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Service

**Southwestern
Region**

Environmental Assessment for the Big Flat Vegetation and Fuels Management Project

Smith River National Recreation Area
Six Rivers National Forest
Del Norte County, California

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Chapter 1 – Introduction

Background

The Six Rivers National Forest proposes to manage vegetation and hazardous fuels on approximately 1,824 acres of conifer/hardwood stands and a meadow through commercial timber harvesting, timber stand improvement, and fuel reduction treatments. The project would take place on National Forest System lands administered by the Smith River National Recreation Area (NRA) adjacent to the community of Big Flat in Del Norte County, California. The proposed action, designed to be a community fire protection and wildlife habitat restoration project falls within the category of Hazardous Fuel Reduction Projects intended to achieve the goals of Title I of the Healthy Forest Restoration Act of 2003 (HFRA). By the authority of the HFRA, the proposed action qualifies for an expedited environmental analysis process under the National Environmental Policy Act. This project meets the intent and spirit of the HFRA by virtue of its design through a collaborative process as a hazardous fuel reduction and ecological restoration project proposed within a federally recognized Wildland Urban Interface Area (WUI).

The proposed project area is located in the vicinity of the Big Flat community and drains into the South Fork Smith River, Jones Creek, and Hurdygurdy Creek. The planning area occurs in portions of the following townships: Township 15 North, Range 2 East; and Township 15 North, Range 3 East; Humboldt Meridian. The planning area is subdivided into three subdivisions: Grande, Jones, and South.

Management Direction

The Big Flat Vegetation and Fuels Management project is designed to respond to goals and objectives of the Six Rivers National Forest Land and Resource Management Plan (LRMP) (USDA Forest Service 1995). The project area land base occurs in the following management areas defined by the LRMP:

Management Area 7 - Smith River National Recreation Area (SRNRA): The SRNRA was established in November of 1990, by U.S. Senate Bill 2566/House Bill 4309. The primary goals are to emphasize, protect, and enhance the unique biological diversity; anadromous fisheries; and the wild, scenic, and recreational potential of the Smith River while providing sustained yields of forest products.

The SRNRA is managed under direction provided by eight management areas (or zones). The Smith River NRA Act promulgates specific statutes. The Smith River NRA management plan (Appendix A of the Six Rivers LRMP) provides direction to guide compliance with those statutes.

Management Area 8 - Special Habitat (Late-Successional Reserve; LSR): The management emphasis and goal for LSR is to protect and enhance conditions of late-successional and old growth forest ecosystems which serve as habitat for late-successional and old growth related species (LRMP, IV-34, 35). The Grande and Jones subdivisions of the project area occur within this management area allocation.

***Management Area 17 – General Forest/NRA Prescribed Timber Zone*:** The management emphasis and goal for the NRA Prescribed Timber Management zone is to

provide a sustained yield of wood products while maintaining biological and ecological diversity (NRAMP, 34-35). This management area includes forested land where commercial timber management is expected to occur. Examples of allowable silvicultural activities include timber harvest, reforestation, conifer release, pre-commercial thinning, and forest pest management. The primary goals are to produce a sustained yield of timber, contribute younger seral stages to the vegetation mosaic of the forest, and conserve key components of functional habitat for mature and old growth associated species. The South subdivision of the project area occurs within this management area allocation.

Management Area 9 - Riparian Reserves (RR): Riparian management areas are located throughout all other management areas. Riparian management areas, also referred to as riparian reserves, are used to maintain and restore riparian structures and functions to five categories of water bodies: 1) fish-bearing streams; 2) permanently flowing non-fish-bearing streams; 3) constructed ponds and reservoirs, and wetlands greater than 1 acre; 4) lakes and natural ponds; and 5) seasonally flowing or intermittent streams, wetlands less than 1 acre, and unstable and potentially unstable areas. Under the Aquatic Conservation Strategy (ACS), RRs are used to maintain and restore riparian structures and function of intermittent streams, confer benefits to riparian-dependent and associated species, and provide for greater connectivity of the watershed (LRMP, IV-44, 45). The management emphasis for RRs is to achieve the goals of the ACS (LRMP, IV-106-108).

Other management allocation areas within the Big Flat Project planning area include Wild River and Recreational River under Section 2 (a) (ii) of the Wild and Scenic Rivers Act (WSRA), with corridor designations running along segments of the South Fork Smith River, Hurdygurdy Creek, and Jones Creek (NRAMP, 54-55). The management emphasis in Wild River corridors is to maintain the river segment's unique character where the appearance remains primitive, with little to no evidence of human activity (LRMP, 26, 27). In this case, timber harvesting is prohibited. In the case of Recreational River corridors, management emphasis is placed on providing for public recreational and resource uses that do not adversely impact or degrade those values. Management may occur within the corridor, provided that near natural visual quality is maintained as seen from the river corridor (LRMP, IV-60, 61).

Purpose and Need for Action

The environmental setting for the planning area is a landscape shaped by past timber management, mining activities, land exchanges, and fire. The current vegetation consists of predominately Tanoak/Douglas-fir stands in a mix of seral stages distributed in a fragmented pattern across the landscape.

The project area encompasses the wildland urban interface (WUI) for the community of Big Flat. The Big Flat WUI was designated as a Community at Risk from wildfire by the US Department of Interior in the Federal Register on August 17, 2001. In 2005, the Del Norte County Fire Safe Council completed the Community Wildfire Protection Plan (CWPP). The CWPP identified that one of the higher fire threat areas in Del Norte County sits northeast of Big Flat, in the headwaters areas of Jones and Hurdygurdy Creeks. The CWPP states that a first priority for defensibility of this community is to create a shaded fuelbreak around the valley. The CWPP identified designated shaded fuelbreak areas along major travel routes recognized as important evacuation routes in the event of wildfires. In addition to the shaded fuelbreaks, District fuels specialists identified other strategic fuel treatments that would further enhance the defensibility of

the community of Big Flat against wildfires. The strategic shaded fuelbreaks and other treatment areas are intended to reduce hazardous fuel loading to retard the spread of fire and provide fire suppression personnel a higher probability of successfully attacking a wildfire. The CWPP recommends that all vegetation management activities within the WUI designed to reduce the amount of fuels around the community.

The majority of the project also occurs within a Late-Successional Reserve (LSR), specifically LSR 303 (Haines LSR). The Smith River National Recreation Area Late-Successional Reserve Assessment (LSRA; 1995) determined that this portion of the LSR was deficient in late-successional habitat. Portions of the LSR were previously privately owned and previously harvested. Extensive stands of plantations exist that do not provide suitable habitat for late-successional species such as the Northern spotted owl. Plantations and young natural stands are even-aged and lack the horizontal and vertical diversity components associated with late-mature stands. Young stands have the potential to achieve rapid diameter and height growth with thinning treatments.

The LSRA: 1) determined that the LSR is deficient in late-successional habitat; 2) recommended developing late-successional habitat in stands that had been converted to early seral vegetation due to past logging and wildfires; and 3) identified strategic fuelbreaks to protect late-successional habitat and reduce catastrophic loss due to wildfire. Silvicultural prescriptions could be applied to younger stands in order to accelerate their development toward late seral conditions. These treatments could increase the amount of late seral vegetation sooner than would occur naturally. Shaded fuelbreaks would reduce the wildfire impacts on existing late-successional habitat both by reducing the impacts of roadside ignitions and by breaking up larger blocks of fuel.

Given the environmental conditions of the project area and the information and recommendations from the above documents, the Purpose and Need for the proposed action is to:

- Reduce hazardous fuel loading in strategically located high-risk areas to enhance the defensibility of the community of Big Flat, and to protect existing late-successional habitat within the LSR.
- Accelerate development of late-successional habitat characteristics in plantations and young natural stands, and restore ecological conditions in special habitats (meadow).

The Purpose and Need objectives drove the identification of treatment areas for the strategically placed shaded fuelbreaks within the WUI, and young even-aged stands (natural stands and plantations) needing treatment within the LSR.

In addition to accomplishing the project's Purpose and Need, the proposed action offers opportunities to provide commodities in the form of sawlogs, fuelwood, and biomass.

Proposed Action

The Six Rivers National Forest proposes to manage vegetation and hazardous fuels on approximately 1,824 acres of conifer/hardwood stands and a meadow through commercial timber harvesting, timber stand improvement, and fuel reduction treatments. Actions included in this proposal are as follows:

- 503 acres of commercial thinning to 40% or greater crown closure and activity fuel treatment in 40 to 45-year old plantations and natural stands. Commercial

thinning would occur both within and outside of strategic fuelbreak areas. Of these acres, 356 acres would be ground skidded and 147 acres would be cable yarded.

  - 45 existing landings would be re-utilized.
  - 4.26 miles of existing temporary roads would be reutilized and subsequently decommissioned after harvest is completed.

