EHR 11-13: Severely limit soil-disturbing activities
    - B. Determine adequate ground cover for disturbed sites outside of streamside management zones during project planning on a case-by-case basis, based on specialist evaluation, using the following as a guide:
        - a. Low EHR (4-5): 40% minimum effective ground cover
        - b. Moderate EHR (6-8): 50% minimum effective ground cover
        - c. High EHR (9-10): 60% minimum effective ground cover
        - d. Very High EHR (11-13): 70% minimum effective ground cover
    - C. To avoid land base productivity loss due to soil compaction, dedicate no more than 15% of timber stands to landings and permanent skid trails. Measurement will be along the travel way and shall not include width of cut and fill slopes.
    - D. Develop specific soil evaluation and mitigation measures for each project site as needed.
    - E. Incorporate measures for protection of long-term soil productivity in controlled burn prescriptions through an interdisciplinary process. Specify objectives for organic material retention for maintenance of ground cover.
2. Eliminate excessive soil loss
    - A. Develop and apply erosion control plans to road construction and other site disturbance projects. Develop specific mitigation measures for each project site as needed.
    - B. Document observations of slope failures, significant erosion of and from road surfaces, erosion of mine spoils, and any other sources of sediment that are affecting water quality or channel stability. Use for future erosion control planning.

Sierra Nevada Forest Plan Amendment FEIS 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.”

4.11.3 Effects Analysis Methodology

Geographic Scope of Analysis:

This section describes the methodology used for the effects analysis of the proposed project for soils resources. This section establishes indicators chosen to measure potential impacts, the analysis area, timeframe, methods used (including field survey methods), and assumptions made for the effects analysis to soil resources of all action alternatives. The analysis of potential effects to soils resources includes the proposed Defensible Fuel Profile Zone (DFPZ) treatment areas within the Concow Project Area (public lands only).

As defined in the regulations for implementing NEPA, Code of Federal Regulations, Chapter 40, Sections 1500-1508, direct effects are those effects which are caused by the proposed action (or action alternative) and which occur at the same time and place as the action. Indirect effects are those caused by the action which are later in time or farther removed in distance from the location of the action.

As defined in Code of Federal Regulations, Chapter 40, Sections 1500-1508, cumulative effects are those impacts “on the environment which result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time.”

Assumptions specific to Soils resources analysis:

- 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. Region 5 Soil Management Handbook as a threshold guideline for soil porosity. It states 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. Only proposed treatment areas with proposed activities that have the potential to cause detrimental soil compaction were surveyed.

- Detrimental soil compaction in the green was determined in field surveys in August 2005 and in the black was determined in field surveys February through April, and July 2009.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.

- In 2006, Region 5 proposed a detrimental compaction risk rating scheme to be determined through field surveys (Roath 2006). The risk rating is intended to help determine the general susceptibility to loss of soil productivity from heavy equipment operation. This rating scheme can not predict the degree or areal extent of detrimental compaction that may occur and cannot predict the level of biomass productivity change that may occur if a soil is compacted. The extent of detrimental compaction depends upon the circumstances at the time of operations, such as the soil moisture content, the kind and ground pressure of the equipment used, and the intensity of the equipment operation over the area. However, it considers the risk that detrimental compaction will occur, and if detrimental compaction would result in productivity loss. The risk rating is used in this analysis to determine management concerns and mitigation measures to reduce cumulative effects to soil productivity.

- The risk rating is based upon the soil texture and rock content of the soil. It presumes the soil is at field capacity or at a moisture level when the soil is most susceptible to soil density increase as a result of heavy equipment operation. This risk rating system is meant to be used to identify the general level of concern for heavy equipment operations within a treatment area. It does not include landings or temporary roads. Landings and temporary roads usually are heavily compacted regardless of soil type because of the heavy use they receive and the fact that watering is done for dust abatement. The severe compaction that occurs on landings and permanent roads has been assessed, and mitigations have been developed to reduce effects to soil productivity.

  The detrimental compaction risk rating was determined in proposed activity areas in the black only with a potential increase in detrimental compaction as a result of proposed activities with ground based equipment operations. The risk rating was not performed in the green, because the scheme was developed after the surveys were conducted.

- Consists of living biomass (plant roots, microorganisms, invertebrates, and vertebrate fauna) and dead biomass (dead bark, large woody debris, litter, duff, and humus materials). Soil organic matter is the primary source of plant-available nitrogen, phosphorous, and sulfur, provides habitat for the diverse soil biota that carry out energy transformation and nutrient cycles, contributes to soil structure and porosity of soils, protects soils from erosion, and enhances infiltration and hydrologic function (Neary et. al. 2005).

- The Region 5 Soil Management Handbook provides 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 Section 2 “Analysis Framework, Statue, Regulations, Forest Plan, and Other Direction). 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 soil field surveys. In the green surveys were performed in August 2005 and in the black pre-fire in August 2005 and post-fire February through April 2009, July 2009. Only proposed treatment areas were significant amounts of soil organic matter could be removed as a result of proposed activities were surveyed.

Data Sources:

- Proposed treatment areas were surveyed if proposed activities could result in a significant reduction of effective soil cover or increase in detrimental soil compaction. In the green (unburned area) proposed treatments acres with a prescribed land management activity of underburning or hand cut and pile burning were not surveyed. The reason is during site visits it was determined that effective soil cover significantly exceed Forest Plan Standards and Guides, and these activities do not significantly decrease effective soil cover and do not cause detrimental soil compaction. The underburning is considered a low to very low burn. The potential effects as result of underburning would be similar to the proposed activity areas that were surveyed and had a light burn severity as a result of the Butte Lighting Complex Fire. These proposed activities areas exceed Forest Plan Standards and Guides post fire. In addition grasses and shrubs recovery quickly after an underburn, this adds to the total effective soil cover. Hand cut and pile burn activities are scattered throughout a proposed treatment area, and the percent of piles is not significant enough to reduce effective soil cover.

- In the black (burned areas) the only proposed treatment areas not surveyed for effective soil cover were areas with prescribed hand cut only treatments. Hand cut only treatments would only increase effective soil cover and soil organic matter. Proposed treatment areas with prescribed hand cut only, hand cut and pile burn, and underburn were not always surveyed for detrimental soil compaction, because these proposed land management activities do not cause detrimental soil compaction.

- 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. In addition several site visits occurred and observations were documented.

Soil Resources Methodology by Action

1. **Direct/indirect effects of proposed DFPZ hazardous fuels reduction and vegetative forest health treatments to soil resources.**

1. Soil Productivity

Definition: 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 measured by effective soil cover, soil porosity (percent of detrimental compaction), and quantity of soil organic matter.

Short-term timeframe: 1 year

Long-term timeframe: 25 years

Spatial boundary: Proposed treatment areas. Effects to soil productivity do not occur outside of the proposed treatment areas as a result of proposed activities.

Methodology: Effective soil cover consists of low-growing vegetation (grasses, forbs and prostrate shrubs), plant and tree litter (fine organic matter), surface rock fragments, and may also include applied mulches (straw or chips) (USDA Forest Service 1995). Vegetative cover serves several purposes in the mitigation of accelerated soil erosion by dissipating the energy of falling raindrops through interception (CSSC 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 in the green (unburned area) in August 2005 and in the black (burned area) pre-fire in August 2005 and post-fire February through April 2009, and July 2009. The Erosion Hazard Rating (EHR) system was used to quantify the kind, amount, and allowable disturbance of effective soil cover necessary to prevent detrimental accelerated soil erosion as defined by the Forest Plan. See appendix B in this FEIS for EHR calculations by proposed treatment area.

2. Soil Hydrologic Function

Definition: Soil hydrologic function is the inherent capacity of 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).

Short-term timeframe: 1 year

Long-term timeframe: 25 years

Spatial boundary: Proposed treatment areas.

Methodology: 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 Water Movement in the Soil Rating from the Erosion Hazard Rating (EHR) system was used to determine the condition of the soil hydrologic function. The Region 5 Soil Management Handbook (USDA Forest Service 1995) suggests a threshold for soil hydrologic function is to avoid accelerated surface runoff, infiltration and permeability reduction of ratings to 6 or 8.

3. Soil BufferingCapacity

Definition: 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). 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.

Short-term timeframe: 1 year

Long-term timeframe: 25 years

Spatial boundary: Proposed treatment areas.

Methodology: The Region 5 Soil Management Handbook guideline states "Materials added to the soil must not alter soil reaction class, buffering or exchange capacities, or microorganism populations to the degree that significantly effects soil productivity, bioremediation potential, soil hydrologic function, or the health of humans or animals" (USDA Forest Service 1995). The handbook also state "Develop local threshold values as the need arises and submit to the Regional Forester for standardization among forests0" (USDA Forest Service 1995).

The proposed activities under all action alternatives do 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. Therefore local threshold values were not developed. This report does qualitatively discuss soil buffering capacity for the existing condition and the reason for little to no change as a result of proposed action alternatives.

2. **Cumulative effects of proposed DFPZ hazardous fuels reduction and vegetative forest health treatments to soil resources.**

1. Soil Productivity

Short-term timeframe: 1 year

Long-term timeframe: 25 years

Spatial boundary: Proposed treatment areas.

Indicator(s): (1)Effective soil cover (percent of total activity area); (2) Change in soil porosity (percent detrimental compaction of an activity area), and (3) amount of soil organic matter (percent of fine organic matter in total activity area and amount of large woody debris per acre in total activity area).

Methodology: A quantifiable reduction or increase in soil cover and soil organic matter is difficult to determine. However, monitoring data has been collected as part of the HFQLG Pilot Project. The proposed land management activities with the use of ground based mechanical equipment are compared to the 2004, 2005, 2006, 2007, and 2008 HFQLG Soil Monitoring to determine potential cumulative effects to soil cover and soil organic matter. The Best Management Practice Monitoring Evaluation Program (BMP EP) report is used to determine cumulative effects for proposed prescribed burning land management activities.

Cumulative effects due to detrimental soil compaction could occur if project activities, combined with past or future foreseeable actions, were to result in an unacceptable proportion of the landscape experiencing detrimental soil compaction that would adversely affect long term soil productivity. A quantifiable reduction or increase in detrimental soil compaction is difficult to determine. It is based on soil strength and moisture content. However, monitoring data has been collected as part of the HFQLG Pilot Project and in the Long Term Soil Productivity (LTSP) study. The types of proposed treatments are compared to the 2004, 2005, 2006, 2007, and 2008 HFQLG Soil Monitoring Reports and to the LTSP study to understand the potential cumulative effects to soil porosity.

2. Soil Hydrologic Function

Short-term timeframe: 1 year

Long-term timeframe: 25 years

Spatial boundary: Proposed treatment areas.

Methodology: The potential cumulative effect due to detrimental soil compaction is used to determine the potential effect to the soil hydrologic function within the proposed treatment area.

3. Soil Buffering Capacity

Short-term timeframe: 1 year

Long-term timeframe: 25 years

Spatial boundary: Proposed treatment areas.

Methodology: The Region 5 soil management handbook guideline state “Materials added to the soil must not alter soil reaction class, buffering or exchange capacities, or microorganism populations to the degree that significantly effects soil productivity, bioremediation potential, soil hydrologic function, or the health of humans or animals.” The handbook also state “Develop local threshold values as the need arises and submit to the Regional Forester for standardization among forests.” The proposed activities under all action alternatives do 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. Therefore local threshold values were not developed. The following analysis does qualitatively discusses soil buffering capacity for existing condition and the reason for little to no change as a result of proposed action alternatives.

4.11.4 Environmental Consequences

Alternative A – No-action

Direct/ Indirect, and Cumulative Effects to Soil Resources

Soil Productivity:

Effective Soil Cover. In the unburned area, the No-action Alternative would allow effective soil cover to remain and develop at its current rate in the Concow Hazardous Fuels Reduction 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. Immediately following a fire, the affected stand may not meet the Forest Plan standards and guides for effective soil cover. In the event of a future wildfire, effective soil cover would be reduced in larger quantities than expected with the proposed project.

In the burn area the no action alternative would allow effective soil cover continue to recover post-fire as vegetation re-growth occurs (see Table 3 above), and reduce erosion significantly compared to the first winter post fire. Erosion rates are expected to return to normal levels 3-5 years post fire.

Soil Porosity. Under the No-action Alterative, no new soil compaction or displacement would occur as a consequence of activities proposed in the Concow Hazardous Fuels Reduction 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.

Organic Matter. In the unburned area, the No-action Alternative accumulation of organic matter would continue at current rates, and not be affected by proposed fuels reduction treatments. 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).

In the burned areas fine organic matter will take many years to recover in the high intensity burn areas because needles and leaves from trees were consumed by the fire. Large woody debris will increase as dead, burned trees fall over. The no-action alternative would allow large amounts of large woody debris to be created. However, there has been new research conducted 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.

Soil Hydrologic Function:

Under the No- action Alternative, infiltration and permeability rates would not be reduced by proposed management activities.

Soil Buffering Capacity:

Under the No-action Alternative there would be no effects to soil buffering capacity.

Alternative B

Direct and Indirect Effects to Soil Resources

Soil Productivity:

Effective Soil Cover: Direct and indirect effects on this measure include partial removal of effective soil cover. It is difficult to predict precise treatment effects on forest floor materials; however general trends are well established. Thinning and Danger Tree removal 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.

Additionally, mastication treatments during dry soil conditions do not cause the removal of existing soil cover because the forest materials (needles, sticks, and logs) act as a cushion for the soil, therefore there is no rutting or soil displacement. Pile burning and underburning could reduce effective soil cover. Pile burning would remove forest floor materials on a micro scale. In the majority of the proposed underburning treatment units, treatments are expected to occur under prescribed conditions that would not result in complete combustion of the duff and litter layers. Typically the duff layer is thick, and fire and fuels specialists have observed that only small quantities of the duff layer is burned, especially on steep slopes where underburning is the only proposed treatment. A reduction in forest floor cover would increase the risk of surface soil erosion temporarily in affected areas. Oak management includes hand treatment which is not a ground disturbing activity, therefore no removal of effective soil cover. Road reconstruction and road maintenance have no direct and indirect effects on effective soil cover. The Forest Plan does not consider National Forest System Roads as part of the productive landscape; therefore soil productivity standards and guides do not apply.

In the green area the quantity of effective soil cover and type of related soil erosion depends on the character of the area. For example, patches of forest floor material across a large area would be more effective at intercepting surface water than large areas devoid of cover. The removal of effective soil cover is most likely to occur in areas in areas such as landings, skid roads, temporary roads, and equipment tracks. It is anticipated that large areas of soil cover would remain and exceed Forest Plan Standards and Guides within thinning and Danger Tree removal areas. Soil erosion would be minimized in areas void of effective soil cover by the installation of erosion control structures (cross ditches, waterbars) which is a standard timber sale contract practice. Within 3-5 years litter fall from the residual trees and vegetation re-growth will increase the effective 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).

Maintenance treatments within the green area is expected to be mastication, hand treatment, and prescribed burning 5-10 years after initial project completion. Effective soil cover is expected to be fully recovered prior to maintenance and these treatments either increase or have minimal decreases in effective soil cover.

In the black area, thinning and Danger Tree removal are expected to affect the recovering landscape. Under the existing condition most proposed treatments do not meet effective soil cover standards and guides. Heavy equipment operations, skid trails, landings, and temporary road construction would remove vegetation re-growth and decrease effective soil cover. As a result erosion rates are expected to increase. To reduce the effects of erosion project designed mitigation features include in table 4-50 and appendix A of this FEIS.

Mastication and chipping treatments have the potential to remove vegetation re-growth, cause soil displacement and rutting and eventual erosion. The heavy equipment could tear up the sensitive landscape because forest material does not cover the ground and act as a cushion for the soil. However project design mitigations are included in the proposed action to prevent the effect to effective soil cover (Table 4-50 and appendix A of this FEIS). Hand treatment without pile burning would increase effective soil cover in patchy locations, and areas with pile burn material will be lopped and scattered until effective soil cover exceeds 60%. In areas of prescribed burn as a follow up treatment, it can only occur if effective soil cover exceeds 60%.

Table 4-50 Black Area Potential Direct and Indirect Effects to Soil Cover Summary and Project Design Mitigations

Treatment Type	Thinning and Danger Tree Removal	Mastication and Chipping	Hand Cut and Pile Burn and/or Prescribed Burn
Potential Direct and Indirect Effects Summary	Decrease effective soil cover in areas of heavy equipment operations	Loss of vegetation re-growth, soil displacement, rutting, and subsequent erosion	Loss of vegetation re-growth and additional loss of remaining/new leaf litter.
Project Design Mitigations to Reduce Direct and Indirect Effects to Soil Cover	• Mastication, • Chipping, • Erosion Control Structures (examples include water bars, rolling dips, and lead out ditches), • Straw and Seed all Landings, Skid trails, and Temporary roads Absent of Effective Soil Cover, • 75 Foot Stream Protection Zones within the RHCAs (re-vegetation within the 75 foot protection zone acts as a sediment filter), and • Mechanized Ground Based Equipment Limited to slopes 35% or Less	• Prime power unit - tracked unit with maximum ground pressure that shall not exceed 5-8 psi.; • Machine shall be equipped with a masticating or mulching head with an articulating boom that can reach 20 feet or greater from center of machine. • Capable of working on slopes continuously on 0 to 35 percent slopes • Limit the number of passes the machine makes for soil compaction concerns. • Limit traveling along the sideslope to reduce soil displacement. • Chips should not exceed a depth of 1 foot. • Masticate material in front of the machine to create a cushion of forest floor materials.	• Prescribed burning can only occur if effective soil cover exceeds 60% • Lop and scatter material cut by hand until effective soil cover exceeds 60%

Soil Porosity. Direct and indirect effects on this measure occurs when soil porosity decreases and detrimental soil compaction increases. The use of heavy forestry equipment and re-entry of stands would increase the potential for detrimental soil compaction (Powers 1999). The degree of detrimental soil compaction varies with soil texture, soil moisture content at the time the activity takes place, the weight or ground pressure of the equipment used, and whether woody material remains in place to cushion the weight of the equipment while the operation is occurring. Increases in detrimentally compacted areas are expected in thinning treatment units due to the need for new skid trails, landings, or temporary roads. Increases in detrimental compaction have been documented in 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 A 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 thinning and mastication treatments causing detrimental compaction, a Limited Operation Period (LOP) would be applied to the entire Concow Hazardous Fuels Reduction 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.

Organic Matter. Direct and indirect effects on this indicator includes the removal of soil organic matter, potential short-term reduction of soil nutrients, and loss of habitat for organisms inhabiting organic matter. The Region 5 Soil Management Handbook is concerned with maintaining soil organic matter in the amounts sufficient to prevent significant short or long-term nutrient cycle deficits, and to avoid detrimental physical and biological soil conditions. The Region 5 Soil Management Handbook provides recommend indicators and thresholds for determining sufficient amounts of soil organic matter. Indicators include fine organic matter and large woody material.

Fine organic material includes plant litter, duff, and woody material less than 3 inches 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.

In the green areas fine organic matter meets or exceeds recommended thresholds. In the burn areas the majority of the proposed treatment areas do not meet recommended thresholds, due to the high intensity burn (Table 4). Direct and indirect effects to soil organic matter are the same as direct and indirect effects to effective soil cover.

Large down woody material is typically reduced as a result of thinning treatments. However, there have been new research presentations by PSW on the importance of large woody material to soil nutrients (personal 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 woody 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 retains available water for plants.

Soil Hydrologic Function:

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 the proposed action, soil hydrologic function is not expected to be altered by proposed management activities. Soil cover in the green area is expected to meet or exceed Forest Plan standards and guides in all proposed treatment units following management activities. In the black area mitigation measures have been designed to increase soil cover and 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.

Soil Buffering Capacity:

It is not expected that soil buffering capacity within the Concow Hazardous Fuels Reduction 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.

Alternative B

Cumulative Effects to Soil Resources

Effective Soil Cover. Cumulative effects of proposed mastication treatments are expected to increase the existing effective soil cover and as a result increase fine organic matter for both soil protection and nutrient cycling. Mitigations for mastication include masticating material ahead of the tractor, so the tractor does not move across bare soil. In addition chipping of large material is proposed which would also increase effective soil cover.

Cumulative effects of thinning treatments proposed in alternative B are expected to temporarily reduce forest effective soil cover from the existing condition. A quantifiable reduction is soil cover is difficult to determine but the 2007 HFQLG Soil Monitoring Report does try to quantify pre- and post- treatment units from 2001 to 2007 where a total of 53 units were monitored (Westmoreland, Dillingham, and Baldwin 2008). The pre- and post- treatment units includes 39 thinning units that have a mean value of 89.9 percent soil cover pre-treatment and a mean value of 77.7 percent soil cover post-treatment both with a 95 percent confidence interval (Westmoreland, Dillingham, and Baldwin 2008). All reductions measured during the monitoring study are within Forest Plan standards and guides.

Reductions in soil cover following implementation of thinning and Danger Tree treatments within the green are expected to be within the ranges found during the HFQLG soil monitoring. 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 Danger Tree treatment units within the green areas. In the black area, thinning and Danger Tree removal treatments are expected to disturb the recovering burned landscape and reduce effective soil cover. However, proposed mitigations and project design features are expected to reduce loss of effective soil cover and soil erosion.

Soil Porosity. 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.

Pre- and post- treatment soil monitoring has been conducted across the HFQLG Pilot Project in group selection, thinning, and mastication treatment units. A total 53 treatment areas have been examined post treatment. The findings reported to date are included in the 2004, 2005, 2006, and 2007 HFQLG Soil Monitoring Reports (Westmoreland and McComb 2004,Westmoreland and McComb 2005, and Westmoreland and McComb 2006, Westmoreland, Dillingham, and Baldwin 2008). 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 EIS).

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 findings indicate that legacy detrimental compaction occurs in the majority of the monitored sites. Post treatment monitoring between 2004 and 2006 has shown a total of 25 out of 52 (about 50 percent) treatment units have had an increase in detrimental 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 area (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 in two 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 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).

The 2007 HFQLG Soil Monitoring Report analyzes the pre- and post- treatment soil data from 2001-2007 for 40 thinning units, 11 group selections, and 2 mastication units (Westmoreland, Dillingham, and Baldwin 2008). Standard and Guidelines described in the Plumas Forest Plan allow no more than 15 percent of an activity area to be dedicated to skid trails and landings (Westmoreland, Dillingham, and Baldwin 2008)

While approximately 28 out of 40 thinning units had a sample mean over 15 percent of detrimental compaction, only 17 units were actually statistically over the threshold value of 15 percent because the lower limit of the confidence interval was above the threshold (Westmoreland, Dillingham, and Baldwin 2008). Five out of 11 group selection units had a sample mean over 15 percent of detrimental compaction, but only two units were actually statistically over the threshold value of 15 percent because the lower limit of the confidence interval was above the threshold (Westmoreland, Dillingham, and Baldwin 2008). Eighteen out of the 40 thinning units that were subsoiled and had a mean of 28 percent for detrimental compaction post-treatment compared pre-treatment of 21.7 percent, for a decrease in overall detrimental compaction (Westmoreland, Dillingham, and Baldwin 2008). Twenty two out of the 40 thinning units were not subsoiled and had a mean of 25.2 percent for detrimental compaction post-treatment compared to pre-treatment of 23.2 percent, which represents an increase in overall detrimental compaction (Westmoreland, Dillingham, and Baldwin 2008). Close inspection of all of the subsoiled pre- and post-treatment units for group selection and thinning indicated that subsoiling does decrease detrimental compaction but is not statistically significant according to the 2007 HFQLG Soil Monitoring Report.

Ongoing research has been published on the effects of soil compaction to long term soil productivity. Powers et al (2005) recently published the ten year results of The Long Term Soil Productivity (LTSP) study. This is a national and international study initiated in 1989 and is comprised of 62 study sites, including sites in the Sierra Nevada. The goals of the study are to gain understanding of a site’s potential soil productivity and effects of land management activities. The study focuses on two key components readily affected by management, soil porosity and soil organic matter. The LTSP study has 1-acre study plots with 3 levels of compaction (none, intermediate, and severe- similar to a landing), in factorial combination with 3 levels of organic matter removal (bole only, whole tree, whole tree and all forest floor).

All plots were clearcut and planted with native species. In addition, to investigate the role of understory vegetation in compaction recovery, vegetation was allowed to naturally return on half of each plot, controlled on the other half by manual or chemical methods. The national ten year results indicate that soil compaction effects on total biomass productivity (all vegetation within a site, not just tree growth) differs depending upon the soil particle size or soil texture, along with other factors such as initial bulk density, rock content, and climate. On soils characterized as Sandy, compacted plots had greater biomass productivity than uncompacted plots; on soils characterized as Loamy, compaction resulted in little change in biomass productivity; and on soils characterized as Clayey, compaction resulted in up to a 50% reduction in biomass productivity at particular sites in the Southern Coastal plains, primarily in areas with poor soil drainage or high water table. This ten-year publication incorporated results from 6 of the 12 California sites.

In June 2007, during the National LTSP Conference, additional results were presented by David Young (R5 North Zone Soil Scientist) incorporating 9 of the 12 California sites to reach ten years; these sites include all study sites within the Sierra Nevada (including Challenge Experiential Forest located on the Feather River Ranger District of the Plumas National Forest). The following information from recent findings is based on personal communications with David Young (June through July 2007), again reflecting total vegetation biomass in addition to trees. For the clay loam sites (Challenge and Brandy City), there is no statistical difference in total biomass production between the no, moderate, and severe compaction levels.

On sites with soils characterized as Loam (Lowell Hill and Blodgett), there is no statistical difference in total biomass production between the no, moderate, and severe compaction levels. The are five study sites with soils characterized as Sandy Loam (Rogers, Wallace, Vista, Central Camp, and Owl); on three of the sites there is no statistically significant difference in total biomass production between the no, moderate, and severe compaction levels.

At the Rogers site (parent material decomposing granite) there was an increase in biomass production in the moderate and severe compaction levels compared to no compaction. At the Owl site, there was a decrease in biomass production in the moderate and severe compaction levels, attributed to a rise in water table after harvest, so aeration porosity was limited by compaction. The latest results have concluded that soil compaction, even above degrees considered detrimental by Regional analysis standards, has little effect on soil productivity at most sites, at least at ten years of growth. These results will be revisited and published after ten year data is available for all 12 California LTSP sites.

It is important to note that LTSP compaction treatments were experimental, as much plot area as possible was compacted (90+ %) and to greater severity than normally encountered during operational practices. Therefore, treatments represent a “worst case scenario” when compared with current operational practices, and resulting effects would presumably be much greater. Despite this, no significant effects of compaction on soil productivity have been discovered at most sites.

Conclusions: Results from the HFQLG Soil Monitoring study are inconclusive for quantifying the cumulative increases or decreases in detrimental soil compaction in timber stands with thinning and group selection treatments. Within the Concow Hazardous Fuels Reduction soil analysis area, legacy detrimental compaction was observed in the majority of the proposed treatment units surveyed. It is expected that the project would cumulatively increase the level of detrimental soil compaction in thinning treatment units. Most of the analysis area contains soils classified as loam or sandy loam, with some occurrence of clay loams. The current LTSP study suggests that soil compaction does not affect soil productivity, except with poorly drained or perennially wet soils (unusual occurrence for general forest soils). Regardless, project design mitigations have been included to decrease the level of detrimental soil compaction that would occur as a result of proposed treatments.

Mitigations: To reduce the increase of detrimental compaction, a Limited Operation Period (LOP) would be applied to the entire Concow Hazardous Fuels Reduction 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. When properly designed and implemented, subsoiling is effective at reducing soil compaction (Kolka and Schmidt 2004).

When subsoiling is used to mitigate for detrimental soil compaction, increases in group selection and thinning treatments would be less (Westmoreland and McComb 2005). Subsoiling on skid trails would not exceed a 25 percent slope, to prevent unacceptable risks of soil erosion and to tree health. Subsoiling creates loose soil material that is susceptible to erosion, and erosion is more likely to occur on steeper slopes. Also there is some risk of root damage to plants during subsoiling. 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, given the results observed during this review. Likewise, these soils are highly erosive.

The subsoiling results observed during June 12-14, 2006 indicated that narrow channels were formed where the tines were pulled through the soil, and in-between the furrow marks the soil was still compacted or crusted. This situation resulted in the channeling and concentration of runoff water in the furrows which caused unacceptable erosion levels. The erosion potential and its control must be carefully evaluated before subsoiling landings or temporary roads with coarse textured granitic soils. All areas to be subsoiled are finalized by sale administer with the sivilculturist and soil scientist available for consultation.

Organic Matter. 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 Organic Matter (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 2007 HFQLG Soil Monitoring Report included data on large down woody material from 2001-2007. Of the 40 thinning units monitored only 6 units had no logs pre-treatment, 8 units were reduced from meeting the guideline of 3 logs per acre after treatment to not meeting the guideline and 25 units met the guideline pre-and post-treatments (Westmoreland, Dillingham, and Baldwin 2008). Of the 11 group selection units monitored 3 units had no logs pre-treatment, 6 units were reduced from meeting the guideline to not meeting the guideline, and only 2 units meet the guideline post-treatment (Westmoreland, Dillingham, and Baldwin 2008).

In 2004 nine thinning treatments were post monitored, and the report determined large down woody material decreased from 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 Concow 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 the “Fire and Fuels” section in this FEIS.

Recently there has been new research presentations by PSW on the importance of large woody material to soil nutrients (personel communication with David Young, research conducted by Robert Powers). One study occurred on the Blacks Mountain Experimental Forest in northeast California in eastside pine ecotypes. Conclusions from the study include: Organic carbon and nitrogen concentrations are much higher in decaying woody 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 retains available water for plants.

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. Recent research indicates that widely dispersed large woody material provides only a minimal and unsubstantial level of nutrients to soil (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 A of the FEIS, 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 Concow “Wildlife Biological Evaluation/Biological Assessment” in appendix C for more information). The cumulative quantity of fine organic matter was estimated in total removal of soil cover. Soil cover is expected to meet Forest Plan standards and 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.

Soil Hydrologic Function

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 in the green area is expected to meet or exceed Forest Plan standards and guides in all proposed treatment units following management activities. In the black area 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.

Soil Buffering Capacity

It is not expected that soil buffering capacity within the Concow Hazardous Fuels Reduction 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.

Alternative C

Direct, Indirect and Cumulative Effects to Soil Resources

Proposed activities in Alternative C compared to Alternative B would have little to no effect to soil resources. This proposed action is mastication and hand cut treatments only. As discussed under Alternative B mastication increase soil cover and fine organic matter and does not cause detrimental compaction when project design mitigations are implemented. Hand cut treatments are not a ground disturbing activity.

4.11.5 Summary of Effects Analysis Across all Alternatives

Table 4-51 Summary of Cumulative Effects to Soil Resources Across all Alternatives

Indicator: Soil Productivity	Alternative A	Alternative B	Alternative C
Effective Soil Cover and Soil Organic Matter	• In the green area remain and continue to accumulate at its current rate. • In the black area vegetative re-growth would continue to occur and recover within 3-5 years.	• In the green area reductions are expected to be short-term and expected to meet or exceed Forest Plan standards and guides in all proposed thinning and Danger Tree treatment units. • In the black area, thinning and Danger Tree removal treatments are expected to disturb the recovering burned landscape and reduce effective soil cover. However, proposed mitigations and project design features listed in Table 16 and Appendix A are expected to reduce total effects. • Mastication and chipping treatments will increase effective soil cover. • Burning treatments can only occur if effective soil cover is greater than 60% and are not expected to significantly reduced soil cover	• Increase in mastication units • No change in hand treatment units
Soil Porosity	• No new detrimental compaction	• Expected to increase detrimental compaction in thinning and Danger Tree removal but little to no effect to soil productivity.	• No effect

4.12 Hydrology

4.12.1 Introduction

Protection of water quantity and quality is an important part of the mission of the Forest Service (Forest Service Strategic Plan for 2007 to 2012, July 2007). Management activities on national forest lands must be planned and implemented to protect the hydrologic functions of forest watersheds, including the volume, timing, and quality of streamflow. The Clean Water Act of 1948 (as amended in 1972 and 1987) establishes as federal policy the control of point and non-point pollution and assigns the States the primary responsibility for control of water pollution. The 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). Compliance with the Clean Water Act by national forests in California is achieved under state law (see below). Beneficial uses are defined under California State law in order to protect against degradation of water resources and to meet state water quality objectives. The 1988 Forest Plan was amended by the 2004 SNFPA Record of Decision states “maintain or, where necessary, improve water quality using Best Management Practices (BMPs).” Subsequent Forest Plan standards and guides state: “implement BMPs to meet water quality objectives and improve the quality of surface water on the Forest.” BMPs are procedures, techniques, and mitigation measures that are incorporated in all Plumas National Forest actions to protect water resources and prevent or diminish adverse effects to water quality

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 mountain range. The topography of the Plumas-Feather River region is relatively subdued in comparison to the higher, more rugged relief of the range further south. The major rivers within the cumulative off-site watershed effects (CWE) analysis area are the West Branch of the Feather River and the North Fork of the Feather River. The elevations within the watersheds analyzed for the project range from 1,500 to 4,000 feet. The highest peaks occur on the ridge between Cirby Creek and Flea Valley creek. The most extreme relief in the area is present on the drop off canyon bottoms of the North Fork and West Branch of the Feather River. The lowest elevations within the area occur near Magalia.

Watershed response to elevated levels of ground disturbance may begin to negatively impact downstream channel stability and water quality. To describe the level of disturbance when such impacts may begin to occur, upper estimates of watershed "tolerance" to land use may be established based on basin-specific experience, comparison with similar basins, and modeling of watershed response. These indices of tolerable levels of disturbance are called thresholds of concern (TOC). The tolerance of a watershed is used to determine acceptable levels of disturbance and prescribe mitigation measures to prevent detrimental responses. The TOC does not represent an exact level of disturbance above which cumulative watershed effects will occur. Rather, it serves as a "yellow flag" indicator of increased risk of significant adverse cumulative effects occurring within a watershed. The land management activities proposed under this project have the potential to affect watershed resources in a beneficial, indifferent, or adverse manner, either through direct, indirect, or cumulative effects, as described in detail below.

4.12.2 Analysis Framework: Statute, Regulation, Forest Plan, and Other Direction

Direction relevant and specific to the Proposed Action and the Alternatives as they affect water resources includes:

Clean Water Act of 1948 (As amended in 1972 and 1987). Establishes as federal policy the control of point and non-point pollution and assigns the States the primary responsibility for control of water pollution. Compliance with the Clean Water Act by national forests in California is achieved under state law (see below).

Section 303(d) of the Clean Water Act. This section requires the identification of water bodies that do not meet, or are not expected to meet, water quality standards or are considered impaired. The list of affected water bodies, and associated pollutants or stressors, is provided the State Water Resources Control Board and approved by the US EPA. The most current list available is the 2006 303(d) list (SWRCB, 2006). The only stream on the 303(d) list in the water resource analysis area is the North Fork Feather River (below Lake Almanor). It is listed for mercury (unknown source) and water temperature (result of hydromodification and flow regulation/modification).

Non-point source pollution on national forests is managed through the Regional Water Quality Management Plan (USDA Forest Service, Pacific Southwest Region, 2000). Water Quality Management for Forest System Lands in California (USDA Forest Service 2000) contains the 1981 Management Agency Agreement between the California State Water Resources Control Board and the USDA Forest Service. The State Board has designated the Forest Service as the management agency for all activities on National Forest lands.

This plan relies on implementation of prescribed best management practices (BMPs). Best Management Practices are procedures, techniques, and mitigation measures that are incorporated in project actions to protect water resources and prevent or diminish adverse effects to water quality. BMPs relating to water quality are included in the handbook "Water Quality Management for National Forest System Lands in California – Best Management Practices" (USDA Forest Service 2000). The BMPs that apply to the Concow Hazardous Fuels Reduction Project are included in appendix A of this FEIS.

Regional Water Quality Control Board; Central Valley Region Beneficial Uses and State Water Quality Objectives (1998 revised 2007). The Cumulative Off-site Watershed Effects analysis is designed to include all effects on beneficial uses of water that occur away from locations of actual land use and are transmitted through the fluvial system (USDA Forest Service 1990a).

Beneficial uses of surface water bodies that may be affected by activities on the Plumas National Forest are listed in Chapter 2 of the Central Valley Region's Water Quality Control Plan (hereinafter referred to as the "Basin Plan") for the Sacramento and San Joaquin River basins (CRWQCB 1998 revised 2007). Existing and potential beneficial uses are defined for Lake Oroville, for the Feather River from the fish barrier dam in Oroville to the Sacramento River, for the watershed areas that are sources to Englebright Reservoir on the Yuba River, and for the Yuba River downstream of Englebright Reservoir. Beneficial uses are not defined for the South Fork Feather River but are assumed to include all the same beneficial uses as the others listed.

The California Water Code. Consists of a comprehensive body of law that incorporates all state laws related to water, including water rights, water developments, and water quality. The laws related to water quality (sections 13000 to 13485) apply to waters on the national forests and are directed at protecting the beneficial uses of water. Of particular relevance for the proposed action is section 13369, which deals with nonpoint-source pollution and best management practices.

The Porter-Cologne Water-Quality Act (As amended in 2006). This Act is included in the California Water Code. This act provides for the protection of water quality by the State Water Resources Control Board and the Regional Water Quality Control Boards, which are authorized by the U.S. Environmental Protection Agency to enforce the Clean Water Act in California.

Timber Harvest Activities Waiver Program. On April 28, 2005, the Regional Board adopted the Conditional Waiver of Waste Discharge Requirements for Discharges Related to Timber Harvest Activities in Resolution R5-2005-0052 (California Regional Water Quality Control Board Central Valley Region 2005). Waiver specifies eligibility criteria and conditions that must be met by dischargers engaged in timber harvest activities on private and Forest Service lands in order to qualify for a waiver of waste discharge requirements. Dischargers submit Waiver Applications prior to commencement of timber harvest activities and Waiver Certifications at the conclusion of those activities. The resolution states "…the Regional Water Boards will wave issuance of waste discharge requirements for United States Forest Service (USFS) timber harvest activities that may result in non-point source discharges, provided that the USFS designs and implements its project to fully comply with State water quality standards."

The Resolution includes Attachment A Waiver of Waste Discharge Requirements for Discharges Related to Timber Harvest Activities and Attachment B Monitoring and Reporting Conditions for Dischargers.

Attachment A states:

1. "The State Water Board continues to certify and the US Environmental Protection Agency continues to approve, pursuant to Section 208 of the federal Clean Water Act, the plan entitled "Water Quality Management for National Forest System Lands in California" including the best management practices set forth therein, and the designation of the USFS as the management agency."

2. "The USFS maintains (a) a water quality program consistent with the Basin Plan and consistent with the requirements of all other applicable water quality control plan; and (b) a program to monitor the implementation and effectiveness of best management practice."

Attachment B states:

1. "The USFS shall comply with all conditions specified in Attachment B, "Monitoring Conditions." The USFS shall also comply with all applicable requirements of Implementation, Forensic and Effectiveness Monitoring and Reporting Program No. R5-2005-0052. The USFS shall comply with additional monitoring and reporting program requirements (including, but not limited to, water quality compliance and/or assessment and trend monitoring) for all projects (except forest stand improvement and Danger Tree removal projects) when directed in writing by the Executive Officer.

2. As specified in Attachment B, the USFS is required to conduct effectiveness and forensic monitoring only when: (1) the discharger's cumulative watershed effects analysis indicates that the project, combined with other USFS projects conducted in the watershed over the past 10 years, may cause any watershed or sub-watershed to exceed a threshold of concern as determined by various models (i.e., Equivalent Roaded Acres (ERA), Surface Erosion (USLE), Mass Wasting (GEO), etc.). The USFS shall comply with the General Conditions described in Part I.B., above.

Attachment B defines monitoring and reporting conditions. Implementation monitoring is detailed visual monitoring of harvested areas and roads/landings prior to the rainy season, with emphasis placed on the determination of whether or not management measures (such as erosion control measures, or riparian buffers) were implemented or installed in accordance with approved Waivers. The Forest Service Region 5 Best Management Practices Evaluation Program (BMP EP) meets the intent of implementation monitoring. The BME EP program requires each Forest every year to randomly sample ground disturbing activities.

Attachment B defines effectiveness monitoring, as monitoring subsequent to harvest to evaluate whether particular management measures are or were effective at achieving desired results. Effectiveness Monitoring may be applied at a range of spatial scales, focusing on specific management measures for multiple rainfall events or multiple years. Effectiveness Monitoring may include visual hillslope monitoring (observations outside of the stream or stream channel, i.e., on the harvested slopes) or visual instream monitoring (evaluation of instream conditions). Effectiveness monitoring inspection are conducted as soon as possible following the winter period to determine the effectiveness of management measures in controlling discharges of sediment and in protecting water quality. The effectiveness monitoring inspection occurs as follows:

- After March 15 and before June 15 to assess the effectiveness of management measures designed to address controllable sediment discharges and to determine if any new controllable sediment sources have developed.