- 581 acres of pre-commercial thinning to a 12-14 foot average spacing and activity fuel treatment in 20 to 30-year old plantations and natural stands. Pre-commercial thinning would occur both within and outside of strategic fuelbreak areas.
- 735 acres of fuel reduction treatments employing manual, mechanical and prescribed burning methods in conifer stands in various seral stages within strategic fuelbreak areas.
- 5 acres of prescribed burning in a meadow.
- 24.9 miles of road maintenance on nine already open system roads and one non-system road.
- 2.4 miles of road reconstruction (temporary upgrade) and subsequent re-closure after harvest is completed on five currently closed system roads.

The following table summarizes the Proposed Action by Attributes and Subdivisions.

Table 1. Summary of Proposed Action

	Grande Subdivision	Jones Subdivision	South Subdivision	Total Project Area
Commercial Timber Harvest / Activity Fuel Treatments				
# Units	11	21	10	**42**
Acres	121	254	128	**503**
Volume Yield (MBF)	1,020	2,032	1,076	**4,128**
Existing Temporary Road Reutilization / Decommissioning Miles	1.15	2.66	0.40	**4.21**
TSI / Activity Fuel Treatments				
# Units	12	16	4	**32**
Acres	126	200	255	**581**
Fuel Treatments				
# Units	17	8	5	**30**
Acres	304	265	171	**740**

	Grande Subdivision	Jones Subdivision	South Subdivision	Total Project Area
All Treatments				
# Units	**40**	**45**	**19**	**104**
Acres	**551**	**719**	**554**	**1,824**
Road Maintenance				
# Roads / Road Segments	2	3	5	**10**
Miles	5.27	9.41	10.23	**24.91**
System Road Reconstruction / Re-closure				
# Roads/Road Segments	1	3	1	**5**
Miles	0.65	1.27	0.50	**2.42**

Chapter 2 has a complete description of the Proposed Action, including specific project design features and monitoring requirements.

Decision Framework

The Forest Supervisor of the Six Rivers National Forest will decide whether and how to fulfill the purpose and need of the Big Flat Vegetation and Fuels Management project in accordance with Forest Plan goals, objectives and desired future conditions. The responsible official will decide whether to implement the proposed action, a modified action alternative, or the no action alternative.

Tribal Consultation

The Six Rivers National Forest initiated formal governmental consultation with two Native American tribes on October 15, 2007 regarding the preliminary design of the Big Flat Vegetation and Fuels Management Project. The tribes contacted were the Smith River Rancheria and the Elk Valley Rancheria. No interest in the project was expressed.

Public Involvement

Collaboration

Collaboration was initiated by the Del Norte Fire Safe Council who volunteered for the task of coordinating the local effort with various stakeholders to develop a fire safe plan. The Council received a grant from the US Forest Service Economic Action program in 2003 to fund the creation of the fire safe plan. The first phase of collaboration culminated in the completion of the Del Norte Fire Safe Plan and CWPP in September of 2005, which identified areas of concern and potential project opportunities across multiple land ownerships within Del Norte County.

Upon the completion of the CWPP, the Six Rivers National Forest identified National Forest System lands near the Big Flat community as a community protection project opportunity. A synopsis of a preliminary proposed action was prepared and sent to prospective stakeholders to initiate the collaboration process required under the Healthy Forest Restoration Act (HFRA). The feedback received from seven individuals and groups was primarily in the form of questions and project design recommendations.

As a result of the feedback received from the initial outreach effort, an informational public meeting and field trip were held on April 15 and April 17, 2008, respectively. These events were announced through a press release issued by the Six Rivers National Forest on April 4, 2008 and announcement letters mailed to prospective stakeholders. Fourteen (14) participants attended the events.

Concerns raised included the economic viability of project design, environmental effects to various resource values, and road access by the public. Ideas and concerns raised by the participants were considered by the Forest and led to the finalization of the proposed action prior to the onset of public scoping.

Scoping

The Council on Environmental Quality (CEQ) defines scoping as "...an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 CFR 1501.7). Among other things, the scoping process is used to invite public participation, to help identify public issues, and to obtain public comment at various stages of the environmental analysis process. To date, the public has been invited to participate in the environmental analysis of this project in the following ways:

- The Big Flat Vegetation and Fuels Management project has been listed on the Six Rivers National Forest Schedule of Proposed Actions (SOPA) since September of 2007.
- On May 19, 2008, a scoping package providing information and seeking public comment on the proposed action was mailed to approximately 107 individuals and groups. This included federal and state agencies, Native American groups, local municipal offices, businesses, interest groups, adjacent landowners, and other individuals.

A total of eight responses to this mailing were received, with four parties that provided substantive comments, one state agency that provided procedural recommendations, two individuals that expressed support for the project, and one individual that requested a copy of this EA. Agency responses and dispositions to the comments received can be found in Appendix B of this EA.

30-Day Objection Period on EA

The 36 CFR 218 appeal regulations require a 30-day pre-decisional objection period for HFRA project environmental assessments before a decision can be made. This proposed project is subject to the objection process pursuant to 36 CFR Part 218 Subpart A and is not subject to notice, comment and appeal procedures under the 36 CFR 215 appeal regulations.

Issues

Scoping and public involvement activities are used to identify unresolved issues about the effects of the proposed action. Issues are addressed through the incorporation of project design features associated with the proposed action, and potentially the development of alternatives to the proposed action. Additional issues and concerns considered but determined non-significant or outside the scope of this project are discussed in Appendix B of this EA.

There were no significant issues identified, as defined in 40 CFR 1502.2. As a result, no other action alternatives were developed for evaluation in this EA.

Federal and State Permits, Licenses, and Certifications

On March 24, 2004, the North Coast Regional Water Quality Control Board adopted Order No. R1-2004-0015, Categorical Waiver for Discharges Related to Timber Activities on Federal Lands Managed by the United States Department of Agriculture, Forest Service (USFS) in the North Coast Region. This waiver exempts silvicultural activities conducted on National Forest System Lands from the waste discharge requirements of Article 4 (commencing with Section 13260) of Chapter 4, Division 7 of the California Water Code, except as provided within the waiver. Order No.R1-2004-0015 expires on March 24, 2009.

Chapter 2 - Alternatives

This chapter describes and compares the alternatives considered by the Forest Service for the Big Flat Vegetation and Fuels Management project. It includes a description of alternatives considered in detail, along with an overview of project design features and monitoring requirements. A map of the Proposed Action alternative can be found in Appendix A of this EA. This chapter ends with a comparison of the alternatives by attributes and connected actions, as well as relative to how well they fulfill the purpose and need objectives for the project and estimated effects to environmental components that warrant mandatory disclosure, which are further described in Chapter 3.

Alternatives Considered in Detail

Alternatives considered in detail include the No Action (Alternative 1) and the Proposed Action (Alternative 2) alternatives.

Alternative 1 (No Action)

The emphasis of this alternative is to propose no vegetation and fuels reduction treatments in the Big Flat project area at this time. This alternative represents the existing and projected future condition against which the other alternatives are compared.

Alternative 2 (Proposed Action)

The proposed action was designed to meet the project's purpose and need while meeting the standards and guidelines of the LRMP. Suggestions received from the public during the informational meeting and field trip were also considered and incorporated in the final design of the proposed action.

The Big Flat Vegetation and Fuels Management Project would treat vegetation to reduce hazardous fuel and restore habitat conditions on approximately 1,824 acres of conifer/hardwood stands and a meadow through commercial timber harvesting, timber stand improvement, and fuel reduction treatments. The project would consist of 104 treatment units located across three subdivisions adjacent to the Big Flat Community.

The proposed action would create strategically located shaded fuelbreaks along high use roads and ridgetops on National Forest System lands. These shaded fuelbreaks would reduce fuel loading in order to create a defensible space for fire suppression resources, decrease the potential for detrimental wildfire effects to the overall project area and the community of Big Flat, and to enhance the treated stands' fire resiliency.

The following describes and summarizes the three categories of proposed vegetation and fuels management activities and connected actions associated with the project.

Fuel Reduction Treatments

The proposed action would create strategically located shaded fuelbreaks along high use roads and ridgetops on National Forest System lands. Shaded fuelbreaks would be variable in width, averaging about 150 feet in width on each side of the road, along the following road systems: County Road 405/Forest Road 16N03 in the Grande

subdivision; Forest Road 16N02 in the Jones subdivision; and Forest Road 15/Forest Road 15N38/Forest Road 15N39 in the South subdivision. Treatment in stand-alone fuels units together with activity fuel treatments associated with the commercial and pre-commercial thinning units would enhance and expand the effectiveness of the shaded fuelbreaks.

Fuels reduction treatments would occur on approximately 740 acres across 30 units (Table 2). These treatments target high-risk stands that occur within the designated shaded fuelbreak areas identified in the Del Norte Fire Safe Plan and in strategic areas identified by District fuels specialists. A wide variety of vegetation types (conifer/hardwood stands and a meadow) and seral stages (early through late-successional) would be treated through manual and prescribed burning methods. In addition, activity-generated fuels in the commercial and pre-commercial thinning units described below would also be treated.

Shaded fuelbreak construction and prescribed fuel treatments include one or several of the following activities: cutting understory vegetation, hand pile and burn, underburn with hand line construction, and fuelwood and biomass collection. The type of treatment applied is based on the vegetation type, hazardous fuel loading and distribution, and the topography of the proposed treatment unit. They are described as follows:

- Cutting understory vegetation: Hand cutting moderate to heavy brush, seedlings, saplings, and small diameter trees up to 8” diameter at breast height (dbh), and limbing lower tree branches of overstory trees (generally up to 6-10 feet above the ground) to remove fuel “ladders” (continuous fuels from the ground up to the overstory canopy) that could accelerate fire spread and increase resistance to control. Work would be accomplished with chainsaws.
- Hand pile and burn: Existing ground fuels, thinning and pruning residue, and cut brush would be piled by hand and burned.
- Understory burn with hand line construction: Understory burning is the use of low-intensity fire to further reduce ground and surface fuels. Hand-constructed control lines (up to 18” wide, cleared down to mineral soil) are used to limit the spread of the prescribed fire.
- Fuelwood and biomass utilization: Providing opportunities for the public to collect cut vegetation to use for fuelwood or for biomass utilization for up to two years after the material is piled and/or decked.

The 5-acre meadow associated with the Chimney Flat day-use site is also proposed for an underburn for ecological restoration, to rejuvenate and reinvigorate the grass and other meadow species, and to remove encroaching vegetation.

The following table summarizes the proposed fuel reduction treatments by unit.

Table 2. Fuel Reduction Treatment Unit Summary

				Acres By Treatment Type			
Subdivision	**Unit ID**	**Stand Type/ Seral Stage**	**Est. Acres**	**HC/HP/B**	**FW/B**	**UB/ HLC**	**UB/ WL**
Grande	F-01	N/EM, MM	41	41			
	F-02	N/EM, MM	19	19			
	F-03	N/MM, SH	22	6	16	22	
	F-04	P/PL	10	5	5		
	F-05	N/MM, LM	23	23		23	
	F-06	N/MM	12		12	4	
	F-07	N/MM	5		5		
	F-08	N/MM	10		10		
	F-09	N/MM	21	21			
	F-10	N/MM	21	21		21	
	F-11	N/MM	15	15			
	F-12	N/EM to MM	46	12	34		
	F-13	N/PL	10	10			
	F-14	N/EM	21	21			
	F-15	N/MM	13		13		
	F-16	N/MM	10	10	10		
	F-22	Meadow	5				5
Grande Subtotal			**304**	**203**	**105**	**70**	**5**
Jones	F-17	N/PL, MM	10	10			
	F-18	N/EM and MM	78	31	47		
	F-19	N/EM	21	21			
	F-23	N/PL and MM	32	32			
	F-24	N/MM , PL, SH	54	54			

				Acres By Treatment Type			
Subdivision	**Unit ID**	**Stand Type/ Seral Stage**	**Est. Acres**	**HC/HP/B**	**FW/B**	**UB/ HLC**	**UB/ WL**
	F-25	N/EM and MM	11	11			
	F-26	N/MM and MM	51	51			
	F-27	N/PL	8	8			
Jones Subtotal			**265**	**218**	**47**	**0**	**0**
South	F-20	N/MM, PL/SH	53	53		37	
	F-21	N/MM	26	26			
	F-28	N/MM	13	13			
	F-29	N/PN,SH, MM	38	38			
	F-30	N/MM,PL	41			41	
South Subtotal			**171**	**130**	**0**	**78**	**0**
PROJECT TOTAL			**740**	**551**	**152**	**148**	**5**

Stand type/seral stage: P-plantation; N-natural stand; SH- shrub stage, PL-pole stage, EM- early mature, MM- mid mature, LM- late mature

Fuel Treatment: HC/HP/B- hand cut and hand pile and burn; UB/HLC understory burn with hand line construction; UB/WL understory burn with wet line (no hand line construction); FW/B-fuelwood or biomass utilization

Commercial Harvesting

Commercial harvesting treatments would occur in 42 units on a total of 503 acres (Table 3). The treatments would occur in even-aged young stands that are primarily plantations and natural stands that are in early seral stages of development. These stands contain trees that are on average pole-sized at 7-12” diameter at breast height (dbh). Units receiving this treatment occur both within and outside of designated shaded fuelbreaks.

Treatments would consist of variable density thinning of plantations and natural stands that are 40-45 years in age. The general prescription would be commercial thinning from below down to 40% or greater canopy closure, resulting in a residual basal area of 80 to 120 square feet per acre. Variable basal area retention would be used to create gaps to promote horizontal diversity through the development of understory trees, while in other areas clumps of trees would be maintained to promote the development of snags.

Individual trees with high potential for rapid growth would be widely spaced to accelerate diameter and height growth with the expectation of achieving vertical diversity. These trees are also expected to develop wide crowns and large limbs. No predominant trees would be removed. Existing snags (20” dbh or greater) and downed logs (20” diameter or greater and 10 feet long) would be maintained unless they pose a safety hazard or reduce the effectiveness of the shaded fuelbreaks.

No trees over 20” dbh would be cut in proposed units within the Grande and Jones subdivisions to meet LRMP standards and guidelines for LSR. The 20”dbh cut limit does not apply in the South subdivision as it is outside the LSR; however, only one proposed unit in the subdivision has trees that are 20”dbh or greater that occur next to neighboring trees that occupy higher crown positions and are larger in diameter.

The focus of this treatment is to retain the largest trees with the best crowns. These trees are generally at or above the average canopy and have the best opportunity to take advantage of additional light, water, and nutrients to maintain or increase growth. Trees designated for cutting would generally be in the intermediate and suppressed crown positions. No predominant trees would be cut, and the largest trees would be favored for retention. The treatments are designed to maintain the existing native species diversity (including hardwoods).

Prescribed logging methods based on existing road and skid trail infrastructure and past logging entries, include ground based tractor skidding or mechanized harvester on gentle slopes (<35% slope) and cable yarding and tractor with 100-foot end lining capability on steeper ground (>35% slope). Cable yarding would be accomplished by the use of high lead systems such as yoders. Approximately 45 existing landings would be reutilized project wide.

Existing temporary roads would be reutilized with minor reconstruction in some of the proposed units. Reutilized temporary roads totaling 22,205 feet (4.21 miles) in length would be subsequently decommissioned after activity fuel treatment operations are completed.

Post-harvest activity fuel treatments would include one or several of the following actions: whole tree yarding or yarding of tops (yarding the entire tree, or tops of trees, to a landing site for disposal), hand pile and burn, fuelwood and biomass utilization, and prescribed understory burning.

Treatments in these stands using commercial harvest methods would produce merchantable material. There is the potential for commercial harvesting to yield about 4.1 MMBF (million board feet) of sawlogs.

The following table summarizes the proposed commercial harvest activities by unit.

Table 3. Commercial Harvest Unit Summary

Subdivision	Unit ID	Est. Acres	Stand Type/ Seral Stage	Logging System	Existing Roads Reutilized / Decom (Ft)	Activity Fuel Rx	Est. Volume (MBF) per Acre	Est. Total Volume Yield (MBF)
Grande	CH-01	6	P/PL	C		YT, HP/B, FW/B	8	48
	CH-02	2	P/PL	T		WTY, HP/B	8	16
	CH-03	3	P/PL	C		HP/B	8	24
	CH-04	26	P/PL	C	3,000	YT, HP/B, UB/HLC, FW/B	8	208
	CH-05	15	P/PL	T/EL	590	YT, HP/B	8	120
	CH-06	2	P/PL	C		YT, HP/B	8	16
	CH-07	22	P/PL	C	1,500	HP/B, FW/B	8	176
	CH-13	2	P/PL	T/MH		WTY, HP/B, FW/B	8	16
	CH-16	25	P/PL	T/MH	935	WTY, HP/B, FW/B	8	200
	CH-17	13	N/PL	T		WTY, HP/B, FW/B	12	156
	CH-18	5	P/PL	T		WTY, HP/B	8	40
Grande Subtotal		**121**			**6,025**			**1,020**
Jones	CH-19	1	P/PL	T		WTY, HP/B	8	8
	CH-20	5	P/PL	C		HP/B, YT	8	40
	CH-21	31	P/PL	T/EL	1,470	HP/B, YT, FW/B	8	248
	CH-22	5	P/PL	T/MH		WTY, HP/B, FW/B	8	40
	CH-23	24	P/PL	C		HP/B	8	192
	CH-24	20	P/PL	C	2,575	HP/B	8	160