- The Effectiveness monitoring inspection shall include visual inspection of hillslope components (roads, landings, skid trails, watercourse crossings and unstable areas). If the visual inspection of hillslope components reveals significant management measure failure(s), a visual inspection of instream components (bank composition and apparent bank stability, water clarity and instream sediment deposition) shall also be conducted.

Attachment B defines forensic monitoring, as a visual field detection technique to detect significant pollution caused by failed management measures, failure to implement necessary measures, legacy timber activities, non-timber related land disturbances and/or natural sediment sources. Forensic Monitoring may also include photo-point monitoring to document pollution sources. Forensic Monitoring is most successful when criteria such as storm events of particular size are used to trigger field investigations for timely detection and repair of controllable sediment sources. Forensic monitoring inspections are conducted during the winter period, at least two times as follows:

- Once, during or within 12 hours following a 24-hour storm event of at least 2 inches (of rainfall) and after 5 inches (of total precipitation) has accumulated after November 15 and before April 1. If inspections cannot be conducted during or within 12 hours of such a storm event (due to worker safety, access or other uncontrollable factors) it would be conducted as soon as possible thereafter.

- Once, during or within 12 hours following a 24-hour storm event of at least 2 inches (of rainfall) and after 15 inches (of total precipitation) has accumulated after November 15 and before April 1. If inspections cannot be conducted during or within 12 hours of such a storm event (due to worker safety, access or other uncontrollable factors) shall be conducted as soon as possible thereafter.

- Additional Forensic Monitoring inspections would be conducted if the following "observation trigger" occurs: A noticeable significant discharge of sediment is observed at any time in any Class I or Class II watercourse. Photo-point monitoring would be conducted when such discharge is the result of failed water quality protection management measure(s) or lack of implementation of such measure(s). Follow-up forensic monitoring inspections would continue until corrective action is completed to repair or replace failed management measures and/or significant sediment discharges have ceased.

For the Concow Hazardous Fuels Reduction Project the last 10 years of Forest Service activities are not causing subwatersheds to be over the threshold of concern. However, proposed treatment units within T23N, R4E, Section 34 are in an area of concern due to the existing condition of the landscape. The Forest Service is proposing to conduct effectiveness and forensic monitoring in this proposed treatment units to ensure correct applications of BMPs and mitigation measures in this sensitive area.

Region 5 Soil and Water Conservation Handbook Forest Service Handbook Cumulative Off-Site Watershed Effects Analysis (25009.22 Chapter 20). Chapter 20 (USDA Forest Service 1990a) describes the cumulative off-site watershed effects (CWE) assessment procedure used on National Forest System lands and in Region 5. The FHS defines a CWE analysis to include known information that produces an objective, reproducible, and professional assessment of the combined effects of all past, present, and reasonably foreseeable future management actions on downstream beneficial uses. It further defines CWE to include all effects on beneficial uses of water that occur away from the locations of actual land use which are transmitted through the fluvial system. Effects can either be beneficial or adverse and result from the synergistic or additive effects of multiple activities within a watershed. Beneficial uses are defined as the use of the waters of the State including but not limited to domestic, municipal, agricultural, and industrial supply, power generation, recreation, aesthetics, navigation, and protection and enhancement of fish, wildlife, and other aquatic resources or preserves. The purpose of this FSH is to:

1. Assist forest mangers in scoping issues and concerns during planning and to identify areas that require additional evaluation of CWE-related issues.

2. Identify beneficial uses of water and watershed, climatic and land use factors that combine to influence the identified beneficial uses.

3. Use existing information to assess the influence of multiple land use activities on beneficial uses of water.

The objective of the FSH is to offer guidance for evaluating CWE susceptibility resulting from forest management activities. The analysis steps used in the Report from this FSH is summarized in the "Affected Environment" in chapter 3 of this FEIS.

The FSH also guides that a watershed analysis include watershed characteristics, hillslope and stream channel attributes, mechanics for initiation a CWE, watershed history, natural watershed sensitivity, watershed tolerance to land use, land disturbance, site disturbance, mitigation measures, site recovery, land use history, current watershed disturbance, proposed land use, CWE susceptibility evaluation, documentation, and monitoring and evaluation.

The Sierra Nevada Forest Plan Amendment (SNFPA). Table 2 of the 2004 Record of Decision on the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement (SNFPA FSEIS) describes standards and guidelines applicable to the Herger-Feinstein Quincy Library Group (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 Record of Decision (ROD) directs that vegetation management projects in the Pilot Project area follow the direction of the Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG Act) in the application of Scientific Analysis Team guidelines (Thomas et al 1993).

Herger-Feinstein Quincy Library Group Forest Recovery Act and Record of Decision (HFQLG Act and ROD). The HFQLG Act gives direction to apply the Scientific Analysis Team guidelines for riparian system protection to all resource management activities specified by the Act and all timber harvesting activities that occur in the Pilot Project area during the term of the Pilot Project. The prescribed minimum widths of "interim boundaries" of Riparian Habitat Conservation Areas (RHCAs) are as follows:

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

RHCA widths are to be determined by the greatest extent of (1) the top of the inner gorge, (2) the 100-year floodplain, (3) the outer edge of riparian vegetation, or (4) a distance equal to one or two site-potential tree heights, depending on the feature class. The site-potential tree height for the Feather River Ranger District is 150 feet. This means that on the Feather River District, 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, instead of a 100-foot RHCA buffer. These guidelines supersede other direction, unless that direction (for example, mitigation measures or project design features) would provide greater protection to riparian and fish habitat or would better achieve Riparian Management Objectives (RMOs).

The HFQLG Record of Decision (USDA Forest Service 1999) directs the Plumas National Forest to:

- Include provisions for accommodating at least a 100-year flow, including associated bedload and debris, at new stream crossings and existing crossings where resources are degraded;
- The Forest is required to meet RMOs during the development and implementation of a road management plan;
- The Forest is required to provide specific direction for management of fire and fuel treatment to meet RMOs and minimize disturbance of riparian ground cover and vegetation (Appendix A), and;
- The Forest is required to design prescribed burn projects to include the identification of objectives and risks in the RHCAs.

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

Forest Plan guidelines are applied to ephemeral channels with no evidence of annual scour and deposition where Scientific Analysis Team guidelines from the HFQLG Act are not applicable. The west side of the Forest contains ephemeral channels with no evidence of annual scour and deposition. The Glossary for the HFQLG Act Final EIS defines these channels as ephemeral swales. These channels may only flow during large magnitude flow events (such as the 2-year or 10-year events), and may represent alteration of the natural channel network related to past management activities. Ephemeral swales are not protected under HFQLG Act guidelines; however, ground-based equipment restrictions are necessary to help prevent further alteration. For these types of streams, Streamside Management Zone (SMZ) widths defined in the Forest Plan are applied. SMZ widths for ephemeral streams may range from 25 to 50 feet, with widths defined by stream bank and channel gradient and stability. Within these protection zones, proposed DFPZ treatment may still occur; however, ground-based equipment is excluded.

The Forest Plan requires the implementation of an SMZ plan for any activity within an SMZ. In accordance with the Forest Plan requirement, a "Streamside Management Zone Plan" has been prepared and is included in Appendix A. It describes in more detail the application of project designed mitigation measures, BMPs, and standards and guidelines applicable to activities within riparian areas of the Concow Hazardous Fuels Reduction Project.

4.12.3 Effects Analysis Methodology

Geographic Scope of Analysis

This section describes the methodology used for the effects analysis of the proposed project for water resources. This section establishes indicators chosen to measure potential impacts, the analysis area, timeframe, methods used (including field survey methods), and assumptions made for the effects analysis to water resources of all action alternatives.

As defined in the regulations for implementing NEPA, Code of Federal Regulations, Chapter 40, Sections 1500-1508, direct effects are those effects which are caused by the proposed action (or action alternative) and which occur at the same time and place as the action. Indirect effects are those caused by the action which are later in time or farther removed in distance from the location of the action.

Direct and indirect effects are determined by assessing the existing condition of hydrologically sensitive areas and upland areas based on the best available monitoring data and scientific research. Direct effects on beneficial uses result when Forest Service land management activities occur in and deposit sediment or pollutants directly into the stream course, reservoir, lake, pond, meadow, or riparain vegetation area. Increased erosion and sedimentation directly into these areas may result from road construction or maintenance, fire line construction and reconstruction for prescribed burning, wildland fires, and timber management activities, such as construction of skid trails, temporary roads, and log landings. Indirect effects can occur on beneficial uses when are hillslope destabilization and/or detachment and mobilization of sediment that will eventually reach streams. For these reasons, the geographic analysis area used to analyze potential effects to water resources includes proposed treatment areas, including silviculture treatments and associated activities, fuel reduction treatments and associated activities, and new/reconstruction of the National Forest System road network on the Feather River Ranger District of the Plumas National Forest (PNF), portions of the Lassen National Forest administered by the PNF, and private lands (composing 74 percent of the analysis area), which lie within the Concow Planning Area.

As defined in Code of Federal Regulations, Chapter 40, Sections 1500-1508, cumulative effects are those impacts “on the environment which result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time.”

For the purpose of this analysis, cumulative effects to beneficial uses are determined by assessing the cumulative off-site watershed effects or CWEs to 15 subwatersheds, with areas that range from 544 acres to 3,223 acres, with a total analysis area of 27,514 acres (see table 4-52). The locations of subwatersheds with respect to proposed treatment areas are displayed in the “Affected Environment” section of this FEIS. CWEs include all effects on beneficial uses of water that occur away from the locations of actual land use and are transmitted through the system (USDA Forest Service 1990). CWE impacts result from the combined effects of multiple land management activities within a watershed (USDA Forest Service 1990). CWEs include any changes that involve watershed processes and are influenced by multiple land use activities (Reid 1993). They do not represent a new type of impact.

In the CWE analysis, reasonable foreseeable future actions are Timber Harvest Plans (THPs) for private lands that were filed with CALFIRE in the 15 subwatersheds analyzed, that do not have a completion date. It was assumed that these THPs were going to be implemented in 2010, the same time as the Concow Hazardous Fuels Reduction Project. This represents a conservative assumption in terms of the combined immediate impact of these activities on the landscape. Reasonable foreseeable future actions were included in the existing condition analysis in order to demonstrate the impacts of the proposed action.

Table 4-52 Subwatersheds Located within the CWE Analysis Area

HFQLG Number	HUC6 Name	HUC6 ID Number	Subwatershed Name	Subwatershed Number	Acres
None	Little Butte Creek	180201580201	Little Butte Creek above Paradise Lake	1	3,004
None	Little Butte Creek	180201580201	Little Butte Creek below Paradise Lake	2	3,127
None	Little West Fork Feather River-West Branch Feather River	180201210704	ID West Branch Feather River	3	2,488
None	Little West Fork Feather River-West Branch Feather River	180201210704	Rattlesnake Creek	4	544
None	Little West Fork Feather River-West Branch Feather River	180201210704	Fortyniner Creek	5	630
None	Little West Fork Feather River-West Branch Feather River	180201210704	Griffin Creek	6	1,354
None	Concow Creek	180201210703	ID Concow Creek above Concow Reservoir	7	3,223
None	Concow Creek	180201210703	ID Concow Reservoir	8	1,439
None	Concow Creek	180201210703	Unnamed Tributary 3 into Concow Reservoir	9	846
None	Concow Creek	180201210703	Deadwood Creek	10	2,560
None	Concow Creek	180201210703	Cirby Creek	11	1,396
None	Concow Creek	180201210703	Unnamed Tributary 1 into Concow Reservoir	12	1,438
None	Concow Creek	180201210703	Unnamed Tributary 2 into Concow Reservoir	13	1,242
110056	Chino Creek-North Fork Feather River	180201210803	Flea Valley Creek	14	2,433
110056	Chino Creek-North Fork Feather River	180201210803	ID North Fork FR	15	1,791

Data Sources and Predictive Models:

- Subwatersheds were delineated with areas between 500 and 2,500 acres, as recommended in the Region 5 CWE methodology (USDA Forest Service 1990). The delineations are based on Hydrologic Unit Code (HUC)-6 watershed boundaries, Herger-Feinstein Quincy Library Group (HFQLG) watershed boundaries, and topography. Four subwatersheds more than 2,500 acres but smaller than 3,300 acres were delineated on criteria mentioned above. The HUC-6 watershed and HFQLG watershed GIS layers are located in the Plumas National Forest Geographic Information System (GIS) Library and are available upon request.

- Streams derived from the Plumas National Forest corporate stream coverage were checked and added to stream location data from topographic maps, private land Timber Harvest Plans (THPs), aerial photos, and data collected within proposed treatment units. A Riparian Habitat Conservation Area (RHCA) layer was delineated, in order to define near-stream sensitive areas for the CWE analysis. Streams derived from the Plumas National Forest corporate stream coverage were checked and added to using stream location data from topographic maps, private land Timber Harvest Plans (THPs), aerial photos, and data collected within proposed treatment areas.

The Plumas National Forest stream layer in this case under estimates the extent of 1st-order headwater tributary streams. While some editing of the stream layer was performed based on this premise, it is assumed that the layer still under estimates the extent of the 1st-order channel network in areas not field checked or covered under a timber harvest plan.

To define the extent of RHCAs, streamlines were buffered using HFQLG (SAT) guidelines for RHCA widths. Polygons were created as follows:

- Fish-bearing streams were buffered 300 feet from each side of the stream;
- Non-fish-bearing streams were buffered 150 feet from each side of stream;
- 1st order stream channels assumed to lack annual scour were buffered 50 feet from each side of the stream; and
- Lakes, meadows, and springs were buffered 150 feet around polygon edges.

Several stream buffers for the ERA calculations were modified to reflect the need to protect a larger area of streams or to treat more within the standard buffer of streams.

A sensitive layer was created that included all the buffers for all the various hydrologic features indicated above. The sensitive layer was used to determine the “near-stream area ERA” by subwatershed. The “near-stream area ERA” and “total subwatershed ERA” are numbers require under HFQLG monitoring. Since the stream coverage overestimates the extent of many stream channels, near-stream sensitive area ERA is likely over-reported within the analysis area.

- Timber harvest activities on private timberlands within the analysis area were inventoried by examining maps and documents of timber harvest plans (THPs) and notices of emergency timber operations (Emergency Notices). THP and Emergency Notice maps dating back ten years are available from the California Department of Forestry and Fire Protection (CALFIRE) at their Northern Operations Center office in Redding, California. The plan maps are available in digital format (shapefile) from CALFIRE for Butte County through their website. THPs provided locations of meadows that were incorporated into the wetland layer and eventually into the sensitive layer. The location of the meadows from THPs were corrected and verified with photo-interpretation.
- Initially the number of reasonable foreseeable future actions was much higher but numerous of them were dropped from the CWE analysis due to the Butte Lightning Complex Wildfire. The THPs with no completion dates prior to the wildfire that were within the wildfire were eliminated from the analysis because the wildfire changed the existing condition making the THP treatment and yarding system invalid or non-applicable. Instead, private landowners would have submitted a notice of emergency timber operations with CALFIRE which we include in our CWE analysis. Further detail is provided under the “Water Resource Cumulative Off-Site Watershed Effects Analysis Methodology” section below.

- The aerial extent or area (acreage) of landings were either photo-interpreted or given a standard buffer width. Using the point data locations of landings from THPs, Notice of Emergency Timber Operations (EM), and Categorical Exclusions maps it was determined that the appropriate size for those landings would be 0.5 acres therefore a standard buffer width was assigned.

- ERA values for urbanization were assigned based on the Butte County parcel and zoning layers. Digital parcel and zoning data was acquired from the county GIS department or was available online, and disturbance coefficients were assigned based on the relative amount of land disturbance typical of various land uses.

- Surveyed locations of user-created Off Highway Vehicle (OHV) routes were also included, with widths assigned based on the type of vehicle use.

- Powerlines were digitized off color aerial photographs and topographic maps. The width of the powerlines was based on photo-interpretation.

- Quarries were digitized off color aerial photographs and topographic maps.

- For National Forest system roads, the Plumas National Forest corporate transportation layer clipped to the analysis area was used as the base layer. County and private roads were added from the Butte County road layer and from THPs maps respectively. All road locations were verified and at times realigned using color aerial photography or digital orthoquads (DOQs). A 10-foot buffer was applied to all roads, which is based on 20-foot average road width. Acreage was calculated based on buffered areas.

Assumptions Specific to Water resources Analysis:

- Post-treatment ERA values were calculated as if all proposed activities would occur in 2010.

- When utilizing the ERA model, all landscape disturbances are evaluated in comparison to a completely impervious or roaded surface. Road surfaces are considered to represent maximum hydrologic disturbance and rainfall-runoff potential. Roads are not assumed to recover because of the constant use and maintenance.

- For subwatersheds that are not located within an HFQLG watershed, it was assumed that these subwatersheds have similar sensitivity ratings and the same TOC as the neighboring HFQLG Watersheds.

- Complete hydrologic recovery due to vegetative reestablishment occurs in twenty-five years following the last major disturbance. The recovery coefficient is applied to vegetation management activities; it does not apply to land disturbance that does not naturally recover without active restoration and revegetation, such as roads, mines, hydroelectric infrastructure and urban development.

- The Plumas National Forest and the Feather River Ranger District have assigned coefficients based on local estimates of the hydrologic impact of land management activities and wildland fire.
- It is assumed that all proposed and future foreseeable activities without a well-determined implementation date would occur in the same year as the analysis. This represents a conservative assumption in terms of the immediate impact of these activities on the landscape.
- The response of landscapes to disturbances is influenced by climate, physiographic, geologic and ecologic conditions. Therefore, recovery coefficients are assigned based on local conditions.

- The response of landscapes to disturbances is influenced by climate, physiographic, geologic and ecologic conditions. Therefore, recovery coefficients are assigned based on local conditions.

Water Resources Methodology by Action

1. **Direct/indirect effects of proposed DFPZ hazardous fuels reduction and vegetative forest health treatments to water resources.**

1. Beneficial Uses

Definition: A use of the waters of the State including but not limited to domestic, municipal, agricultural, and industrial supply, power generation, recreation, aesthetics, navigation, and protection and enhancement of fish, wildlife, and other aquatic resources or preserves (USDA Forest Service 1990).

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, revised 2007). Beneficial uses of surface water bodies, including those that may be affected by activities on the PNF are listed in Chapter 2 of the Basin Plan (CRWQCB 1998, revised 2007). Existing and potential beneficial uses are defined for the North Fork Feather River and its tributaries, for Lake Oroville. All streams within the Concow Hazardous Reduction and Restoration Project analysis area flow into Lake Oroville. The defined existing beneficial uses are:

1. Municipal and domestic water supply include the uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply. *(Middle Fork and Lake Oroville)*

2. Agricultural supply includes the uses of water for farming, horticulture, or ranching including, but not limited to, irrigation (including leaching of salts), stock watering, or support of vegetation for range grazing. *(Irrigation: Middle Fork and Lake Oroville.)*

3. Hydropower generation includes the uses of water for hydropower generation. *(Middle Fork and Lake Oroville)*

4. Water contact recreation includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but

are not limited to, swimming, wading, water-skiing, skiing and scuba diving, surfing, white water activities, fishing, or use of natural hot springs. *(Middle Fork and Lake Oroville)*

5. Non-contact water recreation includes uses of water for recreational activities involving proximity to water, but where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities. *(Middle Fork and Lake Oroville)*

6. Commercial and sport fishing includes uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes. *(Middle Fork and Lake Oroville)*

7. Warm freshwater habitat includes uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates. *(Lake Oroville)*

8. Cold freshwater habitat include uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates. *(Middle Fork and Lake Oroville)*

9. Wildlife habitat includes uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources. *(Middle Fork and Lake Oroville)*

10. Spawning, reproduction, and/or early development include uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish. *(Middle Fork and Lake Oroville)*

Additionally there are three local agricultural, domestic, and municipal water sources located with in the analysis area. Paradise Lake and Magalia Lake managed by Paradise Irrigation District and Concow Reservoir managed by Thermalito Irrigation District. Also in the analysis area there are cold freshwater and wildlife habitats on Little Butte Creek above Paradise and Magalia Lake, West Branch Feather River, Concow Creek, an unnamed tributary to Concow Creek, Criby Creek, 3 unnamed tributaries to Concow Reservoir and Deadwood Creek. (Figure 1) See the BA/BE for more information about aquatic and wildlife habitats.

Short-term timeframe: 1 year

Long-term timeframe: 25 years. The response of landscapes to land disturbances is influenced by climate, physiographic, geologic and ecologic conditions. In most cases the disturbance caused by past land management activities diminishes through time. On the Feather River Ranger District, 25 years is used as the average recovery period for disturbed sites. 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.

Spatial boundary: Proposed treatment areas including silviculture treatments and associated activities, fuel reduction treatments and associated activities, and new/reconstruction of the National Forest System road network.

Methodology: Direct effects on beneficial uses result when Forest Service land management activities occur in and deposit sediment or pollutants directly into stream course, reservoir, lake, pond, meadow, or riparain vegetation area. Increased erosion and sedimentation directly into these areas may result from road construction or maintenance, fire line construction and reconstruction for prescribed burning, wildland fires, and timber management activities, such as construction of skid trails, temporary roads, and log landings.

Indirect effects can occur on beneficial uses when hillslope destabilization and/or detachment and mobilization of sediment will eventually reach streams. This can be caused by land management activities such as timber harvesting and associated activities, prescribed fire, or roads. Indirect effects can also occur naturally in areas that are steep and prone to landslides or after wildland fires. Increased erosion and sedimentation may result in increased peak channel flows, alteration of annual flow distribution, stream channel geometry alteration, and degradation or aggradation of channel beds.

Direct and indirect effects are determined by assessing existing condition of hydrologically sensitive areas and upland areas and using best available monitoring data and scientific research to determine if effects would be adverse or beneficial. If effects were to determined to be adverse, then project design mitigations were developed in all action alternatives to reduce effects if it meet the purpose and need of the action alternative.

Existing condition of stream channels and hillslope for direct and indirect effects were determined by numerous site visits looking for key indicators and using data collected during the soil resource surveys. Key indicators looked for were channel shape, bank stability, substrate composition, hillslope failures, and direct sediment sources to channel. See chapter 3 “Affected Environment” for existing condition information.

Riparain Habitat Conservation Area (RHCAs) land allocations were determined in every proposed treatment unit with a site visit to every channel. The land allocations are based on the HFQLG FRA and the Plumas National Forest Land Management Plan (see Section 2 “Analysis Framework, Statute, Regulation, Forest Plan, and Other Direction and Appendix A). The land allocations were mapped using a Trimble Global Position System (GPS). While mapping the land allocations, a general assessment was conducted to determine existing condition. Key indicators observed were soil cover, vegetative cover, and erosion and sedimentation occurrences.

2. **Cumulative effects of proposed DFPZ hazardous fuels reduction and vegetative forest health treatments to water resources.**

1. **Beneficial Uses**

Short-term timeframe: not applicable; cumulative effects analysis will be done only for the long-term time frame

Long-term timeframe: 25 years. The response of landscapes to land disturbances is influenced by climate, physiographic, geologic and ecologic conditions. In most cases the disturbance caused by past land management activities diminishes through time. On the Feather River Ranger District, 25 years is used as the average recovery period for disturbed sites. 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.

Spatial boundary: The scope of the Cumulative Off-Site Watershed Effects (CWE) analysis includes 15 subwatersheds with areas that range from 544 acres to 3,223 acres, with a total analysis area of 27,514 acres (see above table 4-52).

Indicator(s). In Region 5 the accepted method for quantifying CWEs is the "Equivalent Roaded Areas" (ERAs) model and then comparing to a Threshold of Concern (TOC). Cumulative effects to beneficial uses are determined by assessing the cumulative off-site watershed effects or CWEs. CWEs include all effects on beneficial uses of water that occur away from the locations of actual land use and are transmitted through the system (USDA Forest Service 1990). CWE impacts result from the combined effects of multiple land management activities within a watershed (USDA Forest Service 1990). CWEs include any changes that involve watershed processes and are influenced by multiple land use activities (Reid 1993). They do not represent a new type of impact. Changes that accumulate in time or space are considered CWEs.

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. They modify topography, change the character of soil and vegetation, import or remove water, chemicals, and fauna, and they may introduce pathogens and heat. Changes in these parameters can cause changes in watershed processes. As the watershed changes in response to the altered environmental parameters, changes in production and transport of water, sediment, organic matter, chemicals, and heat occur (Reid 1993).

In the following discussion contains information gathered during site visits by the hydrologist/soil scientist and aquatic biologist.

Water Resource Cumulative Off-Site Watershed Effects Analysis Methodology

In Region 5, the accepted method for quantifying CWEs is the "Equivalent Roaded Areas" (ERAs) model and then comparing to a Threshold of Concern (TOC). 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.

Located in appendix B of this FEIS is a list of past activities and a list of future land disturbing activities (reasonable foreseeable future activities) included within the CWE analysis. Impacts include roads, landings, timber harvesting activities on public and private lands, wildland fire, and grazing. ERA describes these off-site impacts in terms of the area roaded within a watershed by assigning a coefficient to a disturbing activity. This coefficient is how a land management activity disturbance compares to the disturbance of a road. Roads are considered the greatest disturbance and have a coefficient of one. For example a clearcut has a disturbance coefficient of 0.35. This coefficient is multiplied by the total acres of the clearcut. The resulting acres are how many acres of the clearcut is equal to the disturbance acres of a road. It assumes that the more densely a subwatershed is roaded, the greater the impacts will be to water quality downstream.

Watersheds and their associated stream systems can tolerate certain 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) (USDA Forest Service 1990). 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 total 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. 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 (USDA Forest Service 1990).

The implementation of the ERA model was very complex due to higher than usual urban density, private landownership and recent fire activity. The manner in which the ERA model was implemented was that only the most land disturbing activity could be used at the time in which the ERA model was analyzed for. There were more than a dozen different types of disturbances to account for and compare to one another. At times there were 2 or more disturbances in the same area that occurred at different times and had different recovery periods. Due to the complexity a new attribute was created called the Comparison coefficient. The Comparison coefficient reflects the true disturbance coefficient that accounts for the time of recovery. The Comparison coefficient is used to compare the true disturbance coefficient of an activity to another activity. The equation for the Comparison coefficient is displayed below:

Comparison coefficient = (Disturbance coefficient) x (Recovery coefficient).

After the Comparison coefficients were calculated various selections, erases, and clips were used to derive a single disturbance activity (comparison coefficient) for a given area. The process of comparing coefficients was not automated therefore some human error is expected. The human error may account for 1-2% of the percent of threshold of concern (TOC) for the “total subwatershed” values. The disturbance activities were all intersected with the subwatersheds and then the ERA values were calculated. The Comparison coefficient was used to determine the ERA values for the remaining disturbance activities.

The ERA values were calculated using the following equation:

ERA = (Acres of treatment) x Comparison Coefficient

Or

ERA = (Acres of treatment) x (Disturbance equation) x (Recovery Coefficient)

All the ERA values from the disturbance activities were summed up to determine the existing condition “total subwatershed ERA”. After that process the disturbance activities were than intersected with the sensitive layer and then the all the ERAs were summed up to determine the “near-stream area ERA”. The entire process in determining the ERA values was repeated again for both Alternatives B and C.

Equivalent Roaded Area (ERA) Method and Disturbance Coefficients. When utilizing the ERA model, all landscape disturbances are evaluated in comparison to a completely impervious or roaded surface. Road surfaces are considered to represent maximum hydrologic disturbance and rainfall-runoff potential. Other ground-disturbing activities assessed in the Concow Hazardous Fuels Reduction Project cumulative off-site watershed effects (CWE) analysis area include timber harvest and related silvicultural treatments on private and public lands, residential development, mines, wildfire, prescribed burning, and off-highway vehicle (OHV) trails. These components are assigned disturbance coefficients that represent a typical ratio of their hydrologic impact compared to the same roaded area. Disturbance coefficients are assigned based on local conditions.

The Plumas National Forest and the Feather River Ranger District have assigned coefficients based on local estimates of the hydrologic impact of land management activities and wildland fire (refer to table 4-53). In applying the ERA method, all known disturbances within the subwatersheds where management activities are proposed are cataloged and included in the ERA summation. It is assumed that all proposed and future foreseeable activities without a well-determined implementation date would occur in the same year as the analysis. This represents a conservative assumption in terms of the immediate impact of these activities on the landscape.

Recovery Coefficients. The response of landscapes to disturbances is influenced by climate, physiographic, geologic and ecologic conditions. Therefore, recovery coefficients are assigned based on local conditions. On the Feather River Ranger District, twenty-five years is used as the average recovery period for disturbed sites. 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. Therefore, within a twenty-five year period, vegetation generally has sufficient opportunity to reestablish canopy closure, provide interception of rainfall energy, provide soil cover from needle cast and other organic debris-fall, and to add organic material to the soil to moderate soil erosion. Roots have reoccupied the soil mantle and most effects from compaction have been negated except along established roadways. A twenty-five year linear recovery curve has been incorporated into the analysis, reducing the calculated site disturbance with time.

Table 4-53 Disturbance Coefficients for the Plumas National Forest

Harvest Activities:	
Clear Cut, Rehabilitation, Group Selection, Shelterwood, and Seed Tree (Group Selection coefficients divided by 5 to 10 to account for groups distributed across the prescribed area):	
Tractor Pile	0.35
Tractor Yard w/ Broadcast Burn	0.30
Grapple Pile	0.30
Skyline w/ low burn intensity	0.20
Skyline w/ high burn intensity	0.25
Skylines w/ no burn	0.15
Helicopter w/ low burn intensity	0.10
Helicopter w/ high burn intensity	0.15
Helicopter w/ no burn	0.08
Leave Tree, Multi-Product Thinning, Pre commercial Thinning, Individual Tree Selection, Transition and Biomass Removal:	
Tractor (hand pile and burn)*	0.10 – 0.20
Tractor (hand pile and burn) w/ heavy removal	0.25
Skyline*	0.05 – 0.15
Helicopter*	0.02 – 0.05
* Smaller coefficients are for ITS with open canopies and larger coefficient is for ITS with closed canopies and for older sales	
Salvage and Sanitation:	
Range 0.05 to 0.3, use criteria similar to ITS	
Non-Harvest Activities:	
Hand Cut Tractor Pile:	0.15
Hand Cut Pile Burn:	0.01
Wildland Fire:	
High Intensity Burn	0.20
Moderate Intensity Burn	0.15
Low Intensity Burn	0.05
Note: If there is an underburn, coefficient is equivalent to a low intensity burn	
If salvage includes an underburn, add underburn coefficient to salvage coefficient. Broadcast burn is equivalent to a moderate intensity burn	
New treatments with burn piles *(range depends on piles/acre and methods)*	0.02 to 0.05
Mastication with or without pruning:	
On slopes less than 25%	0.05
On slopes greater than 25%	0.10
Grapple Pile and Grapple Pull:	0.1
Grazing Public and Private Lands:	
If lands have not been grazed recently and/or recovering, do not give it an ERA	
Healthy	0 – 0.10
At risk	0.10 – 0.20
Unhealthy (bare ground)	0.20 – 0.30
(Consider soil and vegetation cover for health of meadows)	
Roads, Private Landings, Parking Lots, Mines, and Quarries:	1.0
Powerline Cuts:	0.35
Urbanization (based on county land use codes and photo-interpretation):	
Industrial	0.7
Public Facilities	0.5
Highway Commercial	0.5
Rural Commercial	0.2
Single Family Residence/Mobile Home Park (< 0.5-acre lots)	0.5
Single Family Residence (1-10 acres)	0.2
Recreational Facility	0.1 – 0.5
Residential Agriculture (20-80 acres)	0.05 – 0.1
Summer Camps	0.2

This curve represents a 4% annual linear recovery trend, and assumes complete hydrologic recovery due to vegetative reestablishment in twenty-five years following the last major disturbance. The recovery coefficient is applied to vegetation management activities; it does not apply to land disturbance that does not naturally recover without active restoration and revegetation, such as roads, mines, hydroelectric infrastructure and urban development. Burned areas typically recover faster than areas of timber harvest – a five-year recovery period is applied to wildland fire. The recovery coefficient for vegetation management was calculated using the following equation (the year of project implementation was assumed to be 2010):

Recovery coefficient = [25 – (2010 – date of activity)] ÷ 25.

Meadows – Riparian Areas and Grazing ERAs. Meadows are mapped and evaluated for several purposes relevant to the Concow Hazardous Fuels Reduction Project CWE analysis. Meadows that are actively grazed, or are within grazing allotments that have been grazed within the past five years are assigned an ERA based on their condition. Meadow condition as affected by grazing is related to surface disturbance by grazing animals and their effects on meadow hydrologic function. No grazing activity is evident in the Concow Hazardous Fuels Reduction Project analysis area on private lands, and no active grazing allotments are present in the analysis area on federal lands. Therefore, no grazing disturbance was calculated for the Concow Hazardous Fuels Reduction Project analysis.

Meadows are considered riparian areas, and all meadows within the Concow Hazardous Fuels Reduction Project CWE analysis area were included in the near-stream sensitive areas (equivalent to RHCAs) on both Plumas National Forest and private lands within the analysis area.

Plumas National Forest meadows were digitized based existing information, photo-interpretation, timber harvest plans (THPs) and new field data. The existing data consisted of meadows plotted onto 7.5-minute topographic maps based on interpretation of 1:15,840-scale color aerial photography and field knowledge. These data were later transferred to a GIS layer by heads-up digitizing, and corrections to meadow locations were made based on the additional photo-interpretation. These corrections helped reduce limitations of this layer included data gaps and incorrect locations of some meadows. THPs provided locations of meadows that were incorporated into the wetland layer and eventually into the sensitive layer. The location of the meadows from THPs were corrected and verified with photo-interpretation.

Infrastructures

Landings. Landings on both private and public lands are considered to have the same degree of disturbance as a road. The aerial extent or area (acreage) of landings were either photo-interpreted or given a standard buffer width. Using the point data locations of landings from THP, Notice of Emergency Timber Operations (EM), and Categorical Exclusions maps it was determined that the appropriate size for those landings would be 0.5 acres. Therefore a standard buffer width was assigned. The disturbance coefficient for a landing is the same as a road therefore the ERA of landing would be the same as its acres. A limitation to this layer is that un-recovered landings, skid trails and temporary roads have similar impacts as roads but those locations are not always known therefore not digitized.

Off Highway Vehicles (OHVs). Surveyed locations of user-created Off Highway Vehicle (OHV) routes were also included, with widths assigned based on the type of vehicle use. A 3-foot buffer was applied to the OHV routes, which was based on 6-foot average route width. The OHV routes have the same disturbance coefficient as a road. One limitation of this layer is that it has under mapped the undesignated OHV routes because their locations are unknown.

Powerlines. Powerlines were digitized off color aerial photographs and topographic maps. The width of the powerlines was based on photo-interpretation. The disturbance coefficient of powerlines is 0.3 and does not recover, meaning that the area through time will continue to have the same comparison coefficient because the powerlines are constantly maintained. A limitation to the layer is that it is deficient (under mapped) because the location of secondary grid powerlines is unknown.

Quarries. Quarries were digitized off color aerial photographs and topographic maps. Quarries have the same disturbance coefficient as roads and don't recover therefore the comparison coefficient and ERA values will remain the same through time.

Railroads. Railroads were digitized of the aerial photographs and topographic maps. The aerial extent of the railroads was determined using photo-interpretation. Railroads have the same disturbance coefficients as a road and don't recover therefore the comparison coefficient and ERA values will remain the same through time.

Roads. This layer is based largely on existing information. For National Forest system roads, the Plumas National Forest corporate transportation layer clipped to the analysis area was used as the base layer. County and private roads were added from the Butte County road layer and from THPs maps respectively. All road locations were verified and at times realigned using color aerial photography or digital orthoquads (DOQs). A 10-foot buffer was applied to all roads, which is based on 20-foot average road width. Acreage was calculated based on buffered areas. ERA values were derived directly from the road acreage, since the road disturbance coefficient is equal to 1.0. Roads are not assumed to recover because of the constant use and maintenance. The assumption that roads don't recover means that the recovery coefficient is 1 and that the ERA values for the roads are equal to the acreage of the roads based off the ERA equations. Limitations to this layer include a probable underestimate of road network length and errors in the digitized position of features in the corporate layer. The location or existence of many unclassified roads (also known as legacy or "ghost" roads) is unknown, and they consequently do not appear in the layer.

Plumas National Forest - Past Timber Harvest Activities

The records of past timber harvest activities on National Forest System lands within the analysis area were initially extracted from the Plumas National Forest Stand Record System (SRS) database and accompanying GIS layer, and the updated version of those data in the FACTS database. Data gaps were present in these databases for harvest and site preparation activities for many treatment units. The data were subsequently supplemented by examining hard-copy stand record cards for the units in question, and referring to maps of past timber sales for cross-reference where necessary and available. While doing so, numerous stand records which had not been entered in the SRS database and GIS layer were discovered.

These units were added to the digital layer for the analysis. Additional units not found in any of these information sources but visible on aerial photography were digitized and assigned disturbance coefficients based on the estimated age and nature of the activity that occurred. The most recent major ground disturbing activity in a unit and the year of the activity were used for the ERA calculations. A list of past Plumas National Forest harvest activities and a list of future foreseeable activities is located in Appendix F. Limitations to this layer include additional data gaps in the SRS and FACTS databases and incomplete accomplishment records on the stand record cards.

Private Land Past Timber Harvest Activities

Timber harvest activities on private timberlands within the analysis area were inventoried by examining maps and documents of timber harvest plans (THPs) and notices of emergency timber operations (Emergency Notices). THP and Emergency Notice maps dating back ten years are available from the California Department of Forestry and Fire Protection (CALFIRE) at their Northern Operations Center office in Redding, California. The plan maps are available in digital format (shapefile) from CALFIRE for Butte County through their website. The shapefile from CALFIRE contains complete data from 1997 – 2009 for THPs only. The CALFIRE shapefile was not used in the ERA model because we had already established our own similar THP shapefile. We established our own THP shapefile because at the time we were gathering the THP information the CALFIRE shapefile was not complete and available. The shapefiles that were used in the ERA model for the THPs and Emergency Notices were digitized off hard copies and scans of the original documents that were acquired from the Northern Operations Center office in Redding, California.

The initial attribute data entered in the shapefile was document number, harvest prescription, yarding, and year of completion. Using the attributes just mentioned a disturbance coefficients were assigned using the closest equivalents in the Plumas National Forest ERA classification as seen in table 1. Areas of alternative prescriptions with no close equivalents in the Plumas National Forest classification were assigned coefficients based on photo-interpretation and professional judgment. To account for past harvest activities older than 10 years, stand areas and activity types were photo-interpreted. The years that activities were performed were estimated based on the apparent recovery visible on the aerial photography.

Harvest activities for photo-interpreted stands were classified using a simplified version of the Plumas National Forest ERA classification. Harvest areas most closely resembling clear cuts were assigned the clear cut disturbance coefficient of 0.35 or 0.25, depending whether the unit was tractor- or cable-yarded. Yarding methods were interpreted based on slope gradient and visible evidence of activities, such as landings, skid trails, and cable patterns. Harvest areas most closely resembling select cuts were assigned a select harvest disturbance coefficient of 0.2 for tractor yarding and 0.15 for cable yarding. The lists of future foreseeable activities are based on THPs filed but have no completion dates.

Limitations to the private harvest layer include incomplete final accomplishment records for some THPs, absence of documented harvest records prior to 1995, and limited information regarding site preparation activities.

Wildland Fire. The fire history within the analysis area prior to 2008 indicates that they were two wildfires in 2000 and 2001. Wildfire areas recover much faster than timber harvest areas and a 5 year recovery rate was applied, more than 5 years have passed therefore the area was not considered disturbed in the ERA model. The 2008 Butte Lightning Complex was a major component of the ERA model. The fire severity of the wildfire was determined using the Burned Area Reflectance Classifications (BARC) shapefile. The fire severity ranged from unburned/very low soil burn severity to high burn severity. The recovery rate of wildfires is typically 5 years for low to moderate fires but after numerous field visits in the winter of 2008 and spring 2009 it was determined that, the recovery rate for high burn severity fire was 5 year too.

Urbanized Areas. ERA values for urbanization were assigned based on the Butte County parcel and zoning layers. Digital parcel and zoning data were acquired from the county GIS department or was available online, and disturbance coefficients were assigned based on the relative amount of land disturbance typical of various land uses. These values were adapted from urban interface disturbance coefficients developed by the Eldorado National Forest.

Post-Project ERA of Watersheds

Proposed Action-Alternative B & Alternative C. Post-treatment ERA values were calculated as if all proposed activities would occur in 2010. Consequently, total ERA values for the first post-project year will be somewhat over-estimated, because treatments will actually occur over a several-year time span.