Subdivision	Unit ID	Est. Acres	Stand Type/ Seral Stage	Logging System	Existing Roads Reutilized / Decom (Ft)	Activity Fuel Rx	Est. Volume (MBF) per Acre	Est. Total Volume Yield (MBF)
	CH-26	37	P/PL	T/MH	1,815	WTY, HP/B, UB/HLC, FW/B	8	296
	CH-28	29	P/PL	T/MH	3,930	WTY, HP/B, FW/B	8	232
	CH-29	4	P/PL	T	925	WTY, HP/B	8	32
	CH-30	2	P/PL	T/MH		WTY, HP/B	8	16
	CH-33	16	P/PL	T/MH	1,535	WTY, HP/B, FW/B	8	128
	CH-35	6	P/PL	C		YT, HP/B	8	48
	CH-36	5	P/PL	T		WTY, HP/B	8	40
	CH-37	12	P/PL	C		YT, HP/B	8	96
	CH-38	1	P/PL	T		WTY, HP/B	8	8
	CH-39	5	P/PL	C		YT, HP/B	8	40
	CH-40	2	P/PL	T		WTY, HP/B	8	16
	CH-41	7	P/PL	T		WTY, HP/B	8	56
	CH-42	14	P/PL	T/MH	100	WTY, HP/B, FW/B	8	112
	CH-43	26	P/PL	T/MH	1,705	WTY, HP/B, FW/B	8	208
	CH-44	2	P/PL	T/MH		WTY, HP/B	8	16
Jones Subtotal		**254**			**14,055**			**2,032**
South	CH-46	4	N/PL	T/MH		WTY, HP/B, FW/B	12	48
	CH-48	11	P/PL	C	1,125	YT, HP/B	8	88
	CH-49	5	P/PL	C	1,000	HP/B	8	40
	CH-50	45	P/PL	T/MH		WTY, UB/HLC, HP/B, FW/B	8	360

Subdivision	Unit ID	Est. Acres	Stand Type/ Seral Stage	Logging System	Existing Roads Reutilized / Decom (Ft)	Activity Fuel Rx	Est. Volume (MBF) per Acre	Est. Total Volume Yield (MBF)
	CH-52	12	P/PL	T/MH		WTY, HP/B	8	96
	CH-53	6	P/PL	T/MH		WTY, HP/B	8	48
	CH-54	6	P/PL	T		HP/B	8	48
	CH-58	30	P/PL	T/MH		HP/B, UB/HLC, FW/B	8	240
	CH-59	7	N/PL	T/MH		WTY, HP/B	12	84
	CH-60	2	N/PL	T/MH		WTY, HP/B	12	24
South Subtotal		**128**			**2,125**			**1,076**
PROJECT TOTALS		**503**			**22,305**			**4,128**

Stand type/seral stage: P-plantation; N-natural stand; PL-pole stage

Logging System: T-tractor; C-cable; MH- mechanical harvester; EL-end lining

Activity Fuel Rx: HP/B- hand pile and burn; YT- yard tops; WTY – whole tree yard; FW/B-fuelwood or biomass utilization; UB/HLC – understory burn with hand line construction.

Timber Stand Improvement

The proposed action would pre-commercially thin 32 units (581 acres) of plantations and natural stands 20-30 years of age to reduce stocking levels and increase growth (Table 4). All of these stands are densely stocked, which means that the number of trees per acre is so high that individual tree growth and health are, or will be, negatively affected. Thinning these stands would reduce the competition for resources on the site and improve the growing conditions for the remaining trees. The trees in these stands are generally in the sapling size class. Units receiving this treatment occur both within and outside of designated shaded fuelbreaks.

The general prescription applied to these stands would be pre-commercial thinning from below down to 40% or greater canopy closure at an average spacing of 12-14 feet. Cut trees would be less than 8 inches dbh.

As with commercial thinning, the focus of the pre-commercial thinning treatment is to retain the largest trees with the best crowns. These trees are generally at or above the average canopy and have the best opportunity to take advantage of additional light, water,

and nutrients to maintain or increase growth. The treatments are designed to maintain the existing native species diversity in the unit being treated.

Activity fuel treatments would include one or several of the following actions: hand pile and burn, mastication, roadside chipping, fuelwood and biomass utilization, and lop and scatter of slash (activity generated fuels are lopped into smaller pieces and scattered throughout the unit to a depth no greater than 18 inches). Lop and scatter of slash would be used in certain situations such as in remote units away from the road where the risk of ignition is lower or for erosion control on specific skid roads. Mastication would involve use of low ground-pressure mechanical equipment (similar to a mowing machine) used to cut live vegetation. Material would be masticated up to approximately 6-8 inches above the ground surface.

The following table summarizes the proposed timber stand improvement activities by unit.

Table 4. Timber Stand Improvement Unit Summary

Grande Subdivision			Jones Subdivision			South Subdivision		
Unit ID	**Est. Acres**	**Activity Fuel Rx**	**Unit ID**	**Est. Acres**	**Activity Fuel Rx**	**Unit ID**	**Est. Acres**	**Activity Fuel Rx**
TSI-01	11	HP/B, FW/B, L&S	TSI-11	10	L&S	TSI-27	5	HP/B
TSI-02	17	HP/B, FW/B, L&S	TSI-12	26	MAS, HP/B, FW/B	TSI-28	17	HP/B, L&S, FW/B
TSI-03	3	HP/B, FW/B, L&S	TSI-13	17	L&S	TSI-29	97	HP/B, FW/B
TSI-04	23	HP/B, FW/B, L&S	TSI-14	5	L&S	TSI-34	136	HP/B
TSI-05	3	HP/B, FW/B, L&S	TSI-15	2	HP/B			
TSI-06	2	HP/B, FW/B	TSI-16	4	L&S			
TSI-07	37	L&S	TSI-17	5	HP/B			
TSI-08	8	L&S	TSI-18	14	HP/B, RC, FW/B			

Grande Subdivision			Jones Subdivision			South Subdivision		
Unit ID	**Est. Acres**	**Activity Fuel Rx**	**Unit ID**	**Est. Acres**	**Activity Fuel Rx**	**Unit ID**	**Est. Acres**	**Activity Fuel Rx**
TSI-09	3	L&S	TSI-19	9	HP/B			
TSI-10	5	L&S	TSI-20	20	HP/B, L&S			
TSI-32	10	HP/B	TSI-21	17	HP/B, RC, FW/B			
TSI-33	4	MAS, HP/B	TSI-22	7	L&S			
			TSI-23	5	L&S			
			TSI-24	4	L&S			
			TSI-25	4	L&S			
			TSI-26	51	HP/B, L&S			
Subdivision Totals	**126**			**200**			**255**	
PROJECT TOTAL	**581**							
Activity Fuel Rx: HP/B- hand pile and burn; L&S- lop and scatter; RC-roadside chipping; MAS-mastication; FW/B-fuelwood or biomass utilization								

System Road Management

Access into the Big Flat Vegetation and Fuels Management Project area would be by a series of Del Norte County and National Forest System (NFS) roads, near the community of Big Flat, California.

Each of the NFS roads has an objective maintenance level (OML) associated with it based on resource protection objectives, vehicle capability, and driver comfort considerations. The main NFS roads that serve the project area are 15N01, 16N02, and 16N03, which are all open to vehicular traffic year round. Of these, Road 15N01 which is classified as OML 5 (open to passenger vehicle traffic considering high driver comfort) is a surfaced all-weather road capable of haul year round. The rest of the roads in the planning area are a combination of aggregate surface and native surface roads designed for haul outside the wet weather season and would be subject to haul restrictions during wet weather. Most of these roads are classified as either OML 1 (closed to vehicular traffic), as OML 2 (open to high clearance vehicular traffic), or as OML 3 (open to passenger car vehicular traffic not considering driver comfort).

Existing NFS roads needed for the project would require maintenance and limited reconstruction to meet project requirements. There would be no new roads constructed and added to the Forest road system. All aggregate rock and water hole requirements for this project can be met from existing sources on National Forest lands. No new sources would be developed.

Ten roads and road segments totaling 24.91 miles that are currently open to vehicular traffic would require routine road maintenance to meet project requirements. Maintenance work would entail brushing, blading, minor drainage work, and spot rocking. Of these roads, two NFS roads are classified as OML 1 but functioning as OML 2; these roads are 15N63 and 15N36N. The other NFS roads and road segments have higher OML classifications. Their status would remain unchanged after the project is completed.

An existing road that connects to15N38 and accesses private and public lands is also currently open to vehicular traffic. As with the previously mentioned system roads, this unclassified road would receive routine maintenance, and its open status would remain unchanged after the project is completed.

Five NFS roads and road segments totaling 2.42 miles that are currently closed to vehicular traffic (OML 1) would be reopened temporarily for this project. They would be reconstructed or temporarily upgraded to an OML 2 classification for the duration of the project, and then re-closed upon completion of the project. The limited reconstruction prescribed would not result in realignment and would consist of brush and tree clearing, blading, and minimal drainage maintenance work. These roads include: 16N24A, 16N02H, 16N02S, 16N02T, and 15N39B.

The following table summarizes the proposed management of the system roads required for the Big Flat Vegetation and Fuels Management project.