The method for calculating the ERA values for both Alternatives B and C would be the same as how they were calculated for the existing condition (Alternative A) except for both alternatives would incorporate the proposed action.

Maintenance on Federal Land-Alternative B. ERA values were calculated for Alternative B for years 5 and 10 after the implementation of the project to assess the impact of the maintenance for the given years just mentioned. The same method of determining the ERA values were used. 5 years after the implementation of the project the land solely disturbed by the 2008 Butte Lightning Complex would have recovered because more than 5 years would have passed. Any past land disturbance within the 2008 wildfire that would have not recovered would take the place of the wildfire disturbance.

Threshold of Concern (TOC)

Watershed sensitivity is an estimate of a watershed's natural ability to tolerate land use impacts without increasing the risk of cumulative impacts to unacceptably high levels. Measures used to evaluate watershed sensitivity for individual watersheds included the potential for 1) soil erosion, 2) high intensity and/or long duration precipitation events, including rain-on-snow, 3) landslides and debris flows and 4) channel erosion within alluvial stream channels.

Watershed response to elevated levels of ground disturbance may begin to negatively impact downstream channel stability and water quality. To describe the level of disturbance when such impacts may begin to occur, upper estimates of watershed "tolerance" to land use may be established based on basin-specific experience, comparison with similar basins, and modeling of watershed response. These indices of tolerable levels of disturbance are called thresholds of concern (TOC). The tolerance of a watershed is used to determine acceptable levels of disturbance and prescribe mitigation measures to prevent detrimental responses. The TOC does not represent an exact level of disturbance above which cumulative watershed effects will occur. Rather, it serves as a "yellow flag" indicator of increased risk of significant adverse cumulative effects occurring within a watershed.

Currently the Plumas National Forest uses TOC values that range from 10 to 14 percent. A range is appropriate and is determined by the overall watershed sensitivity. Sensitivity Ratings for HFQLG watersheds were calculated for the HFQLG Final Environmental Impact Statement (USDA Forest Service 1999), and are listed in Table 2 of Appendix N of that document. These sensitivity ratings were used to determine TOC values for the subwatersheds located in the corresponding HFQLG watersheds. The sensitivity ratings were assigned to rating categories of low (< 8), moderate (7.5-12.5), and high (>12.5). Table 2 below displays the relationship between Sensitivity Ratings and TOC. This relationship is estimated by observations and research conducted on the Plumas National Forest and is subject to change as more site-specific information is developed. It is a requirement for HFQLG monitoring that near-stream sensitive areas are distinguished and analyzed independently for risk of adverse CWEs. These sensitive areas are assigned a lower TOC, indicative of greater sensitivity to disturbance than the watershed as a whole. The Plumas National Forest uses TOC values of five to six percent for near-stream sensitive areas, described in the tables in the HFQLG FEIS and the Concow Hazardous Fuels Reduction and Restoration Project Hydrology report as Near-Stream Area. Tables 4-54 and 4-55 below lists the sensitivity rating, rating factor, and TOC value of the HFQLG watersheds located in the analysis area.

Table 4-54 Relationship Between Sensitivity Rating and Threshold of Concern (Taylor, 2002)

Sensitivity Rating	Threshold of Concern (Percent ERA)
Low	14-16
Moderate	12-14
High	10-12

Table 4-55 Sensitivity Ratings of HFQLG Watersheds Located In the Project Area

HFQLG Number	HFQLG Sensitivity Rating	Sensitivity Rating Factors	TOC as Percent of Entire Watershed	TOC as Percent of Near-Stream
110055	11	Moderate	12	6
110056	11	Moderate	12	6

For subwatersheds that are not located within an HFQLG watershed, it was assumed that these subwatersheds have similar sensitivity ratings and the same TOC as the neighboring HFQLG Watersheds. The calculated ERA values for existing condition, for the proposed action, and for the alternative action were compared to TOC values. The proposed action includes ERA values for the year of implementation, 5-year and 10-year maintenance. The comparisons were established 1) near-stream; 2) on a subwatershed scale; and 3) for the entire analysis area. The risk of cumulative effects is generally reported at a subwatershed scale in order to categorize the distribution of potential effects across the landscape, and to determine the potential impacts to off-site stream and riparian resources at the level of the second-to third-order channel, where such effects tend to concentrate.

The results of these comparisons are reported as percent disturbed and percent of TOC for each subwatershed. Percent disturbance is calculated by dividing total ERA for the subwatershed by the total subwatershed acres, and multiplying the result by 100 to report the proportion as a percentage. This number represents the percent of acres disturbed in the watershed, and is required to be reported for HFQLG monitoring. The percentage of TOC is calculated by the following equation:

$$\text{Percent TOC} = [\text{ERA} \div (\text{acres of watershed} \times \text{TOC})] \times 100$$

If this number is less than 100% than the watershed disturbance is under threshold of concern, and if it is over 100% then it exceeds threshold of concern. This number provides a simple ratio of watershed condition compared to unit value equivalent to the TOC. This number is required to be reported for HFQLG monitoring.

4.12.4 Environmental Consequences

Alternative A – No Action

Direct and Indirect Effects to Water Resources

Beneficial Uses. Under the No-action Alternative, fuel reduction treatments, Danger Tree, temporary road construction, road reconstruction and maintenance, and oak management would not occur. Therefore, there would be no direct and indirect effects to the stream channel network from the Concow Hazardous Fuels Reduction Project. As previously mentioned in the “Existing Condition” Section direct and indirect effects from the Butte Lighting Complex are expected to be significantly reduced during the 2010 water year compared to the 2009 water year due to effective soil cover significantly increasing as a result of vegetative re-growth.

The erosion and sedimentation process are expected to return to normal within 3-5 years. In Concow Creek and the unnamed tributary to Concow creek, there is a large quantity of fine sediment due to erosion of bare soil post fire during the 2009 water year. The in-channel fine sediment is expected to flush out within a couple of water years and return to normal levels.

Alternative A – No Action

Cumulative Effects to Water Resources

Beneficial Uses. Under the No-action Alternative, fuel reduction treatments Danger Tree, temporary road construction, road reconstruction and maintenance, and oak management would not occur, and there would be no project-related increase in ERA values or in the risk of CWEs to beneficial uses. There is a slight increase in percent TOC in Subwatershed 1 and 2 due to future foreseeable projects on private timber land. CWEs to beneficial uses as a result of the Butte Lighting Complex Fire are expected to end within the next 3-5 years.

Increased sediment from bare soil will be reduced during the 2010 water year compared to the 2009 water year due to rapid vegetative re-growth. Concow Reservoir could turn brown again during winter 2010 due to high quantities of in-stream fine sediment within the tributaries to Concow Reservoir.

Table 4-56 Percent of TOC by Subwatershed for Alternative A

Subwatershed Number	Existing Condition: Percent of TOC		Alternative A, No Action: Percent of TOC	
	Near-Stream	Total	Near-Stream	Total
1	118%	76%	160%	103%
2	91%	82%	93%	83%
3	21%	24%	21%	24%
4	55%	54%	55%	54%
5	200%	87%	200%	87%
6	358%	167%	358%	167%
7	292%	143%	292%	143%
8	234%	169%	234%	169%
9	310%	144%	310%	144%
10	181%	78%	181%	78%
11	295%	112%	295%	112%
12	378%	164%	378%	164%
13	332%	162%	332%	162%
14	240%	97%	240%	97%
15	172%	80%	172%	80%

Alternative B

Direct and Indirect Effects to Water Resources

Beneficial Uses. Under the Proposed Action, there is potential for direct and indirect effects on beneficial uses from prescribed vegetation management activities. Skid trail construction, temporary road constructing, and mechanical ground-based equipment would remove new vegetation growth and reduce the effective soil cover. However, correct implementation of RHCA and SMZ protection of headwaters and tributaries to larger watersheds, along with implementation of effective non-point source conservation measures (BMPs), would provide protection from these direct and indirect effects (See Appendix A). Protection measures included: waterbar skid trails and temporary roads, mastication and chipping to meet effective soil cover standards and guides, and equipment restricted to slopes less than 35%.. In RHCAs and SMZs, vegetation management activities could occur. 75 foot equipment exclusion zones would be marked on the ground, based upon field surveys and aquatic habitat research. See Concow Biological Assessment and Biological Evaluation for Fish and Wildlife in the project record for more information. If sedimentation is controlled through implementation of BMPs and project design mitigation measures, potential of sedimentation to the immediate channel and channels downstream should be small.

Maintenance treatments of mastication and prescribed burn treatments could occur twice between 5-10 years post project. These treatments are expected to have little to no effect on the landscape. Mastication increases effective soil cover and prescribed burning cannot occur unless effective soil cover exceeds Forest Plan Standards and Guides.

Alternative B

Cumulative Effects to Water Resources

Beneficial Uses. The results of the CWE analysis for the proposed action includes the sum of ERA values for the existing condition, reasonable foreseeable future activities, and for the proposed action. The ERA for each project related disturbance, a total ERA summation and comparison of the ERA to the TOC is included and information pertaining to the effect of each disturbance compared to the total ERA by subwatershed is included in appendix B of this FEIS. Table 4-57 includes the final results of each subwatershed, represented as a percent of TOC for both near-stream sensitive areas (all RHCAs and SMZs within the analysis area) and the subwatershed as a whole, cause of the subwatershed disturbances, and if the subwatershed is approaching or over the threshold of concern.

The total ERA score had a minor increase as a result of the proposed action. The largest increase occurred in Subwatershed 2 with 11% of the total ERA. The overall increase is minor compared to other disturbances in the subwatershed. The main reasons are: private land timber harvesting activities, roads, and the Butte Lighting Complex. The subwatersheds over the threshold of concern due to the Butte Lighting Complex are expected to be below TOC with 5 years. Typically in this landscape full vegetation recovery (i.e. soil cover) returns within 5 years post fire.

Table 4-57 Alternative B percent of TOC by subwatershed and reason for subwatershed percent of TOC close to the Threshold of Concern.

Subwatershed Number	Percent of TOC		Under, Over, or Approaching TOC	Percent of the Land base Managed by the US Forest Service	Cause of Watershed Disturbance
	Near-Stream	Total			
1	166%	107%	Over	3	Powerlines (>1%), Quarries (>1%), Roads and Landings (32%), Private Land Timber Harvesting (53%), Urban Development (12%), Forest Service Timber Harvesting (3%)
2	98%	98%	Approaching	12	Roads and Landings (28%), Forest Service Timber Harvesting (11%), Private Land Timber Harvesting (32%), Urban Development (29%)
3	20%	26%	Under	16	Roads and Landings (35%), Butte Lighting Complex (7%), Forest Service Timber Harvesting (4%), Private Land Timber Harvesting (9%), Urban Development (46%)
4	55%	60%	Under	34	Roads and Landings (15%), Butte Lighting Complex (1%), Forest Service Timber Harvesting (7%), Private Land Timber Harvesting (53%)
5	140%	94%	Approaching	40	Roads and Landings (10%), Butte Lighting Complex (34%), Forest Service Timber Harvesting (8%), Private Land Timber Harvesting (48%)
6	269%	167%	Over	7	Roads and Landings (11%), Butte Lighting Complex (29%), BLM Timber Harvesting (11%), Private Land Timber Harvesting (48%), Urban Development (1%), Forest Service Timber Harvesting (>1%)
7	237%	147%	Over	28	Roads and Landings (15%), Butte Lighting Complex (25%), BLM Timber Harvesting (>1%), Private Land Timber Harvesting (56%), Urban Development (2%), Forest Service Timber Harvesting (2%)
8	228%	169%	Over	0	Roads and Landings (14%), Butte Lighting Complex (9%), Private Land Timber Harvesting (74%), Urban Development (3%)
9	259%	151%	Over	14	Powerlines (>1%), Roads and Landings (21%), Butte Lighting Complex (27%), Private Land Timber Harvesting (47%), Urban Development (1%), Forest Service Timber Harvesting Activities (11%)

Subwatershed Number	Percent of TOC		Under, Over, or Approaching TOC	Percent of the Land base Managed by the US Forest Service	Cause of Watershed Disturbance
	Near-Stream	Total			
10	148%	78%	Under	14	Powerlines (3%), Roads and Landings (24%), Butte Lighting Complex (26%), Private Land Timber Harvesting (16%), Urban Development (29%), Forest Service Timber Harvesting (>1%)
11	233%	122%	Over	28	Roads and Landings (16%), Butte Lighting Complex (52%), Private Land Timber Harvesting (22%), Urban Development (2%), Forest Service Timber Harvesting (8%)
12	322%	173%	Over	21	Powerlines (1%), Quarries (>1%), Roads and Landings (14%), Butte Lighting Complex (24%), Private Land Timber Harvesting (54%), Urban Development (1%), Forest Service Timber Harvesting Activities (6%)
13	308%	180%	Over	28	Powerlines (2%), Roads and Landings (18%), Butte Lighting Complex (13%), Private Land Timber Harvesting (56%), Urban Development (2%), Forest Service Timber Harvesting (8%)
14	167%	101%	Over	68	Powerlines (9%), Quarries (>1%), Railroad (3%), Roads and Landings (11%), Butte Lighting Complex (62%), Private Land Timber Harvesting (12%), Forest Service Timber Harvesting (2%)
15	149%	80%	Approaching	59	Powerlines (27), Railroad (2%), Roads and Landings (17%), Butte Lighting Complex (27%), Private Land Timber Harvesting (27%), Forest Service Timber Harvesting (>1%)

The application of BMPs and project design mitigation measures, including riparian buffers, would reduce the risks of CWEs to beneficial uses from project activities. 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 resulted from removal of the recovering effective soil cover.

Peak flow changes, in particular, may cause increased sedimentation, changes in bedload transport, altered flow regimes, channel incision, undercuts and unstable banks, and channel width increases (Reid 1993). If a CWE were to occur, it would most likely occur within low-gradient, third-order or greater reaches of the channel network and/or at major confluences. The third order channels act as sediment catches in areas composed of DG.

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 as a result of Forest Service activities. If sedimentation is controlled through implementation of BMPs, the potential for project related sediment delivery to the immediate channel and channels downstream would be small.

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

1. Failure to implement Best Management Practices, Forest Plan Standards and Guidelines, and other required mitigations.
2. Extreme water yields resulting from abnormally high intensity, magnitude, and duration storm events.

Monitoring of BMPs and project design mitigations will be monitored through the Region 5 BMP Evaluation Program (EP). Typically forensic and effectiveness monitoring are required by the Central Valley Water Board for Federal projects only if "the discharger's cumulative off-site watershed effects analysis indicates that the project, combined with other Forest Service projects conducted in the watershed over the past 10 years, may cause any watershed or subwatershed to exceed a threshold of concern" (CRWQCB, 2005).

The Forest Service projects conducted over the last 10 years have not caused the subwatersheds within the analysis area to Exceed Threshold Of Concern. However, units within T23N, R4E, Section 34 are a concern due to cumulative effects from the fire and additional proposed treatments have the potential to increase CWEs. Therefore, the Forest Service is going to conduct forensic and effectiveness monitoring in Section 34 in addition to BMP EPs.

The 2008 Plumas National Forest BMP EP annual report conducted 101 BMP EP throughout the forest. The following is a table of BMP EP onsite evaluation protocols and associated BMPs that are relevant to the Concow Hazardous Fuels Reduction Project:

Table 4-58 BMPEP Onsite Evaluation Protocols and associated BMP's

BMPEP Onsite Evaluation Protocols	BMPs Evaluated
T01: Streamside Management Zones (SMZs)	SMZ Designation (1-8)
	Streamcourse and Aquatic Protection (1-19)
	Slash Treatment in Sensitive Areas (1-22)
T02: Skid Trails	Tractor Skidding Design (1-10)
	Erosion Control on Skid Trails (1-17)
T03: Suspended Yarding	Suspended Log Yarding in Timber Harvesting (1-11)
BMPEP Onsite Evaluation Protocols	**BMPs Evaluated**
T04: Landings	Log Landing Location (1-12)
	Log Landing Erosion Control (1-16)
E08: Road Surface, Drainage & Slope Protection	Erosion Control Plan (2-2)
	Stabilization of Road Slope Surfaces and Spoil
	Disposal Areas (2-4)
	Road Slope Stabilization Construction Practices (2-5)
	Control of Drainage (2-7)
	Construction of Stable Embankments (2-10)
	Maintenance of Roads (2-22)
	Road Surface Treatments to Prevent Loss of Materials (2-23)
E09: Stream Crossings	General Guidelines for Location and Design of Roads (2-1)
	Stabilization of Road Slope Surfaces and Spoil Disposal Areas (2-4)
	Road Slope Stabilization Construction Practices (2-5)
	Control of Road Drainage (2-7)
	Construction of Stable Embankments (fills) (2-10)
	Stabilization of Road Slope Surfaces and Spoil Disposal Areas (2-4)
F25: Prescribed Fire	Control of Sanitation Facilities (4-4)
	Control of Solid Waste Disposal (4-5)
	Assuring that Organizational Camps Have Proper Sanitation and Water Supply Facilities (4-6)
	Protection of Water Quality Within Developed and Dispersed Recreation Areas (4-9)
	Location of Pack and Riding Stock Facilities and Use in Wilderness, Primitive, and Wilderness Study Areas (4-10)

In 2008 annual report for BMP EP changed its scoring system (rating system) to “pass”, “at risk”, and “fail” to rate BMP implementation and effectiveness. In 2008 there were 12 evaluations completed for T01-Streamside Management Zones, 10 got a “pass” for implementation and effectiveness while 1 “at risk” and “fail” for effectiveness. 15 evaluations completed for T02-Skid Trails, 0 “fail” implementation, 1 “fail” effectiveness, and 13 “pass” effectiveness. 16 evaluations completed for T04-Landings, all “pass” for implementation and effectiveness. 13 evaluations completed for E08-Road Surface, Drainage, and Slope Protection, 0 “fail” implementation. 7 of the 13 were rated as “pass” for effectiveness the other 4 were rated as “fail”. The ones that were rated as “fail” for effectiveness was because sediment from the fill slopes entered a stream channel. Due to the high percentage of “fail” BMP effectiveness for E08, forest and district employees have visited the sites to discuss corrective treatments and ways to improve upon this issue for future projects. 10 evaluations were completed for E09-Stream Crossings, all evaluations “pass” implementation but 3 “fail” for effectiveness and the other 7 “pass”.

The 3 that “failed” all had the same issue of a long ditch meaning there weren’t sufficient cross drains resulting in scour at either the inlet or outlet of the culvert. The erosion and sediment to the stream crossing was observed to be more likely caused by legacy factors associated with the road design and location not by current management activities (USDA Forest Service 2008). Overall the 2008 annual report for BMP EP indicates that the Plumas National Forest implements have done well when implementing their BMPs. The effectiveness of the BMPs is very good but there are a few areas for improvement which were identified and solutions were developed to improve upon those areas.

Under Alternative B, maintenance is expected around year 5 and year 10. Table 18 includes the final results of each subwatershed, represented as percent of TOC for both near-stream sensitive areas (all RHCAs and SMZs within the analysis area) and the subwatershed as a whole, cause of the subwatershed disturbances, and if the subwatershed is approaching or over the threshold of concern for proposed maintenance.

The ERA for each project related disturbance, a total ERA summation and comparison of the ERA to the TOC is included and information pertaining to the effect of each disturbance compared to the total ERA by subwatershed is included in Appendix G. The majority of the subwatersheds have a decrease in percent of TOC, mostly due to CWE from fire effects which are expected to return to normal within 5 years. Timber harvesting effects are expected to recover within 25 years, therefore there is a small recovery at the 5 year mark and almost a 50% recovery at the 10 year mark. Roads, powerlines, and urban development have no recovery rate, and will probably increase within the next 5-10 years. No assumptions were made to increase these effects due to the difficulty of predicting population growth.

Table 4-59 Alternative B - 5 Year and 10 Year Percent of TOC by Subwatershed.

Subwatershed Number	Proposed Action: Percent of TOC		Year 5 Maintenance: Percent of TOC		Year 10 Maintenance: Percent of TOC	
	Near-Stream	Total	Near-Stream	Total	Near-Stream	Total
1	166%	107%	158%	97%	141%	80%
2	98%	98%	101%	97%	93%	87%
3	20%	26%	17%	24%	17%	23%
4	55%	60%	54%	58%	45%	50%
5	140%	94%	63%	53%	48%	43%
6	269%	167%	131%	99%	103%	78%
7	237%	147%	133%	96%	107%	77%
8	228%	169%	187%	132%	144%	104%
9	259%	151%	146%	97%	122%	81%
10	148%	78%	94%	57%	89%	54%
11	233%	122%	110%	64%	93%	54%
12	322%	173%	196%	114%	155%	91%
13	308%	180%	229%	139%	180%	114%
14	167%	101%	68%	47%	61%	41%
15	149%	80%	104%	55%	95%	50%

Alternative C

Direct, Indirect and Cumulative Effects to Water Resources

Proposed activities in Alternative C compared to Alternative B have a decrease in percent TOC. Mastication treatments have little to no effect on the ground and increases effective soil cover. Table 4-60 includes the final results of each subwatershed, represented as percent of TOC for both near-stream sensitive areas (all RHCAs and SMZs within the analysis area) and the subwatershed as a whole).

Table 4-60 Alternative C Percent of TOC by Subwatershed

Subwatershed Number	Percent of TOC Alternative B		Under, Over, or Approaching TOC	Percent of TOC Alternative C		Under, Over, or Approaching TOC
	Near-Stream	Total		Near-Stream	Total	
1	166%	107%	Over	164%	105%	Over
2	98%	98%	Approaching	97%	92%	Approaching
3	20%	26%	Under	20%	25%	Under
4	55%	60%	Under	55%	60%	Under
5	140%	94%	Approaching	140%	94%	Approaching
6	269%	167%	Over	269%	167%	Over
7	237%	147%	Over	233%	145%	Over
8	228%	169%	Over	228%	169%	Over
9	259%	151%	Over	257%	149%	Over
10	148%	78%	Under	148%	78%	Under
11	233%	122%	Over	226%	117%	Over
12	322%	173%	Over	320%	167%	Over
13	308%	180%	Over	308%	172%	Over
14	167%	101%	Over	167%	100%	Over
15	149%	80%	Approaching	149%	80%	Approaching

4.12.5 Summary of Effects Analysis Across All Alternatives

Table 4-57 includes the summary of percent TOC by alternative and proposed maintenance. Increase in percent TOC from existing condition to Alterative A in Subwatersheds 1 and 2 are a result of reasonable foreseeable future actions on private timber land. An increase from Alternative A to Alternative B is mostly due to private land timber harvesting activities, with a slight increase from Forest Service proposed activities (max 11% of the total ERA score in Subwatershed 2). Decreases from Alterative B to C are due a reduction in Forest Service timber harvesting activities.

Table 4-61 Summary of Cumulative Effects to Water Resources Across all Alternatives

Subwatershed Number	Existing Condition: Percent of TOC		Alternative A, No Action: Percent of TOC		Alternative B, Proposed Action: Percent of TOC		Alternative C: Percent of TOC	
	Near-Stream	Total	Near-Stream	Total	Near-Stream	Total	Near-Stream	Total
1	118%	76%	160%	103%	166%	107%	164%	105%
2	91%	82%	93%	83%	98%	98%	97%	92%
3	21%	24%	21%	24%	20%	26%	20%	25%
4	55%	54%	55%	54%	55%	60%	55%	60%
5	200%	87%	200%	87%	140%	94%	140%	94%
6	358%	167%	358%	167%	269%	167%	269%	167%
7	292%	143%	292%	143%	237%	147%	233%	145%
8	234%	169%	234%	169%	228%	169%	228%	169%
9	310%	144%	310%	144%	259%	151%	257%	149%
10	181%	78%	181%	78%	148%	78%	148%	78%
11	295%	112%	295%	112%	233%	122%	226%	117%
12	378%	164%	378%	164%	322%	173%	320%	167%
13	332%	162%	332%	162%	308%	180%	308%	172%
14	240%	97%	240%	97%	167%	101%	167%	100%
15	172%	80%	172%	80%	149%	80%	149%	80%

4.13 Air Quality

4.13.1 Introduction

The analysis for the Concow Project uses one indicator for air quality: criteria pollutant totals required for compliance with federal, state, and local laws and regulations. Prescribed fire is one of the primary activities proposed for the Concow Project that would have a direct impact on air quality. Underburning and pile burning would be conducted during fall, spring, or winter—the most favorable times in terms of smoke dispersion. A secondary source of impacts on air quality would be from dust and internal combustion engine emissions during project harvest, and mastication. The air quality analysis for activities associated with each alternative includes identification of adjacent and downwind air basins of concern (class one and nonattainment areas), comparison of the amount of smoke and particulate matter to be produced as a result of fuels treatment and other project activities in DFPZs, and a discussion of the consequences of wildfire produced emissions compared to prescriptive fire.

4.13.2 Analysis Framework: Statute, Regulation, Forest Plan, and other Direction

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

The original *Air Quality Act* was passed in 1963. This act was followed by the *Clean Air Act* and its amendments of 1970, 1977, and 1990. The *Clean Air Act* is the primary legal instrument for air resource management. It requires the EPA to identify pollutants that have adverse effects on public health and welfare and to establish air quality standards for each pollutant. The EPA has issued National Ambient Air Quality Standards for sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, lead, and particulate matter (PM) that is 10 microns (PM_{10}) in diameter or smaller. If the National Ambient Air Quality Standards are violated in an area, that area is designated as "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 sets similar standards for these pollutants.

The 1977 *Clean Air Act* amendments 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 Methods. Class I areas include international parks, national parks larger than 6,000 acres, and national wilderness areas larger than 5,000 acres.

The 1990 amendment of the *Clean Air Act* published the General Conformity Determination. It states that in federal nonattainment areas, before actions can be taken on federal lands that have the potential to emit pollutants to the atmosphere, a determination must be made that the emissions will not exceed a *de minimis* (threshold) level measured in tons per year.

If the action exceeds the *de minimis* level, then a conformity determination is required to document how the federal action will not (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area. If the project emissions are below *de minimis* levels, the project would be considered exempt from conformity determination with the State Implementation Plan.

Activities that affect air quality in the project area are (1) prescribed burning on National Forest lands for reforestation, hazard reduction, and wildlife habitat improvement; (2) dust from construction and use of unpaved roads and harvest activities; and (3) wildfire occurrence. On the Plumas National Forest, the 1988 *Plumas National Forest Land and Resource Management Plan*, the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS, and the 1999 HFQLG Act final EIS provide direction for coordination and cooperation with local Air Quality Management Districts.

The following operating procedures are from the HFQLG Act final EIS (1999) and the SNFPA final EIS (2004):

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

4.13.3 Effects Analysis Methodology

Geographic Scope of the Analysis

The analysis area for air quality is the area potentially affected by smoke emissions, fugitive dust, and emissions from proposed treatments, relevant to Project Area and the air basin in which the project area is located. The project area lies entirely within the Sacramento Valley air basin (see figure 4-19). This air basin is administered by the local Air Quality Management District with oversight regulation by the California Air Resources Board (CARB) (see figure 4-20). The Concow Project is located in Butte County.

Figure 4-11 California Air Basins and Counties.

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

Figure 4-12 California Air Quality Management Districts and Counties.

Assumptions used for determining emissions from timber operations and prescribed burns specific to air resources analysis:

- Underburning would be done over a period of five years; the amount of particulates is based on approximately 100 acres burned annually
- The prescribed fire would be done in the spring, fall, or winter months because these are the best times of year for dispersion.
- Each year the burning would take place over a period of months, with treated areas spread throughout the project area.
- All harvest thinning equipment will be diesel powered, and thinning treatments will occur over a three-year period. Harvest operations include harvesting, processing, skidding, loading, hauling, and road watering.
- Slash piles are constructed free of dirt, with 90 percent consumption.
- The emissions from burning will result from a combination of pile burning and under burning of approximately 200 acres annually on a five-year plan and would not be continuous (that is, separated by space and time).

Data Sources and Predictive Models

- The predicted emissions from wildfire, prescribe fire and harvest activities in the proposed project area have been estimated using emission factors from EPA Document 42.
- The emission factors used to determine effects from the project were taken from EPA Document 42 (EPA 1995) for prescribed burning, and from the *National Environmental Policy Act Air Quality Desk Reference Guide* (CH2M Hill 1995; table 3.3.2-1 for timber harvest operations).

Basis for Analysis/Air Quality Indicators:

The Concow Project area is located in Butte County, California and the units are scattered north and east of Paradise California Butte County falls within the Sacramento Air Basin and has it own Air Quality Management District (AQMD). Butte County is currently in federal nonattainment status for ozone, a product of volatile organic compounds or nitrogen oxides. There are no published emission factors that isolate ozone. Standards have been set, however, for the ozone precursors such as the volatile organic compounds and nitrogen oxides.

Climatic conditions in the project area are governed by a combination of large- and small- scale factors. Among the large-scale factors are the latitude, prevailing hemispheric wind patterns, and extensive mountain barriers to the east. Large-scale airflow is generally westerly throughout much of the year. Small-scale or local factors include drainages as well as vegetation cover (Schroder and Buck, 1970). During the summer, winds over the proposed project area are typically southwest from the Sacramento River Delta.

Temperature inversions are rare. When they do occur, they are usually in the early morning, breaking up by mid-morning. Local upcanyon, up valley winds are prevalent during the remaining months with occasional northerly and easterly winds. These surface air flow patterns account for pollution transport between the Sacramento Valley and Sierra foothills and mountains.

The communities of Paradise, Magalia, and Concow are within the project area vicinity. There are numerous smoke sensitive areas in the project vicinity including, schools, hospitals, day care and elderly care facilities. The nearest air quality monitoring stations are in Paradise and Chico, California.

Air quality can be severely impacted by particulate matter and other pollutants during large wildfire events. Impacts from the 2007 Moonlight fire on the Plumas National Forest affected air quality 200 miles away in San Francisco, California. Fugitive dust caused by construction and use of unpaved roads can produce PM_{10} in quantities great enough to impair the visual quality of the air. These effects are localized and can be mitigated by effective dust abatement methods. Dust generated by skidding, loading, and site preparation activities also contributes to fugitive dust; however, the level contributed by these activities is unknown.

Air Quality Resources Methodology by Action:

1. **Direct and indirect effects of prescribed burning and equipment emissions to air quality.**

Considerations: The establishment and maintenance of proposed Defensible Fuel Profile Zones (DFPZ) in the project area has the potential for adverse affects to air quality in the short term.

Short-term timeframe: 5 years.

Spatial boundary: The Sacramento Valley air basin HFQLG Pilot region and the Concow Project Area.

Indicators: PM10 and PM2.5 atmospheric concentrations.

Long-term timeframe: Not applicable.

Spatial boundary: The Sacramento Valley air basin HFQLG Pilot region and the Concow Project Area.

Indicators: PM10 and PM2.5 atmospheric concentrations

Methodology: Conformity Determination. As stated above, and Butte County is currently in federal nonattainment status for ozone (a product of volatile organic compounds or nitrogen oxides). The current allocation for volatile organic compounds or nitrogen oxides is 50 tons per year.

PM_{10} has been established as one of the six criteria pollutants because of adverse human health effects. The emission levels for PM_{10} are not mandated in the project area. Butte County is currently in attainment for PM_{10}, and efforts to reduce PM_{10} would be implemented to prevent future health threats.

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

Prescribed burning affects air quality in ways similar to wildfires, but prescribed burning offers many advantages over wildfire. This is because the effects of prescribed fire on air quality can be manipulated to reduce adverse effects. The Best Available Control Measures (BACM) are guidelines that have been developed to reduce the adverse effects of prescribed burns. The BACM are based on the "Prescribed Burning Background Document" and "Technical Information Document for Prescribed Burning Best Available Control Measures" (EPA 1992a, 1992b). The BACM are based on avoidance, dilution, and emission reduction strategies. Smoke mitigation techniques include consideration of atmospheric conditions, season of burn, fuel and duff moisture, daily wind shifts, appropriate ignition techniques, and rapid mop-up. Following these BACM, and identifying them in burn plans, is critical in preventing adverse air quality effects.

2. Cumulative effects of prescribed burning and equipment emissions to air quality.

Considerations: The establishment and maintenance of proposed Defensible Fuel Profile Zones (DFPZ) in the project area has the potential for adverse affects to air quality in the short term.

Short-term timeframe: 5 years.

Spatial boundary: The Sacramento Valley air basin HFQLG Pilot region and the Concow Project Area.

Indicators: PM10 and PM2.5 atmospheric concentrations.

Long-term timeframe: Not applicable.

Spatial boundary: The Sacramento Valley air basin HFQLG Pilot region and the Concow Project Area.

Indicators: PM10 and PM2.5 atmospheric concentrations

Methodology: Conformity Determination. Refer to the discussion above under direct and indirect effects methodology.

4.13.4 Environmental Consequences

Alternative A – No-action

Direct and Indirect Effects to Air Quality

Under this alternative, no increase in ozone precursors or PM10 emission levels would be produced from prescribed burning of activity-generated fuels, harvest operations, or understory burning. Alternative A would not result in a reduction of surface fuels, so the potential for substantial degradation of air quality from future wildfire would not be reduced. The no-action alternative would not provide any opportunities for reducing existing forest fuels and the hazard they pose in wildland fires. During the flaming phase of a catastrophic wildfire, air quality degradation can exceed federal and state standards as far as 200 miles downwind. Wildfire usually occurs under very stable atmospheric conditions, which tend not disperse smoke; consequently, this can not be regulated by local Air Quality Management Districts. The potential ozone precursors from a wildfire are shown in table 4-62 below.

Table 4-62 Potential Ozone Precursors and PM10 from Wildfire Emissions for a 500 Acre Wildfire.

Nitrogen Oxides	Volatile Organic Compounds	Particulate Matter (PM_{10})
74.80 tons	212.11 tons	483.77 tons

Alternative A – No-action

Cumulative Effects to Air Quality

Under alternative A, the Project Area would be subjected to long-term deposition of surface fuels. Forest fuels would continue to increase with biomass production and would out-produce the decomposition rates in this climate. The long-term chronic effects of wildfires would be higher PM_{10} emissions, mostly due to large areas of exposed soil and ash in the aftermath of a high-intensity wildfire.

Alternatives B and C

Direct Effects to Air Quality

Two methods of prescribed burning would be used to accomplish fuel load reduction: underburning and pile burning (piles created by machine and by hand). Underburning would be used to reduce both natural and activity-generated fuels where it is not cost effective or physically practical to pile and burn. The objective of underburning would be to reduce fuel loading while protecting the residual overstory trees from damage caused by heat and flames or damage from equipment. Pile burning would produce less particulate matter per acre than underburning because piled material can be ignited with lower fuel moistures, which ensures complete and efficient consumption.

Table 4-63 Difference between Alternatives B and C

Alternative B and C difference					
	Pile Burning	Prescribed Under burning	Mastication	Timber Harvest Removal Volume*	
Alternative B	664 Acres	476 Acres	671	Option 1	3750 tons (Biomass) 2 MMBF(sawlog)
				Option 2	3750 tons (Biomass) 2.1 MMBF(sawlog)
Alternative C	586 Acres	476 Acres	626	0 MBF	

*This volume includes both biomass and sawlog removal.

The release of particulate matter into the air during prescribed burning can have adverse effects on visibility and public health. As described above, the volume of particulate matter is related to which burning method is used and the extent of the burning. Particulate concentrations in the Sacramento Valley air basin (see figure 4-19 and 4-20 above) are influenced by climatic conditions and other emission-generating activities carried out in the air basin. Particulate concentrations are regulated through compliance with the California Air Resources Board and local Air Quality Management Districts.

The prescribed burning proposed in the action alternatives would be used to reduce fuel loadings to an acceptable level. Under favorable smoke-dispersal conditions, the smoke would likely affect air quality during ignition and for approximately three days following ignition. Another impact of all action alternatives would be the emissions and dust caused by project activities. Emissions from burning and equipment used for other project activities (such as thinning and mastication) may be occurring at the same time, which would elevate particulate matter.

By following the burn plan and Air Quality Management District requirements for burning and managing other project activities, it is unlikely that emissions caused by the project would exceed California Air Quality Standards for the Air Quality Management District. By implementing prescribed burning for the Concow Project at 100 acres or less annually, the particulates from prescribed burning would not exceed the *de minimis* threshold values, thus the project would meet conformity.

The prescribed fire proposed for the Concow Project would produce a total of 36.51 tons of volatile organic compounds (VOC), 20.69 tons of nitrogen oxides (NO_x), and 88.36 tons of PM_{10} annually (see table 4-60 and 4-61). The annual criteria pollutant totals for timber operations (emissions from trucks and other equipment) would vary according to the acres of treatments performed each year (table 4-62 and 4-63). Tables 4-64 and 4-65 present the total criteria pollutants for prescribed burning and timber operations. *De minimis* levels for VOC and NO_x are 50 tons per year. As shown, the emission levels for VOC and NO_x are below the *de minimis* levels. Therefore, the Concow Project is exempt from conformity determination. Emission levels are not mandated in the project area because Butte County is in attainment for PM_{10}.

Table 4-64 Alternatives B and C Annual Criteria Pollutant Totals

Year	Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
	Tons		
1	9.27	26.29	59.96
2	9.27	26.29	59.96
3	9.27	26.29	59.96
4	9.27	26.29	59.96
5	9.27	26.29	59.96

(understory burning [approximately 100 acres annually]).

Table 4-65 Alternatives B and C Annual Criteria Pollutant Totals

Year	Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
	Tons		
1	11.42	10.22	28.4
2	11.42	10.22	28.4
3	11.42	10.22	28.4
4	11.42	10.22	28.4
5	11.42	10.22	28.4

(pile burning [approximately 135 acres annually]).

Table 4-66 Alternative B option 1Criteria pollutant totals, timber operations, Helicopter and ground logging system.

Year	Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
	Tons		
1	3.6	.21	.23
2	3.6	.21	.23
3	3.6	.21	.23

Table 4-67 Alternative B option 2 Criteria pollutant totals, timber operations, Ground-based logging system

Year	Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
	Tons		
1	4.36	.24	.28
2	4.36	.24	.28
3	4.36	.24	.28

Table 4-68 Alternative B option 1 Annual Criteria Pollutant Totals for Timber Operations and Prescribed Burning Combined

Year	Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
	Tons		
1	24.29	36.72	88.59
2	24.29	36.72	88.59
3	24.29	36.72	88.59
4	20.69	36.51	88.36
5	20.69	36.51	88.36

Table 4-69 Alternative B option 2 Annual Criteria Pollutant Totals for Timber Operations and Prescribed Burning Combined

Year	Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
	Tons		
1	25.05	36.75	88.64
2	25.05	36.75	88.64
3	25.05	36.75	88.64
4	20.69	36.51	88.36
5	20.69	36.51	88.36

Table 4-70 Alternative C Total Pollutant for Mastication

Year	Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
	Tons		
1	1.08	0.08	0.06

Table 4-71 Alternative C Overall Pollutant Totals for Mastication

Year	Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
	Tons		
1	21.13	36.59	88.42
2	20.69	36.51	88.36
3	20.69	36.51	88.36
4	20.69	36.51	88.36
5	20.69	36.51	88.36

Table 4-72 Daily Criteria Pollutant Total

Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
Tons		
4.6	13.1	29.9

(understory burning [approximately 50 acres daily]).

Alternatives B and C

Indirect Effects to Air Quality

In the event of a wildfire, the stands in the Concow Project area that are treated by mastication, pile burning, or underburning would produce less particulate matter emissions than untreated areas outside the project area.

Alternatives B and C

Cumulative Effects to Air Quality

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

4.13.5 Summary of Cumulative Effects Across All Alternatives

Without considering the possibility of future wildfires, the No-action alternative would have no cumulative effects on particulate matter and visibility. The action alternatives would have cumulative effects on air quality in the project area and local air basin (Sacramento Valley), but the effects would be managed to be within the regulatory standards of the California Air Resources Board. The dust and emissions from project activities would be mitigated by requiring that standard operating procedures be included with timber sale or service contract packages. The cumulative effect of all action Alternatives is that PM10 would contribute to particulate matter loading locally, regionally, as well as up to 50 mile around the project area itself.

Emissions could possibly reach communities of Concow, Paradise, Chico, Oroville and other smoke sensitive areas. These effects would be reduced by using the nine operating procedures mentioned in the regulatory framework and working with the local air quality management district. Local effects include cumulative emissions from prescribed burning conducted on Federal, State, and private lands near the Concow project area. PM10 and PM2.5 atmospheric concentrations currently do not exceed national standards.

However, emissions could exceed California Air Resource Board (CARB) standards if: 1) weather conditions predicted by CARB meteorologists do not prevail, 2) emissions are not dispersed as predicted, and/or 3) emissions from other AQMDs adversely impact air quality in local districts. Forest Service and CARB smoke dispersal forecasting would be used as part of the burn plan to mitigate effects within the regulatory framework. Without considering the possibility of future wildfires, the no action alternative would have no cumulative effects to particulate matter and visibility. The action alternatives could have cumulative effects to air quality in the project area and local air basins (Sacramento Valley and possibly Mountain Counties air basin), but these impacts would be managed within California Air Resources Board regulatory standards. Dust from the project activities would be mitigated by standard operating procedures through sale and other project contracts.