Table 5. Road Management Summary

Road Maintenance				
Subdivision	**System Road Number**	**Objective Maintenance Level (OML)**	**Total Length (Miles)**	**Length Needed for Project (Miles)**
Grande	16N03	3	14.23	4.50
	16N24	2	1.10	0.77
Grande Subtotals			**15.33**	**5.27**
Jones	15N36	3	1.36	1.36
	15N36N	1	2.60	1.30
	16N02	3	21.63	6.75
Jones Subtotals			**25.59**	**9.41**

South	15N01	5	18.30	4.70
	15N38	2	2.90	2.50
	15N39	3	2.03	2.03
	15N63	1	0.50	0.50
	Unclassified	N/A	0.50	0.50
South Subtotals			**24.23**	**10.23**
Project Totals			**65.15**	**24.91**
Road Reconstruction / Re-closure				
Subdivision	**System Road Number**	**Objective Maintenance Level (OML)**	**Total Length (Miles)**	**Length Needed for Project (Miles)**
Grande	16N24A	1	0.65	0.65
Grande Subtotals			**0.64**	**0.65**
Jones	16N02H	1	0.40	0.40
	16N02S	1	0.64	0.64
	16N02T	1	0.50	0.23
Jones Subtotals			**1.54**	**1.27**
South	15N39B	1	0.50	0.50
South Subtotals			**0.50**	**0.50**
Project Totals			**2.68**	**2.42**

Project Design Features and Monitoring Requirements for the Proposed Action Alternative

Project Design Features are incorporated into the design of the project activities described above and are intended to reduce, minimize, or eliminate impacts to various natural and human resources and ensure the project is in compliance with the resource protection standards and guidelines of the Six Rivers National Forest LRMP, the Region 5 Soil Management Handbook (FSH 2509.18), and the *2001 Record of Decision for Amendments to the Survey and Manage, Protection Buffer, and Mitigation Measures Standard and Guidelines* as updated by the 2003 Annual Species Review. The design features identified through an interdisciplinary team review are listed below by resource.

Soil Productivity

1. End lining would be used to minimize the skid trail density. No full-bench skid trails or roads would be constructed. "Logical" flat openings would be used as processing areas to limb and buck trees, and then logs would be skidded to landings for loading onto trucks.

2. Tractor skid trails would be limited to less than 15 percent of the treated area. Where appropriate, measures such as deep tilling, ripping, skidding over down limbs, and limiting the number of equipment passes over an area would be applied to minimize compaction.

3. Skid trails would generally be located on ridge tops, flat benches, or existing skid trails to minimize soil displacement and allow for proper drainage.

4. Skid roads would be water barred or outsloped after skidding operations are complete.

5. Where adverse skidding may occur on steeper slopes, skid trails would be mulched with certified weed free straw and slash after skidding operations are completed.

6. Tractor skidding would be limited to slopes less than 35%.

7. Skid roads would be water barred or outsloped after skidding operations are complete.

8. Controlled burning prescriptions in all units, including the meadow (F-22), would be designed and implemented when soils are wet enough to minimize potential impacts to soil quality while still meeting fuel reduction objectives.

9. At least 90% of soil porosity on at least 85% of the unit area would be maintained.

10. Existing down coarse woody debris (CWD) would be retained wherever possible; at a minimum, five pieces of coarse woody debris per acre would be maintained as a source of organic matter for surface organisms (LRMP Appendix L-1).

11. At the end of project activities, a layer of litter and duff should occur over at least 50% of the activity area (LRMP Ch. 4 Sec.6-14; R-5 Soil Quality Standards 1a, b, c (1)).

Wildlife

1. Shaded fuelbreak construction may occur in suitable threatened, endangered and sensitive species habitat. No overstory trees or overstory canopy would be removed; however, in areas where the existing overstory canopy closure is low (but greater than 40%) treatments in secondary or understory canopy layers should maintain a minimum overall total canopy closure of 60%.

2. The project would not remove potential threatened, endangered, and sensitive species nest trees (predominants) or affect the canopy around potential nest trees.

Directional falling would be used to protect all predominant trees and any tree forming a canopy around the predominants.

3. Snags and logs would be retained as per Six Rivers National Forest Land Resource Management Plan, Standard and Guidelines Table IV-8, and Appendix L. Treatments within Late-Successional Reserves, Riparian Reserves, Critical Habitat Units, and suitable Northern spotted owl habitat (regardless of land allocation) would maintain snags (20” dbh and greater or the largest available in younger seral stages) and downed logs (20” and greater and at least 10 feet long or the largest available) at the 80 to 100% level, unless they pose a safety hazard or would not meet fuel treatment objectives. Hazard trees are defined as any tree that is dead, dying, or showing signs of failure that has the potential to hit the area of operations (leaning toward the site and is within tree-height distance).

4. Surveys for goshawk in the project area are in progress and would be completed in 2008. If nesting goshawks are found within 0.25 miles of any treatment units, a limited operating period (no activities between March 1 and August 31) would be imposed.

5. In early seral stage stands lacking downed woody debris (shrub and pole seral stages), small diameter slash would be piled and left on site to provide cover for small mammals, birds, reptiles and amphibians. The size of the piles would vary depending on the availability of slash; however the preferred size is at least 10 feet in diameter and 4-6 feet tall. Small diameter debris decomposes quickly, so large piles may have greater longevity. The number of piles per acre would be moderated with fire risk. In high public use areas, only 1 or 2 piles per acre would be left in the stand. In other areas 3 to 4 piles per acre would be left in the stand. No piles would be left within 100 feet of roads.

Port-Orford-Cedar Root Disease

To reduce the risk of introducing Port-Orford cedar root disease into the project area, the following would be implemented:

1. Limit road reconstruction and decommissioning to the dry season only.

2. Limit operating season of the timber sale to the drier months. No operations may occur between October 15th and May 15th without written approval by the Forest Service.

3. No surface maintenance on gravel roads would occur when road conditions are wet (such as during or immediately after rainfall).

4. Equipment must be washed before entering the project area or leaving the area at a place approved by the Forest Service. Wash mud and dirt from earth moving, yarding, loading, and other support equipment prior to beginning work on the project site and following completion of work. Use chlorinated water to wash all vehicles and heavy equipment.

5. Constrain timber haul and purchaser vehicle access so that vehicles do not travel from an infected to un-infected area.

6. Avoid using water for dust abatement that may be potentially infected with root disease. If a potentially infected water source must be used, treat with Clorox brand chlorine bleach before application (1 gallon of Clorox per 1000 gallons of water). Use chlorinated water to wash all vehicles and heavy equipment.

Water Quality and Riparian Reserves

1. Thinning and burning in Riparian Reserves (RRs) would be allowed to within either 50 feet of all stream channels, or the break in slope at the edge of the inner gorge, whichever is greater. 50-foot inner gorge no-treatment buffers are expected to protect streams from: 1) impacts to water quality resulting from ash due to burning, 2) sedimentation from ground disturbance involved in thinning and removal, and 3) temperature and microclimate impacts from canopy reduction immediately adjacent to the channel.

2. Ignition may occur within RRs only when necessary to minimize underburn intensity and/or the potential for burning material to roll down into a RR.

3. No fire line would be constructed within RRs

4. No ground disturbing machinery would operate within RRs. Thinning and release work within RRs would be accomplished with small gas powered hand tools (e.g. chainsaws, brush cutters, etc.). Removal of trees and vegetation may occur by cable yarding upslope with a yarder located outside of the RR. Directional felling away from the stream bank is required for all vegetation removal within the RRs.

5. Canopy closure in RRs would be maintained at 60% or greater.

6. Hand piling and pile burning may not occur within 50 feet of any stream, and may only occur within a RR if the hand piles are 6 feet or less in diameter, and less than 6 feet in height.

7. Best Management Practices (BMPs) would be followed for activities associated with the project to be in compliance with the Clean Water Act. Refer to Appendix C of this EA.

Botany

Survey and Manage Plant and Fungi Species

1. With the exception of hand removal of dead fuels as necessary, no activities shall occur within an approximate 25-foot radius of trees occupied by *Lobaria oregana* in the following fuel treatment units: F-1, F-2 (two sites), F-8, F-10, F-11, F-13, F-15, F-16 (two sites), F-20 (five sites), and F-22, F-23, F-24, and F-29. Where *Lobaria oregana* occupies more than one tree within less than 50 feet from one another (Units F-2, F-16 and F-20), the buffer shall incorporate the aggregate of trees that comprise the known site.

2. No activities shall occur within a 25-foot radius of occupied trees in the following timber stand improvement units: TSI-7 (one site), TSI-29 (one site consisting of multiple pre-dominant trees). No activities shall occur within an approximate 30-50-foot radius (variable size to accommodate sub-canopy trees in the buffer) in CH-4 (one site).

3. Design features under Sensitive species would be required for a known site of *Sowerbyella rhenana* (also a Survey and Manage fungus species) in unit F-15.