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

4.13.6 Other Required Disclosures

The following is a summary of effects that were considered during the analysis process, not necessarily as issues, and not always totally quantifiable. All effects analyzed for all Action Alternatives were determined to be consistent with goals, objectives and Standards and Guidelines identified in the Forest Plan, as amended.

Public and Worker Safety

There may be a concern for increased risk of accidental injury to members of the public who recreate in the Project Areas during implementation activities. The application of mitigation measures designed for the protection of forest visitors would minimize this risk. Mitigation measures would include: restricted operations during specific implementation actions; informing forest visitors of operations through signing of the Project Areas; and partial or complete closure of some areas during implementation activities.

All project activities (Forest Service actions and actions under Forest Service contract authorities) would comply with State and Federal Occupational Safety and Health (OSHA) codes. All Forest Service project operations would be guided by FS Handbook 6709.11 (Health and Safety Code Handbook).

Environmental Justice

Environmental Justice means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on, are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner, by government programs and activities affecting human health or the environment.

One goal of Executive Order 12898 is to provide, to the greatest extent practicable, the opportunity for minority and low-income populations to participate in planning, analysis, and decision-making that affect their health or environment, including identification of program needs and designs.

This public involvement process for the Proposed Action has been conducted under Departmental regulation 5600-2, December 15, 1997, including the Environmental Justice Flowchart (Appendix E). The Proposed Action, its Purpose and Need, and area of potential effect have been clearly defined. Scoping under the National Environmental Policy Act has utilized extensive and creative ways to communicate.

This Proposed Action does not appear to have a disproportionately high or adverse effect on minority or low-income populations. Extensive scoping did not reveal any issues or concerns associated with the principles of Environmental Justice. No mitigation measures to offset or ameliorate adverse affects to these populations have been identified. All interested and affected parties will continue to be involved with the public involvement and decision process.

Adverse Environmental Effects Which Cannot Be Avoided

The implementation of either Action Alternatives would result in some adverse impacts to the physical, biological, and human environments. Many of these impacts can be mitigated to acceptable levels using the Mitigation Measures specified by resource topic and alternative (see appendix A of this FEIS). The unavoidable adverse impacts summarized below are those that are expected to occur after the application of mitigation measures, or cannot be mitigated to a level approaching existing conditions.

Effects on Wetlands and Floodplains

If any wetlands associated with Executive Order 11990 were to be located during project layout, appropriate buffers would be provided in compliance with the Aquatic Conservation Strategy of the Northwest Forest Plan.

There would be no effects on floodplains associated with Executive Order 11988 as a result of implementing this fire hazard reduction proposal, as none exist or would be affected.

Irreversible and Irretrievable Effects

Irreversible commitment of resources refers to a loss of non-renewable resources, such as mineral extraction, heritage (cultural) resources, or to those factors, which are renewable only over long time spans, such as soil productivity. Under No-Action, there would be no irreversible or irretrievable commitment of resources.

Under the Action Alternatives, additional area would be irreversibly committed from the connected actions associated with landing construction and roads. These impacts are considered necessary to implement and maintain the efficacy of Defensible Fuel Profile Zone (DFPZ) treatments over time.

Irretrievable commitment applies to losses that are temporary, such as use of renewable natural resources. The production lost would be irretrievable, but the action would not be irreversible. Vegetation removed as commodity byproducts under the Action Alternatives, is considered an irretrievable impact. Forest conditions would return, but it would take many decades for them to obtain the current conditions. The vegetation that would be removed under the Action Alternatives would also have value as wildlife habitat, and/or human value for recreation or aesthetics, and would be irretrievably lost. However, this impact is in accordance with the management goals and objectives of Defensible Fuel Profile Zone (DFPZ) treatments.

Effects on Prime Farmland, Rangeland and Forest Land

All alternatives are in keeping with the intent of Secretary of Agriculture Memorandum 1827 for prime farmland. Prime forest land is not applicable to lands within the National Forest System. In both Action Alternatives, Forest system lands would be managed with coordination and sensitivity to the effects on adjacent lands.

Chapter 5. Coordination, Collaboration and Consultation

5.1 List of Preparers

The Concow Hazardous Fuels Reduction Final Environmental Impact Statement (FEIS) was prepared by the USDA, Forest Service as Lead Agency, in collaboration with the USDI, Bureau of Land Management as the Cooperating Agency. This Proposed Action is designed to contribute towards completing the *Herger-Feinstein Quincy Library Group* (HFQLG) Pilot Project's larger Defensible Fuel Profile Zone (DFPZ) network, while complementing local community fuels reduction and shaded fuelbreak defensible space projects, both accomplished and proposed, occurring in the wildland urban-interface (WUI).

The extended HFQLG Forest Recovery Act applies some portions of the *Healthy Forest Restoration Act* (HFRA; Sections 104–106), including establishing special procedures for federal agencies projects aimed at encouraging meaningful public participation during the planning process (Section 104(f)). Since 2004, local community members and interest groups, such as the local Fire Safe Councils in Butte County, have been collaborating with the Forest Service, other federal and state agencies, and private landowners to develop a large scale defensible space network strategy (refer to chapters 1 and 2) around the Towns of Paradise, Magalia, Concow and Yankee Hill, and adopted in the Community Wildfire Protection Plan (CWPP). Local councils, industrial landowners and residents provided substantial coordination time and provided numerous public forum opportunities and outreach support.

5.2 List of Project Coordinators

The following USDA, Forest Service, Plumas National Forest and USDI, Bureau of Land Management, Northern California District personnel provided leadership for this project, or served as project coordinators during different phases of the project. Major responsibilities included coordination of the environmental analysis process, public participation and review, documentation and resource expert review of the EIS under the provision of the National Environmental Policy Act (NEPA).

Table 5-1 Lead and Cooperating Agency Coordinators

Coordinator	Contribution
Karen L. Hayden; District Ranger, Feather River Ranger District, Plumas National Forest (NF)	Deciding Official, Forest Service.
Steve Anderson; District Manager, Redding District, Northern California District	Deciding Official, Bureau of Land Management.
Jane Beaulieu; Plumas NF Forest Environmental Coordinator	Forest Service: Environmental analysis process coordination and review.
Nancy Francine; Plumas NF Forest Ecosystem Management Coordinator	Forest Service: Environmental analysis process coordination and review.
Linnea Hanson; District Ecosystem Management Coordinator, Feather River Ranger District, Plumas NF	Forest Service: Environmental analysis process coordination and review.

Coordinator	Contribution
Carol Spinos; District Senior NEPA Planner, Feather River Ranger District, Plumas NF	Forest Service: Environmental analysis process and review coordination, writer (chapters 1 and 2), and overall document compilation, preparation of the socioeconomic report.
Sharen Parker; District NEPA Planner, Feather River Ranger District, Plumas NF	Forest Service: Coordination of FEIS printing and distribution, and other administrative support.
Donald Chase; District Writer/Editor, Feather River Ranger District, Plumas NF	Forest Service: Lead public outreach coordinator, writer/editor, compilation, coordination of DEIS/FEIS review, printing and distribution.
Julie Woldow; District Writer/Editor, Feather River Ranger District, Plumas NF	Forest Service: Lead writer/editor, FEIS compilation and review, graphic design, production and layout of chapters 1 and 2 introductory materials.
John Rea; Land Surveyor, Lassen NF	Forest Service: Coordination of post-fire land surveys, supplies and information exchange with Butte County.
Timothy Bradley; Fuels Management Officer Redding District, Northern California District	Bureau of Land Management: Environmental analysis process and review coordination.
Jeremy Strait; Fire Mitigation and Educational Specialist, Redding District, Northern California District	Bureau of Land Management: Environmental analysis process and review coordination.

5.3 List of Lead and Cooperating Agency Resource Specialists

The following Forest Service contributors provided resource analysis and documentation to prepare the Concow Hazardous Fuels Reduction FEIS.

Table 5-2 Lead and Cooperating Agency Resource Specialists

Agency Coordinator	Contribution and Qualifications
Dee Dee Cherry; District Fire and Fuels Officer, Feather River Ranger District, Plumas National Forest (NF)	Forest Service: Analysis and documentation of fuels management, treatment design, fire behavior consequences, field surveys and FEIS editor. B.S. Athletic Training.Four years education,twenty one years experience.
Pete Duncan; Plumas NF Fire and Fuels Manager	Forest Service: Analysis and documentation of fuels management review, treatment design and fire behavior consequences consultation, and FEIS editor.
Kathy Murphy; Regional Fuels Manager - Operations	Forest Service: Treatment design consultation.
Peter Stine; Pacific Southwest Research Station	Forest Service: Treatment design consultation.

Agency Coordinator	Contribution and Qualifications
Judith Welles; District Silviculturist, Feather River Ranger District, Plumas National Forest	Forest Service: Silvicultural treatment design, environmental process, analysis and documentation, Forest Plan consistency review, and FEIS editor.
Mary Webb-Marek; Silviculture: District Assistant Silviculturist, Feather River Ranger District, Plumas National Forest	Forest Service: Silvicultural analysis and documentation, including coordination and compilation of field surveys. B.S. forestry, Univeristy of Oklahoma, M.S. forest resources, Clemson University. Six years education, ten years experience, expertise in private landowner assistance.
William Smith; Plumas NF Silviculturist	Forest Service: Silvicultural treatment design, analysis and documentation consultation.
Michael Landram; Regional Silviculturist	Forest Service: Treatment design consultation.
Oswaldo Angulo; District Assistant Hydrologist, Feather River Ranger District, Plumas National Forest	Analysis and documentation of watershed and soil resources, coordination and compilation of field surveys, research and non-federal land uses within the Planning Area, including preparation of the cumulative watershed effects analysis. B.S. geoscience, option in hydrology, 2007 California State University, Chico.GIS certificate 2006. Four years education, three years experience.
Kelly Whitsett; District Hydrologist Feather River Ranger District, Plumas National Forest	Analysis and documentation of watershed and soil resources, coordination and compilation of field surveys. B.S. geology and geophysics, University of Missouri, Rolla, M.S. hydrology, University of Arkansas, Fayetteville. Nine years experience.
David Young; Zone Soil Scientist, Pacific Southwest Region, North Zone	Soil analysis and treatment design consultation.
Brent Roath; Regional Soil Scientist/BAER Coordinator, Pacific Southwest Region	Soil analysis and treatment design consultation.
Joseph A Hoffman; Plumas NF Watershed Program Manager,	Consultation and review of the watershed and soil resources analysis and documentation. M.S. environmental engineering. Ten years experience.
Joanna Arroyo; District Assistant Wildlife Biologist**,** Feather River Ranger District, Plumas National Forest	Forest Service: Wildlife analysis and documentation, including ESA listed, FS Sensitive, MIS and other terrestrial species; compiled in the Biological Assessment and Biological Evaluation for Fish and Wildlife, informal consultation. B.S. and M.S. wildlife management, New Mexico State University, Las Cruses. Six years education, ten years experience.
Cindy Roberts; District Wildlife Biologist**,** Feather River Ranger District, Plumas NF	Forest Service: Wildlife analysis and documentation review, analysis and documentation of MIS and migratory habitat and species, including editor of the Biological Assessment and Biological Evaluation for Fish and Wildlife, consultation. B.S. wildlife biology, M.S. wildlife management. Eight years education, twenty years experience.

Dawn Alvarez; District Fisheries/Aquatics Biologist, Feather River Ranger District, Plumas NF	Forest Service: Fisheries and aquatics analysis and documentation, including ESA listed, FS Sensitive, MIS and other fish/aquatic species; compiled in the Biological Assessment and Biological Evaluation for Fish and Wildlife, informal consultation
George C Garcia; Plumas NF Wildlife Program Manager	Consultation and review of the terrestrial wildlife resource analysis and documentation, including ESA listed, FS Sensitive, MIS, migratory, and other wildlife species; compiled in the Biological Assessment and Biological Evaluation for Fish and Wildlife. B.S. natural resource management, emphasis in fish and wildlife. Twenty one years experience.
Cheyenne Yancey; District Logging Systems, Feather River Ranger District, Plumas NF	Transportation review, access and logging systems analysis, recommendations and documentation; including field reconnaissance.
Elaine Vercruysse; District Logging Systems, Feather River Ranger District, Plumas NF	Transportation review and logging systems analysis.
Roger Powell; District Forest Sale Administer, Contract Officer Representative, Feather River Ranger District, Plumas NF	Transportation review and access analysis.
Pete Hochrein, Plumas NF Transportation Planner, Feather River Ranger District, Plumas NF	Transportation review and logging systems analysis. B.S. forestry resource management, Univeristy of C alifornia, Berkeley, M.S. forestry, Oregon State University. Thirty years experience.
Mark Beaulieu; Plumas NF, Public Service Staff/Forest Engineer	Transportation and permitting consultation. B.S. and M.F. forest engineering. Twenty one years experience.
Jamie Moore: District Archaeologist, Feather River Ranger District, Plumas NF	Forest Service: Analysis and documentation of Heritage Resources. Coordination and compilation of heritage field surveys. M.A. anthropology, 2002 California State University, Sacramento. Eleven years education, seventeen years experience.
Chris Christofferson: District Botanist, Feather River Ranger District, Plumas NF	Botanical analysis and documentation, integrated pest management treatment design, including coordinating, conducting and compiling field surveys. B.S. biology, emphasis in ecology, California State University, Chico, M.S. integrated pest management, University of California, Davis. Eight years education, ten years experience, expertise in rare plant and invasive species management.
Deb Schoenberg: District Recreation/Lands/Visuals, Feather River Ranger District, Plumas NF	Consultation, analysis review and documentation of Recreation, Non-federal land uses, Scenic Quality and Public Health and Safety. B.S. landscape architecture. Twenty five years experience, expertise in recreation scenery management.
Linda Morehouse-Braxton: District Lands/Minerals**,** Feather River Ranger District, Plumas NF	Analysis and documentation of Recreation, Non-federal land uses, and Scenic Quality. Thirteen years experience in recreation, lands and minerals, expertise in specials uses, recreation management and minerals review.

Carvel Bass: District Geographic Information Systems (GIS) Coordinator, Feather River Ranger District, Plumas NF	Analysis and production of GIS generated maps associated with displaying treatment locations and methods, and other natural resource information. B.A. geography.GIS certificate. Four years education, five years experience, expertise in GIS.
Cedra Hill: Cartographic Technician, Enterprise Team	Production of GIS generated maps associated with displaying treatment locations and methods, and other natural resource information.

5.4 List of Community Contributors

In 2004, the Forest Service began collaboration by hosting community meetings and field tours for those concerned about hazardous fuels and interested in establishing defensible space, particularly within the wildland urban-interface near the Towns of Paradise, Magalia, Concow, and Yankee Hill in Butte County, California. The Concow Hazardous Fuels Reduction Project is the culmination of these collaborative efforts.

The following community contributors provided substantial coordination time and provided numerous public forum opportunities, outreach and administrative support during the Scoping process provided analysis and documentation in support of preparing the Concow Hazardous Fuels Reduction FEIS.

Table 5-3 Lead Community Contributors

Community Collaborator	Contribution
Calli-Jane Burch; Executive Director, Butte County Fire Safe Council	Public outreach coordination and distribution of public forum notices, treatment design CWPP consistency review and recommendations, collaborative public education.
Brenda Rightmyer; Chairperson, Yankee Hill Fire Safe Council	Public outreach coordination and meeting facilitation, treatment design review and recommendations.
Wade Killingsworth; Chairperson, Upper Ridge Fire Safe Council	Public outreach coordination and meeting facilitation.
Frank Stewart, Counties of Lassen, Plumas, Shasta, Sierra, and Tehama Quincy Library Group (QLG) Forester	Substantial public participation, treatment design review and recommendations.
Teri Rubiolo, Cirby Creek Road Maintenance Association	Substantial access coordination, including hosting and facilitating a neighborhood meeting.

5.5 Distribution of the Final Environmental Impact Statement

5.5.1 Federal, State, and Local Agencies

Letters are being distributed to the following government agencies to announce the Concow Hazardous Fuels Reduction, Final Environmental Impact Statement (FEIS) is available for public review and duplication at the Plumas National Forest internet website http://www.fs.fed.us/r5/plumas/projects_and_plans/concow_fuels_reduction_project/

Director, Planning and Review Advisory Council on Historic Preservation

Deputy Director USDA APHIS PPD/EAD

Natural Resources Conservation Service National Environmental Coordinator

U.S. Army Engineer Division, South Pacific CESPD-CMP

U.S. Coast Guard (USCG) Environmental Management CG-443

Western-Pacific Region, Regional Administrator Federal Aviation Administration

Black and white copies and/or CD (color version) of this FEIS are being distributed to the following government agencies:

USDA National Agricultural Library, Acquisitions and Serials Branch

National Marine Fisheries Service Habitat Conservationists Division

US Environmental Protection Agency, Office of Federal Activities

Director, Office of Environmental Policy and Compliance, U.S. Department of Interior

Environmental Protection Agency, Region 9, EIS Review Coordinator

USDA Forest Service, Pacific Southwest Research Station, Sierra Nevada Research Center

USDA Forest Service, Rocky Mountain Research Station,

Office of United States Senator Feinstein

U.S. House of Representatives, Field Representative Second District of California

Member of Congress, 2nd District, District Director, California

Butte County Board of Supervisors, District 1 Supervisor

Butte County Board of Supervisors, District 5 Supervisor

Butte County Fire Department, California Department of Forestry and Fire Protection (CDF/CAL FIRE)

Paradise Irrigation District

South Feather Water and Power Company

Butte County, Resource Conservation District

Resource Conservation District for the Central Sacramento Valley

Natural Resources Conservation Service

University of California, Cooperative Extension

University of California, Division of Ecosystem Science, Department of Environmental Science, Policy, and Management, Berkeley

CSU Chico, Departments for Ecosystem Research and Geography & Planning

Butte College, Departments for Agriculture & Environmental Sciences, Biology and Environmental Horticulture

University of Montana, Division of Biological Sciences, Avian Science Center

5.5.2 Local Organizations and Individuals

Black and white copies and/or CD (color version) of this FEIS are being distributed to the following local (non-governmental) organizations and individuals:

Quincy Library Group
Butte County Fire Safe Council
Yankee Hill Fire Safe Council
Upper Ridge Fire Safe Council
Cirby Creek Road Maintenance Association
Concow Phoenix Project
Golden Feather Community Alliance
Sierra Forest Legacy
Earth Island Institute (John Muir Project)
Lomakatsi (Restoration Project)
Center for Biological Diversity
Sierra Nevada Conservancy
The Forest History Society
Paradise Ridge Riders
Sierra Pacific Industries
Paradise Pine Property Owners Association
Pacific Gas & Electric Company
California Fire Alliance
American Insurance Association
Insurance Institute for Property Loss Reduction
Linda Blum
Jim Broshears
Jim Brobeck
Susie Heffernan
John Remalia
Richard Artley
Mary Cottrell
Martha Beninger
Jay Lininger

5.6 Consultation with United States Fish and Wildlife Service

Wildlife. The Biological Assessment (BA) is prepared to determine the effects of proposed projects on species listed by the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service as Endangered, Threatened or Proposed for listing. It is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (19 U.S.C. 1536 {c}), 50 CFR 402, and standards established in Forest Service Manual (FSM) direction (FSM 2672.42).

The Biological Evaluation (BE) provides a process to review all Forest Service planned, funded, executed, or permitted programs and activities for possible effects on regionally listed Forest Service Sensitive species (FSM 2672.42). For the purpose of this FEIS, the supporting BA and BE for fish and wildlife (including invertebrates, amphibians, reptiles, birds, and mammals) are combined into one report.

A list of Threatened & Endangered Species was provided by the "Federal Endangered and Threatened Species that may be affected by Projects on the Plumas National Forest", updated December 01, 2010 report date April 21, 2010 accessed via USFWS county list web page. Refer to Concow Hazardous Fuels Reduction Project's Biological Assessment and Biological Evaluation (BA/BE) for Fish and Wildlife; Appendix A for the species list or search http://sacramento.fws.gov/es/spplists/NFActionPage.cfm

The Bald Eagle falls under "The Bald and Golden Eagle Protection Act." Early involvement for the Bald Eagle was initiated with the U.S. Fish and Wildlife Service (USFWS) on June 04, 2007. Refer to the BA/BE; Appendix C. A site visit for the Bald Eagle nest with the U. S. Fish & Wildlife Service (FWS) occurred on July 5, 2007. It has been determined through early involvement with the FWS that treatments proposed would not adversely affect the Bald Eagle for the following reason; a Bald Eagle nest does not occur in the project area, if a Bald Eagle and/or nest are found within the project the Forest Service is mandated to follow The Bald and Golden Eagle Protection Act and Forest Guidelines for the eagle protection. No Bald Eagles are nesting (2009).