Sensitive Plant and Fungi Species

1. Application of design features stated above for *Lobaria oregana* in unit F-22 would alleviate direct impacts to *Ramalina thrausta*, a Sensitive lichen species which was also detected at that site.

2. Maintenance of at least 60% canopy cover and 80-100% downed logs in greater than 80 year old stands, use of end lining to minimize skid trail density, limiting skid trails to less than 15 percent of the treated areas, maintenance of litter and duff over 50% of the activity area, and maintenance of at least 90% of soil porosity over at least 85% of the unit area would be required to maintain habitat components for Sensitive species.

Noxious Weeds

1. Equipment cleaning measures identified under Port-Orford-cedar design measures would be implemented to reduce the risk of incidental import of noxious weed seed on equipment to uninfected areas.

2. Scotch and French broom occurrence sites were identified and flagged within unit F-22 and roadside adjacent to the following units: F-3, F-15, F-17 (2 sites), F-18 (2 sites), F-20, F-21, F-24, CH-34, and TSI-29.

    a. To reduce the risk of spread in Unit F-22, woody material removed in the course of the fuel treatment would be piled on top of the broom sites and burned to kill above-ground plants and seed stored in the bank. Post-treatment monitoring would be conducted in the first and subsequent years (up to five) to determine needs for follow-up treatments.

    b. For all other occurrences, Scotch and French broom would be treated by hand-pulling, and if over 2 inches in diameter, a weed wrench would be used to avoid breaking the base of the shrub.

3. Use of any foreign material (e.g. rock aggregate, mulch) shall come from a weed-free source.

Air Quality

1. Dust abatement with water or other abatement material would be required during hauling operations.

2. Burning would only be conducted on days approved by the North Coast Unified Air Quality Management District.

Visual Quality

1. Stumps would be flush cut to the ground in portions of units visible from the main travel routes within Recreational River corridors.

Monitoring Requirements

Monitoring is an ongoing process by which the effectiveness of planning and accomplishment are measured. Implementation monitoring focuses on ensuring that activities and design features specified in the planning process are carried out; they include the following:

1. The layout forester would ensure that all unit design features are accomplished.
2. The location of buffer areas and noxious weed locations would be delineated in the field, on project area maps, and on stand record cards.
3. The layout forester or silviculturist would inspect the mark to ensure that marking guidelines are followed.
4. The timber sale contract preparation officer would include all relevant contract clauses in the timber sale contract package that are needed to fulfill the specified design features of the project.
5. Key specialists in the interdisciplinary team would check the contract document to ensure that all design features specified in the environmental assessment are included in the contract.
6. The timber sale administrator would ensure that all contract clauses are enacted.
7. Members of the interdisciplinary team may conduct field reviews during timber sale and post harvest operations to ensure project design feature implementation.
8. Post burn evaluations would be conducted on prescribed burning operations to determine implementation success in terms of fire behavior and resource objectives.

Effectiveness monitoring would be conducted for the following:

1. Implemented Best Management Practices (BMPs). Onsite evaluation of BMPs would be conducted according to protocols established by the Best Management Practices Evaluation Program (BMPEP).
2. Effectiveness of noxious weed mitigations. Roadsides, landings, or other areas disturbed in the course of project implementation shall be monitored one year after project completion to ensure weed seed was not introduced. Additionally, known sites shall be monitored to ensure noxious weed occurrences did not increase at or move beyond existing sites as a result of project implementation.
3. Photo points would be established to monitor the effectiveness of prescribed treatments in achieving the objectives of the project.

Multiparty Monitoring under the HFRA

The HFRA contains provisions requiring that the Forest Service monitor the results of a representative sample of authorized hazardous-fuel-reduction projects and submit a report

every five years that includes an evaluation of the progress toward project goals and recommendations for project modifications.

Section 102(g)(5) of the HFRA instructs the Forest Service to establish a collaborative multiparty monitoring, evaluation, and accountability process when interest is expressed in such an approach. The process would be used to assess the positive or negative ecological and social effects of authorized fuel-reduction projects.

Alternatives Considered but Eliminated from Detailed Study

One alternative that was suggested by a respondent was considered but eliminated from detailed study in this EA. The suggested alternative would forego the cutting of trees greater than 20 inches diameter at breast height (dbh) in one proposed harvest unit in the South subdivision (allocated to Prescribed Timber Harvest under the LRMP). The intent of this design was to mitigate for deficiency of late-successional conifer stands in the vicinity of the project area by leaving more large trees in the unit.

The purpose and need for the proposed action is to accelerate the development of late-successional habitat. To that end, commercial thinning prescriptions were designed to maintain the largest and healthiest trees in the stand. Under the prescription, the limited number of trees 20 inches dbh or greater in that one unit (natural early-seral stand) would only be taken when removing them would improve growing conditions for the neighboring larger, dominant trees.

The alternative was considered yet not further evaluated because it would not fully achieve the purpose and need for the project. Moreover, it would have limited effectiveness in addressing the concern for the late-successional stand deficiency inherent to the project area.

Comparison of Alternatives

This section provides a comparison of the two alternatives considered in detail on the basis of attributes and connected actions. It also compares the alternatives by how well they meet the project objectives described in the Purpose and Need section, and by estimated effects on resource values discussed in Chapter 3.

Table 6. Comparison of Alternatives by Attributes and Connected Actions

Design Attribute/Connected Actions	Alternative 1 No Action	Alternative 2 Proposed Action
Commercial Harvest / Activity Fuel Treatments (CH Units)		
Commercial Thinning Area (acres)	0	503
Total Timber Volume Yield (MBF)	0	4,128
Tractor/Mechanized Harvester (acres)	0	356
Cable Yarding (acres)	0	147
Existing Landings Reutilized	0	45
Existing Temporary Roads Reutilized / Decommissioned (miles)	0	4.21
Hand Piling and Burning (acres)	0	503
Underburn/Hand Line Construction (acres)	0	138
Biomass / Fuelwood Utilization Opportunities (acres)	0	331
Timber Stand Improvement / Activity Fuel Treatments (TSI Units)		
Pre-Commercial Thinning Area (acres)	0	581
Hand Piling and Burning (acres)	0	430
Roadside Chipping (acres)	0	12
Mastication (acres)	0	30
Lop and Scatter (acres)	0	109
Biomass/Fuelwood Utilization Opportunities (acres)	0	230
Fuel Treatments (F Units)		
Shaded Fuelbreak Constructed (acres)	0	735
Hand Cutting of Brush and Trees (acres)	0	551
Hand Piling (acres)	0	551
Pile Burning (acres)	0	551

Design Attribute/Connected Actions	Alternative 1 No Action	Alternative 2 Proposed Action
Underburn in Conifer Stands (acres)	0	153
Underburn in Meadow (acres)	0	5
Biomass/Fuelwood Utilization Opportunities (acres)	0	152
Project Wide (CH, TSI, and F Units)		
Shaded Fuelbreak Constructed (acres) **(miles)**	0 0	735 19.75
Hand Fireline Construction (feet)	0	38,970
Biomass / Fuel Wood Utilization Opportunities (acres)	0	713
System Road Management		
Road Maintenance (miles)	0	24.91
Road Reconstruction / Re-closure (miles)	0	2.42

Table 7. Comparison of Alternatives by Estimated Effects

Purpose and Need Element	Alternative. 1 No Action	Alternative 2 Proposed Action
Fuel Reduction in Strategic Locations Relative to the WUI and LSR		
Shaded Fuelbreak Constructed (acres)	0	735
Fuel Loading	High	Reduced
Predicted Fire Behavior	High	Reduced
Fire Risk along Travel Routes	High	Reduced
Fire Suppression Effectiveness	Low	Improved
Habitat Restoration in Early Seral Stands and Meadow		
Average Pole Stand Basal Area (sq. ft/acre)	220-280	80-120

Purpose and Need Element	Alternative. 1 No Action	Alternative 2 Proposed Action
Average Stand Density Index in 50 Years for Young Pole Stands (currently at 320)	407	259
Predicted # of Trees > 20 in. dbh per Acre in 50 Years for Young Pole Stands	39	50
Early Seral Stage Stands Treated (acres)	0	1084
Meadow Restoration (acres)	0	5
Other Environmental Components	**Alternative. 1 No Action**	**Alternative 2 Proposed Action**
Soil Productivity / Soil Quality Standards Met	n/a	Yes
Water Quality / Potential Sediment Yield (WEPP Model) (cu yd)	7,786	795
Riparian Reserves Improved (acres)	0	47.7
Cumulative Watershed Effects (%ERA) (range of watershed values)	0.2%-3.7%	0.3%-4.3%
Wildlife--Threatened, Endangered and Sensitive Species	No Effect	May affect. not likely to adversely affect; long term beneficial effect
Fisheries—Threatened, Endangered and Sensitive	No Effect	May affect. not likely to adversely affect; long term beneficial effect
Botany--Sensitive and Survey & Manage Species	No Effect	No Effect w/ PDFs
Invasive and Noxious Weed Species / Risk of Spread	Low	Low w/ PDFs
Port-Orford-Cedar Root Disease / Risk of Spread	Low	Low w/ PDFs
Economics / Present Net Value of Total Project ($)	0	-$1,335,440
Economics / Economic Viability of Commercial Harvest Component—Projected Bid Value to Purchaser ($)	0	$455,731

Chapter 3 - Environmental Consequences

Introduction

This chapter describes the important effects of each alternative, including direct, indirect and cumulative effects. It also presents the scientific and analytical basis for the comparison of alternatives. The first section of this chapter provides an overview of past, present, and reasonably foreseeable actions and events that would be considered in the analysis of cumulative effects for various resources. The second section compares the effects of the Proposed Action and No Action relative to achieving the objectives of the purpose and need for the project. The final section summarizes effects on environmental components that warrant mandatory disclosures required by laws, regulation, and policy. Comparison of alternatives relative to the project objectives and effects on key environmental components discussed in this chapter are summarized in Table 7 in the preceding chapter.

The discussion of effects uses existing information included in the Six Rivers LRMP, Smith River LSR Assessment and Watershed Analysis, Del Norte County Fire Safe Plan, and other sources as indicated. Where applicable, pertinent information from other documents is briefly summarized and referenced. The planning record includes all project-specific information, including specialist reports, project planning meeting notes and other results of field investigations. The planning record also contains information resulting from public involvement efforts. The planning record is located at the Smith River NRA Ranger District in Gasquet, California, and is available for review during regular business hours. Information from the record is available upon request.

Cumulative Effects Analysis Assumptions

Cumulative effects analysis requires consideration of past, present, proposed, and reasonably foreseeable actions on both Federal and non-Federal lands. Many of the environmental effects analyzed in this EA are based on Six Rivers National Forest vegetation mapping, as well as other Federal and private lands harvest history records. Vegetation mapping was updated using 2000 aerial photo imagery and includes all Federal and private lands within the Forest's administrative boundary. It is assumed that all harvest activities affecting forest vegetation prior to 2000 were accounted for in the mapping. The vegetation layer for the North zone was updated to 2006 for this project to reflect natural disturbance and management induced changes since 2000. There have been no management actions in the project area that would have affected vegetation since 2006.

Cumulative effects analyses are conducted at various temporal and spatial scales, depending on the resource value analyzed. The following section provides an overview of the past, present, and reasonably foreseeable future actions or events that occur within the bounds of the Lower Hurdygurdy Creek, Middle Jones, Lower Jones Creek, and the Blackhawk/Yellow-jacket Creek watersheds, and the Haines Late-Successional Reserve (LSR 303).

Past, Present, and Reasonably Foreseeable Future Actions

The project area incorporates the community of Big Flat. Private land activities include agriculture, grazing, domestic use, timber harvest, and fuel treatments. Timber harvest has occurred and is expected to continue on the privately owned timber ground. There are no known proposed Timber Harvest Plans being considered on non-Federal land parcels at this time.

On Federal lands, past actions and events included timber harvesting, mining, recreational trail projects, and wildfires have occurred. Road building, including temporary roads and skid trails, has occurred throughout the watersheds and LSR and generally been associated with timber harvesting.

Reasonably foreseeable future actions include private, county, state, and federal actions that are in any stage of project planning and those for which decisions have been made and are awaiting implementation. On Federal lands, planning for the Coast to Crest Trail Project was completed in 2007 and is scheduled to be implemented in 2009. A portion of the trail will be constructed or reconstructed (much of the historic trail still exists) in the Big Flat project area. Another Forest Service action includes implementing the recommendations of the Smith River NRA Roads Analysis Process (RAP) completed in November of 2005, which would call for re-classification of inventoried roads by objective maintenance levels, additions of non-system roads to the NFS system, and road decommissioning. The recommendations are being evaluated in the Smith River NRA Road Management and Route Designation Project EA which is pending a decision at this time.

Effects on Elements of the Purpose and Need

This section compares the Proposed Action with No Action relative to the purpose and need objectives for the project. As described in Chapter 1, the objectives are:

- Reduce hazardous fuel loading in strategically located high-risk areas to enhance the defensibility of the community of Big Flat, and to protect existing late-successional habitat within the LSR.
- Accelerate development of late-successional habitat characteristics in plantations and young natural stands and restore ecological conditions in a special habitat (meadow).

The attainment of these objectives centers on the estimated response to proposed silvicultural activities on vegetation and fuels in the stands targeted for treatment. The modeling program Forest Vegetation Simulator (FVS) and its Fire and Fuels Extension (FFE) were used to develop and test restoration prescriptions and to compare effects of the Proposed Action with the No Action alternative. The FVS (Dixon, 2003) starts with general information about existing stand condition, then projects growth and development later in time. The model was designed using years of forest inventory data about how stands grow and develop in this region of the United States. The model was customized by collecting and inputting stand measurements from selected plantations and young natural stands in the project area (collected in 2006). This addition of site-specific information (such as tree species, tree diameter and number of trees per acre) adjusted the model and improved its ability to forecast how stands would grow and develop under the alternative scenarios of treatment vs. no treatment. The results of the modeling provided

measures and basis for comparison of the alternatives, such as projected number of large trees per acre, fuel loadings, and number of dead trees per acre.

The FFE component of the model was used to project how fire would behave (height of flames, rate of fire spread, severity, etc.) in stand conditions that would be present under the Proposed Action and No Action alternatives. Since fire burns differently under different weather conditions, the FFE model was customized by inputting data recorded at a local weather station). By using the FVS-FFE model, it was possible to project what proportion of treated stands would probably be killed under a late summer wildfire scenario in the project area.

Fire and Fuel Conditions

This section discloses the effects of the alternatives on fuel loading, predicted fire behavior, and fire suppression effectiveness within strategic locations relative to the community of Big Flat Community and the LSR. The strategic locations were defined as designated fuelbreak areas determined by the Del Norte CWPP and District fuel specialists. The prescribed shaded fuelbreaks which encompass approximately 735 acres and run parallel to 19.75 miles of major travel routes would be constructed through and would form the basis for the following discussion on effects to these fuels and fire elements.

Alternative 1 (No Action)

Direct and Indirect Effects

Under the No Action alternative, no commercial thinning, timber stand improvement (pre-commercial thinning), fuels treatments or strategically located shaded fuelbreaks would be constructed. The No Action alternative would not change the current conditions. There would be no direct effects on fire behavior specifically to the torching index and potential flame lengths. There would also be no direct effect to the fuel loading. Aggressive fire suppression would continue to be the only strategy available during critical fire weather periods.

Fuel treatments would not occur, so no reduction in predicted fire behavior (torching index, flame length) and fuel loading, or increase in fire suppression effectiveness would result. Fire severity and intensity would continue to compound as crown fire potential continues to increase through time and space. LSR 303 would continue to be at risk to wildfire. Impacts of wildfires to private property would likely increase and effectiveness of roads as safe evacuation routes or safe access for fire suppression forces would be reduced. There could also be increased impacts from fire suppression activities (more use of dozer lines as control features).

Cumulative Effects

With no fuel reduction treatments, fuels would continue to build and contribute to increased impacts from wildfires and contribute to reducing the effectiveness of fire suppression efforts. Wildfires would continue to be suppressed in order to protect resources and property. If fire suppression continues to be successful, the no-action alternative would allow for vegetation to continue to grow denser and increase the risk for high-intensity wildfires.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

There would be immediate effects to fire behavior and fuel loading. Available canopy fuels would be decreased in the commercial thinning units decreasing the crown fire potential. Available brush and understory canopy fuels (live fuels) would be decreased in the fuel treatment units and dead fuel loading would also be decreased resulting in a reduction in potential fire behavior. The available live and dead fuels in the TSI units with hand piling and burning of activity fuels would also result in a reduction in potential fire behavior. TSI units with lop and scatter type fuels treatment would have neither an increase nor a decrease in potential fire behavior, and would remain near pre-treatment fire behavior potential (which is high). Those units treated with a lop and scatter prescription are more remote and inaccessible, and therefore generally have less potential for human caused ignitions.

Potential fire behavior would decrease and fire suppression effectiveness would increase. There would likely be less potential impacts to private property. The effectiveness of using roads for evacuation routes would be increased along with safer access for fire suppression resources. There may be some associated risks during the implementation of prescribed burning, but this risk would be carefully assessed and mitigated as much as possible. Understory burning projects would be conducted when weather and fuel moisture conditions are appropriate to achieve a "cool" underburn. Fuel moistures and humidity are monitored to assure that the prescriptions are met. Burn prescriptions are designed to prevent severe burn levels, maintain a cover of fine organic matter on at least 50% of the burn area (USFS Region 5 Soil Quality Standards and Guidelines), retain large down woody material and snags, and to result in light impacts to the canopy level of conifers and hardwoods. The objective is to keep flame lengths low, to minimize mortality of residual live trees.