The Valley elderberry longhorn beetle is a listed threatened species (August 8, 1980) (Federal Register 45: 52803-52807) and is fully protected under the Endangered Species Act of 1973, as amended (16 U.S.U. 1531 et seq.). Early involvement with USFWS prior to the fire on July 5 2007 found that the elderberry plant, the host plant for the elderberry beetle was not within or near treatment areas. It has been determined that the treatments proposed would not adversely affect the valley elderberry longhorn beetle. Elderberry plants are recovering favorably from the 2008 wildfires. No beetles have been detected and the elderberry plant is re-sprouting post fire (M. Cisneros, Forest Service biologist personal communication, 2009).

The California red-legged frog is a listed threatened species (May 23, 1996) (Federal Register 61: 25813-25833) and is fully protected under the Endangered Species Act of 1973, as amended (16 U.S.U. 1531 et seq.). Early involvement with USFWS for the pre-fire Flea Project occurred on July 5, 2007. Implementation of project design features, mitigations, protection measures, site assessments, surveys, and Best Management Practices will result in no adverse effects to California red-legged frogs.

Botanical. Forest Service Manual 2672.42 specifies that a biological evaluation (BE) be prepared to determine if a project may affect any Forest Service Sensitive species or U.S. Fish and Wildlife Service (USFWS) Threatened, Endangered, or Proposed species. The purpose of this BE is to describe the effects of the proposed project on all Threatened, Endangered and Sensitive (TES) plant species of record for the project area.

The latest USFWS species list for the Plumas National Forest was accessed from the USFWS website on 9/08/2009. This list fulfills the requirements to provide a current species list pursuant to Section 7(c) of the 1973 Endangered Species Act, as amended. The USFWS list of Threatened and Endangered species potentially occurring in the Plumas National Forest included the following species, *Orcuttia tenuis*, (slender Orcutt grass). *Orcuttia tenuis* is limited to relatively deep vernal pools or vernal pool type habitat with clay soil. No suitable habitat for this species occurs in the Project Area. *Packera layneae* (Layne's ragwort), is found on dry pine and oak woodland on serpentine soils (Jepson 1993). There is ultramafic habitat located within this Project Area. However, these areas have been surveyed for this threatened taxon and no plants were identified.

Webberi's Ivesia is listed as a candidate species. *Ivesia webberi* is found in open areas in eastside pine and sagebrush communities. No suitable habitat for this species occurs in the project area, and therefore no candidate species are considered likely to occur in the project area. Consequently, no formal or informal consultation with the USFWS has been conducted, since there are no Threatened, Endangered, or Proposed species in this analysis area.

5.7 Consultation with California Department of Fish and Game

The department was contacted during treatment design and analysis for the Concow Project. The department manages wildlife populations for the state of California, with an emphasis typically on game species, such as the local deer herds and associated habitats.

5.8 Consultation with Tribes

Concow Maidu Tribe of Mooretown Rancheria

Estom Yumeka Maidu Tribe of Enterprise Rancheria

Mechoopda Indian Tribe of Chico Rancheria

Tyme Maidu Tribe of Berry Creek Rancheria

Glossary

Basal Area: Cross-sectional area of all stems in a stand per unit of ground area (Helms 1998). *Basal area* is a measure of stand density and is often correlated with other stand characteristics, such as productivity or canopy fuel characteristics. The cross-sectional area of a stem is calculated at breast height, which is defined as 4.5 ft (1.37 m) above ground level.

Best Management Practices (BMPs): Mititgation measures applied to a project to help ensure that it is conducted in an environmentally responsible manner. BMPs protect people, wildlife, air quality and landscapes.

Biomass: Mass of organic matter per unit of ground area. Biomass includes both the mass of plants (phytomass) and the mass of animals (zoomass). In forestry and wildland fire applications, biomass refers specifically to phytomass. Individual components of biomass can be identified specifically; for example, total above-ground biomass is the mass of all parts of trees, shrubs, and grasses occurring above the ground surface, specifically excluding below-ground plant mass consisting of roots.

Butte Unit's Community Wildfire Protection Plan (CWPP): Management plan using focused, pre-fire treatments at the landscape level to protect assets at risk, with the goal of mitigating future destruction and associated costs from severe wildfire.

California Wildlife Habitat Relationship (CWHR): Wildlife habitat classification and information system, and predictive model for Californias regularly-occurring birds, mammals, reptiles, and amphibians.

Canopy/Crown Base Height: Lowest height above the ground at which there is sufficient canopy fuel to propagate fire vertically (Scott and Reinhardt 2001). *Canopy base height* is a property of a plot, stand, or group of trees, not of an individual tree (see crown base height). For fire modeling, canopy base height is an effective value that incorporates ladder fuel , such as tall shrubs and small trees. No physical field measurement of canopy base height exists; therefore, different observers will estimate different values in the same stand.

Canopy Cover: Fraction of ground area covered by the vertical projection of tree crown perimeters. Canopy cover is commonly expressed as a percentage of total ground area; for example, at 50 percent canopy cover, half of the total ground area is covered by the vertical projection of tree crowns. Unless otherwise specified, canopy cover refers to non-overlapping canopy cover. Two overlapping crowns are not counted twice, so the theoretical maximum attainable canopy cover value is 100 percent. Values of overlapping canopy cover, used in ecological applications, can exceed 100 percent.

Char: Substance or material that has been blackened by fire or reduced to charcoal by incomplete combustion. *Char* is a general term referring to an object that has been blackened by fire. Char that forms on tree bark is called bark char ; char that forms on duff or ground fuel is referred to as ground char . Bark char is measured using bark char classes (see bark char). Ground char is measured using ground char classes (see ground char). These classes are indirect measures of how long the substrate was exposed to heat.

Crown Fuels: Foliage and fine branchwood of trees. It is generally assumed that all canopy fuel consumption takes place during the short duration of the flaming front of a crown fire. Only fine fuel particles are consumed in the flaming crown fire front -- the foliage plus some fraction of the live and dead branchwood (Brown and Bradshaw 1994; Brown and Reinhardt 1991). Scott and Reinhardt (2005) estimated available canopy fuel as the foliage plus 0-3 mm live branchwood plus 0-6 mm dead branchwood. Brown, J.K. and L.S. Bradshaw. 1994.

Crown Fire: Wildland fire that burns forest canopy **fuel** (Scott and Reinhardt 2001).The term crown fire is used in reference to both true crown fires (referring to burning individual tree crowns, also called torching or passive crown fire) and canopy fires (referring to fires that burn the whole forest canopy as a single entity, which include active, continuous, and independent crown fires).

Active Crown Fire: Crown fire in which the entire fuel complex is involved in flame, but the crowning phase remains dependent on heat released from surface fuel for continued spread (Scott and Reinhardt 2001). An *active crown fire* may also be also called a running crown fire or continuous crown fire . An active crown fire presents a solid wall of flame from the surface through the canopy fuel layers. Flames appear to emanate from the canopy as a whole rather than from individual trees within the canopy. Joe Scott, Research Forester Systems for Environmental Management. Active crown fire is one of several types of crown fire and is contrasted with passive crown fire and intermittent crown fire , both of which are less vigorous types of crown fire that do not emit continuous, solid flames from the canopy.

Defensible Fuel Profile Zone (DFPZ): Area where fuel has been treated to reduce surface fuel loads, increase the canopy base height, or decrease canopy bulk density. A *Defensible Fuel Profile Zone* (DFPZ) is another phrase for a fuelbreak but is applicable usually to forest fuelbreaks (as contrasted with fuelbreaks in shrublands). The term originates from the Quincy Library Group's proposal for fragmenting fuels on the Lassen and Plumas national forests and north portion of the Tahoe National Forest in California. In concept, a DFPZ is a shaded fuelbreak .

Desired Conditions: The goal outcome for a resource or ecosystem; desired conditions generally represent long-term goals, so are not immediately attainable in their nature. A lengthy period of time may be required to achieve them, and during that time they may be modified, if necessary, to respond to changing conditions and/or improved knowledge.

Diameter at Breast Height: Diameter of a tree stem at a height 4.5 ft above ground level.Diameter at breast height (DBH), unless otherwise noted, is measured outside the bark (DBHOB). On sloping terrain, DBH is measured 4.5 feet above the highest ground around the tree. DBH is can be measured by ocular estimate or using tools such as a Biltmore stick, calipers, or diameter tape (d-tape). DBH of very large trees is estimated by dividing the circumference (outside bark) by pi (3.14159).

Fire Disturbance: In its natural role, fire should not be considered a disturbance that impacts ecosystems, but rather an incorporated ecological process that is as much a part of the environment as wind, flooding, soil development, erosion, predation, herbivory, carbon and nutrient cycling, and energy flow. Fire resets vegetation trajectories, sets up and maintains a dynamic mosaic of different vegetation structures and compositions, and reduces fuel accumulations. Humans have often disrupted these processes, and the result can be that fire behavior and fire effects are outside of their range of natural variation. At that point, fire is considered an exogenous disturbance factor (Sugihara and others 2006).

Fire hazard: A physical situation with potential for fire to cause harm or damage. There are three primary factors affecting fire hazard: fuel, weather, and topography. Note that the commonly used term "fuel hazard" is misleading because fuel is but one component of fire hazard. No standard quantitative measure of fire hazard exists; however, two characteristics are possible to estimate: annual burn probability and expected distribution of a fire behavior characteristic (for example, fireline intensity).

Fire Intensity: Amount of energy or heat release per unit time, which can encompasses several specific types of fire intensity measures. Byram (1959) defined the term as "the rate of energy or heat release per unit time, per unit length of fire front, regardless of its depth.” However, to avoid confusion with related terms, we suggest the specific term “fireline intensity ” when referring to Byram’s definition. Reaction intensity and total fire flux are examples of other measures of fire intensity.

Fire Severity: Effect of a fire on ecosystem properties, usually defined by the degree of soil heating or mortality of vegetation.The severity of a fire depends on the fire intensity and the degree to which ecosystem properties are fire resistant . For example, a fire of exactly the same fireline intensity might kill thin-barked trees but have little effect on thick-barked trees. Therefore, *fire severity* is, in part, a function of the ecosystem being burned and is not simply indexed from fireline intensity. If a fire has a long residence time, fire severity will usually increase.

Flame Length: Flame length is measured to the leading edge so that the measurement follows the streamlines in the flame. It has been defined alternatively as the cord length from the tip of the flame to a point along the base of the flame midway between the leading and trailing edge. The former is the preferred definition. Anderson, W.; Pastor, E.; Butler, B.; Catchpole, E.; Dupuy, J.; Fernades, P.; Guijarro., M.; Mendes-Lopes, J.; Ventura, J. 2006. Evaluating models to estimate flame characteristics for free-burning fires using laboratory and field data: Proceedings 5th Intl. Conf. on For. Fire Res., Viegas, D.X., ed. 2006 November 27-30; Figueira daFoz, Portugal, University of Coimbra. In: Elsevier, Forest Ecology and Management 234 Supplement 1 (2006).

Fuels: In wildland fire , fuel is all combustible plant-derived material including grass, litter , duff , down dead woody debris, exposed roots, plants, shrubs, and trees. This plant-derived material can be dead or alive. Plant parts that are not consumed, such as the trunks of live trees, are not considered fuvan Wagtendonk, J.W. 2006. Fire is a physical process.

Fuel continuity: Fire's ability to sustain combustion and spread and applies to both surface fuel and crown fuel.

Fuel load: Amount of fuel that is potentially available for combustion (van Wagtendonk 2006). Fuel load is usually quantified numerically as total mass per unit area. One of the more commonly used field methods for estimating fuel load in forest ecosystems was developed by Brown (1974). Brown, J.K. 1974. Handbook for inventorying downed woody material.

Habitat: Place or type of site in which an organism typically lives, grows and/or exists.

Home Range: Geographic area within which an animal restricts its activities.

Horizontal Fuels: Flammable material distributed in a plane approximately perpendicular to the vertical. The greater the spacing between plants, the greater the wind speed must be to spread a fire. The actual distance required between plants depends on the height of the plants and the slope of the land.

Implementation Plan, 10-Year Strategy (2002), superseded by revised version (2006): Identifies 22 specific tasks requisite to achieving the four goals identified in the 10-Year Strategy, as well as and the performance measures that are interagency and interdepartmental in scope. The plan emphasizes a collaborative, community-based approach to addressing wildland fire related issues.

Ladder Fuels: Fuel that provides vertical continuity between surface fuel and canopy fuel strata, increasing the likelihood that fire will carry from surface fuel into the crowns of shrubs and trees (NWCG 2005). Ladder fuel typically consists of shrubs and small trees growing under the canopy fuel stratum. When the canopy is composed of pines, such ladder fuel may become draped with fallen needles, making it even more likely to transfer fire between strata. Ignition of ladder fuel can help initiate and sustain crown fire activity.

Landscape: Heterogeneous land area with interacting ecosystems that are repeated in similar form throughout.

Large woody debris (LWD): Materials including whole trees with a rootwad and limbs attached or portions of trees with or without rootwad or limbs. LWD is typically defined by biologists as logs with a minimum diameter of 4 inches and a minimum length of 6 feet that protrude or lay within a stream channel.

Management Indicator Species (MIS): Species selected because its welfare is presumed to be an indicator of the welfare of other species in the habitat. A species whose condition can be used to assess the impacts of management actions on a particular area. Managing for these species requires significant allocations of land or resources.

Mastication: Fuel modification technique involving the use of heavy machinery to shred standing live and dead shrubs and tree saplings into small chunks. Mastication is the shredding of standing trees and shrubs with a specially designed masitication head mounted on an excavator or on a bulldozer. The rapidly spinning mastication head breaks the standing live and dead material into smaller chunks and disperses it. Eric Knapp, Research Ecologist Pacific Southwest Research Station

Measurement Indicators: Observable phenomena that consistently correlate strongly with the object or phenomenon being measured, and thus whose occurrence suggests the co-occurrence of that which is being measured.

Mitigation Measures: Modifications of actions with the goal(s) of: (1) avoiding impacts by not taking certain actions or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (3) rectifying impacts by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating impacts over time by preservation and maintenance operations during the life of the action, or; (5) compensating for impacts by replacing or providing substitute resources or environments.

National Forest Management Act (NFMA): :Law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring the preparation of Forest Plans and the preparation of regulations to guide that development.

Prescribed Fire: Conflagration started and maintained under controllable conditions, for the purpose of meeting management objectives. A written, approved prescribed fire plan must exist, and NEPA requirements (where applicable) must be met, prior to ignition.

Rate of spread: Linear rate of advance of a fire front in the direction perpendicular to the fire front. The above definition allows calculation of rate of spread or fireline intensity for any portion of the fire perimeter. When estimating rate of spread by observing the time interval between flaming front passage at two points, it is important that the two points be oriented perpendicular to the fire front. The term "forward rate of spread" is used in place of rate of spread by some authors to indicate rate of spread in the heading direction. In that case, the preferred phrase is “head fire rate of spread.” Some authors may also use forward rate of spread to distinguish from other measures of fire growth rate, such as rate of area increase.

Reburn: Phenomenon of fire spreading across an already burned fuelbed. The term reburn actually describes two separate phenomena. One is the burning of an upper fuel stratum after a fire has burned through a lower stratum. For example, a fire backing down a steep slope may burn only the litter beneath a shrub canopy (the lower fuel stratum) when the fire front first passes. Later, under the influence of stronger winds, drier fuel or a flaming front oriented in the heading direction, a second flaming front may spread through the upper shrub canopy layer even though the litter has already burned.

Serpentine Landscapes: Areas where the soil contains high concentrations of Serpentinite or minerals of the serpentine metamorphic group, which are low in plant nutrients and high in toxic metals. Thus the vegetation on the so-called serpentine landscape is dramatically different from other plant communities, and serpentine barrens contain many specialized, endemic species.

Smoke: Mixture of particulates, gasses, and liquid droplets combined with air that is produced by the combustion of woody (or other carbon-based) fuel. Snag: any standing dead, partially dead, or defective (cull) tree. *Smoke* typically includes carbon particles, carbon dioxide, carbon monoxide, water vapor, water droplets, some more complex hydrocarbons, and other volatile gasses. The exact composition changes as the smoke ages and/or cools. Brian Potter, Research Meteorologist Pacific Northwest Research Station

Snag Retention Areas (SRAs): Public land in the project area where dead trees will be retained as relatively undisturbed habitat for wildlife

Spotting: Behavior of a fire that produces firebrands that are transported by ambient winds, fire whirls, and/or convection columns causing spot fires ahead of the main fire perimeter (Andrews 1996; NWCG 2005). Spotting can occur over distances ranging from a few meters to tens of kilometers ahead of the flaming front. Albini (1983) described short-range, intermediate-range, and long-range spotting. Short-range spotting can reach up to several tens of meters, intermediate-range spotting can reach up to several kilometers, and long-range spotting can reach distances of tens of kilometers ahead of the main fire.

Spot Fire: Fire ignited outside the perimeter of the main fire by a firebrand or any other piece of burning material (Andrews 1996; NWCG 2005).Fire growth by spot fires allow fires to cross barriers like rivers and highways.

Stand (of trees): Aggregation of trees occupying a specific area and sufficiently uniform in composition, age, arrangement, and condition so that it is distinguishable from the forest in adjoining areas.

Surface Fuels: Fuel lying on or near the surface of the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and living plants of low stature. (NWCG 2005) In natural ecosystems, fire generally is ignited in and carried by surface fuel.

Threatened and Endangered (TE) Species: Plant or animal species defined through the Endangered Species Act as being in immediate danger of extinction, or likely to become in danger of extinction, throughout all or a significant portion of their ranges within the foreseeable future; a plant or animal identified and defined in accordance with the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.) and published in the Federal Register.

Threshold of Concern: Measure of potential cumulative effects to species and habitats; a level above which exposure will pose a significant risk. The threshold-of-concern technique is an interdisciplinary planning tool useful in evaluating impacts of proposed land-management practices. It is most helpful for dealing with impacts that are difficult to quantify in physical terms. For the purpose of this document, the aquatic analysis incorporates calculated "Equivalent Roaded Areas" (ERAs) evaluated in terms of a Threshold of Concern (TOC) at a Hydrologic Unit Code (HUC)-6 watershed (subwatershed) scale.

Torching: Phenomenon that occurs when a fire transitions from a surface fire into the crowns of individual trees or small groups of trees and burns briefly and vigorously but not necessarily from one crown to another (Albini 1983; Andrews 1996). Torching is also referred to as “passive crown fire.”

Underburn: Purposefully initiated fire in a forest stand of low to moderate fireline intensity that remains a surface fire. An underburn is defined as a fire that is constrained to surface fuel and therefore has a low to moderate fireline intensity (less than 300 kW/m). Underburns are commonly prescribed for dry forest types such as ponderosa pine or mixed conifer to reduce fuel but leave the overstory intact. Underburns are usually classified as low-severity fires.

Vertical Fuels: Fuels (vegetation) leading from the ground into the tops of the tallest trees. (See ladder fuels).

Visual Quality Objective: Set of maximum allowable levels of future visual alteration of a characteristic landscape.

Watershed: Drainage basin contributing water, organic matter, dissolved nutrients and sediment to a stream or lake.

Wildfire: Unplanned, wildland fire burning in vegitative fuel. Wildfires include any wildland fire for which the objective is to contain and control the fire, including unauthorized human-caused fires.

Wildland Urban Interface (WUI): Area, or zone, where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. It generally extends 1.5 miles from the edge of developed private land into the wildland.

Wildlife Mast: Reproductive fruit of trees, shrubs, and other woody plants consumed by wildlife. There are two basic kinds: hard mast and soft mast. Hard mast is hard shelled mast such as acorns, walnuts, pecans, and other nuts. Soft mast includes pine nuts, fruits, berries, and other soft-bodied seeds.

Woody Biomass: Trees and woody plants, including limbs, tops, needles, and other woody parts, grown in a forest, woodland, or rangeland environment that are the by-products of management, including restoration and hazardous fuel reduction.

"90th – 97th Percentile" Weather Conditions: Extreme state of summer temperature, humidity, wind, and fuel moisture, which creates conditions considered warmer, drier, and windier than 90–97 percent of other summertime weather.

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