With large areas of reduced fuel loading, suppression forces could, with more confidence of success, consider using roads and riparian areas for control features rather than dozer lines.

Cumulative Effects

The project is located near the community of Big Flat in Del Norte County CA in the headwaters area of Jones and Hurdygurdy Creeks, along the western edge of the Klamath Mountains physiographic province. The project boundary encompasses the Wildland Urban Interface (WUI) surrounding the Big Flat community. The current vegetation consists of predominately Tanoak/Douglas-fir stands in a mix of seral stages distributed in a fragmented pattern across the landscape. Past human caused disturbances such as aboriginal burning, cattle and sheep grazing, and mining has had an impact on the area. More recent management activities such as logging and recreation have had a significant impact on the seral stage distribution.

Fire regimes within the project area have been altered by fire suppression, logging, mining, and wildfire occurrence. Aggressive suppression activity over the last 80 years has resulted in unnatural fuel profiles that are more continuous, both horizontally and vertically. Given a fire start, resulting wildfires could become larger and more destructive than in the past. The absence of fire has decreased the abundance of some old-growth forest types that are dependent on frequent, low intensity fires. Weather

variations, whether related to long-term droughts or possible climate change trends, may also increase the number of dead trees and the amount of dead fuels.

As with most of the western National Forests, the suppression of wildfire in the project area has led to changes in successional pathways and increases in fuels, especially in plant communities that are fire dependent. There has been a reduction in old-growth forests and an increase in shrub, pole, and early mature forests. This shift in seral stage distribution is highest in the tanoak and Douglas-fir series, due to harvest of commercially valuable old-growth Douglas-fir stands that began in the late 1950s. Young plantations now occupy most of the harvested old-growth sites on National Forest system lands. Early and mid seral stages of Douglas-fir are more susceptible to mortality by wildfire than older late seral stands. Thick, corky bark on the lower bole and roots of older trees protects the cambium from heat damage. In addition, the tall trees have their foliage concentrated on the upper bole, which makes it difficult for fire to reach the crown; however, trees are typically not free of lower branches until they are more than 100 years old (Hermann et al, 1990). Stands of Douglas-fir in the Big Flat project area are mostly early and mid seral stage, and approximately 80 or less years old.

A fire regime is the temporal and spatial pattern of fire occurrence and effects, typically described by fire return interval, seasonality, frequency, and severity. Fire regimes vary with soil, climate, topography, vegetation, fire causative agents, and even previous fire patterns (Atzet and Martin 1991). The Smith River NRA is in the dry to intermediate terrestrial physiographic province. This indicates that fire has been the dominant forest disturbance factor. Typical fire return intervals and fire severities have been found to be highly variable, and wildfires did not always result in complete stand mortality. Adams and Sawyer (1980) analyzed fire scars within the Douglas-fir dominated mixed evergreen vegetation type on the Six Rivers National Forest. Their results showed a mean fire free interval of 21 years for the Smith River NRA

From the period of 1909 to 1994, fire suppression on the Six Rivers National Forest resulted in a reduction of acreage burned annually from nearly 10,000 acres per year to less than 900 acres per year in 1994 (Jimerson, et al. 1996). From 1978 until 2007, based on the most recent thirty years of statistical fire information available, 443 fires burned a total of 33,124 acres on the Smith River NRA (Six Rivers NF unpublished). Table 8 shows statistical fire information in 10-year intervals including number of fires and acres. The average acres burned for the past 10 years (1,104 acres per year) mimics available fire statistics prior to 1909 of nearly 10,000 acres per year; however fire severity and fire intensity is likely entirely different, resulting in more stand-replacing fire events. The primary fire cause for the past 30 years is human with 320 human caused fires from 1978 to 2007. The second highest fire cause for the same period is lightning at 123 fires.

Table 8. Smith River NRA Fire History, 1978-2007

Period	# of Fires	Acres
1978-1987	84	542
1988-1997	124	948

Period	# of Fires	Acres
1998-2007	235	31633
TOTAL	**443**	**33,124**

Table 9 shows the reduction of acres burned in the project area since 1960.

Table 9. Project Area Fire History

Period	# of fires	Acres
1960-1969	12	418
1970-1979	6	5
1980-1989	7	2
1990-1999	24	6
2000-2007	10	1
TOTAL	**59**	**432**

The dramatic reduction in wildfire burn acreages over the last 80 years appears to have resulted in unnatural fuel profiles that are more continuous, both horizontally and vertically. Panoramic views from the Smith River NRA's lookouts from 1934 photos show a more open landscape, with greater amounts of shrub fields and open meadows. Given this increased conifer density, future wildfires could become larger and more destructive than in the past. Some mortality can be expected as a result of wildfires and, to a lesser extent, understory burning.

Fire regime has been disturbed and many areas have fuel build-up. The natural fire regime of the area is generally comprised of frequent low intensity surface events ('ground cleaning' or litter burning events with little tree mortality) with infrequent high intensity events (which produced patches of overstory mortality). The fire types most important in determining the vegetation patterns are not the infrequent, severe stand replacement fires, but rather the frequent low-moderate intensity fires. Frequent low-to-moderate severity fire was one of the more important ecological processes in the Klamath Province. The structure, composition, productivity and overall health and vigor of today's forests are the consequence of various types of human intervention, and this includes long-term fire exclusion.

The goal of Big Flat Vegetation and Fuels Management Project is to create conditions for fire resilient/resistant forests and attempts to return fire to its natural place in the environment. Post-treatment, potential fire behavior would decrease and fire suppression effectiveness would increase. There would likely be less potential impacts to

private property. The effectiveness of using roads for evacuation routes would be increased along with safer access for fire suppression resources. Over time, as fuel treatments are implemented, the project would continue to reduce impacts from wildfires and increase fire suppression effectiveness.

Alternative Comparison

The following section discusses assumptions used in the modeling exercise to determine measures associated with fuel profiling and predicted fire behavior under the three treatment categories and compares the alternatives on the basis of these measures.

Shaded Fuelbreaks

Shaded fuelbreaks are created by altering surface fuels, increasing the height to the base of the live crown, and opening the canopy be removing small diameter trees, generally less than 8” diameter at breast height (DBH). By managing surface fuels and low crown stratum, fireline intensity and fire severity could be lowered to an acceptable level or below an identified critical level (Agee et al, 2000). Roadside shaded fuelbreaks are prescribed in approximately 735 acres of the Big Flat Project, primarily along major roads and connecting to other treatment units within the project area to provide connectivity and enhance strategic fire control across the landscape.

Creating shaded fuelbreaks and fuel treatment areas would provide defensible space and strategic control lines for firefighters, and would assist with the control efforts in the event of a wildland fire threatening the community and surrounding developed areas. In addition, shaded fuelbreaks reduce the wildfire impacts on existing late-successional habitat both by reducing the impacts of roadside ignitions and by breaking up larger blocks of fuel.

Shaded fuelbreaks have proven to be effective in reducing the effects of crown fire (Agee and Skinner 2005). The shaded fuelbreaks are designed to reduce ground and ladder fuels within 8 to 10 feet of the ground along high-use roads to limit the risk of fire disturbance on a large scale and to protect large tracts of late-successional habitat. No overstory trees would be felled. The fuelbreaks would occur in all seral stages. The focus of these fuel reduction treatments is to reduce and break up the continuity of the existing fuel bed at the ground level, and to reduce fuel laddering in the lower stratum of the stands where the risk of crown fire is high. The targeted fuel for removal is brush and suppressed saplings. The desired outcome is a mosaic of live fuel reduced in height with clean mineral soil.

Shaded fuelbreaks would be maintained on a 5-15 year interval.

Commercial Thinning / Activity Fuel Treatment (CH Units)

Stand and fuels information (stand exams) was collected in 2006 and used for inputs into the FFE-FVS model (Fire and Fuels Extension of the Forest Vegetation Simulator) for alternative comparisons in the proposed CH units. FFE-FVS evaluates potential fire behavior, stand mortality, and subsequent vegetation growth in the project area. All fire behavior modeling was done in order to estimate the severity that could be expected when a fire occurs during what is considered severe weather conditions. Late summer (August-September) weather conditions (hot, dry, windy conditions occurring on mid afternoons) are generally referred to as the severe weather conditions. The August

weather condition variables used in FFE-FVS simulations were taken from local weather stations and are shown in Table 3 of the Fuels Specialist Report.

Certain elements from the simulations were identified as indicators to compare effectiveness of each alternative. These elements are: flame length, torching index, and potential mortality % of basal area, and fire type.

- Flame length is the average length of the flame front from the ground to the flame tips and it is used as one measure of fire fighting effectiveness. The lower the flame lengths, the better it meets the goal of reducing adverse effects from wildfires
- Torching index is the 20-foot wind speed (mph measured 20 feet from the top of the vegetation) at which crown fire is expected to initiate. The torching index is a function of surface fuels characteristics, surface fuel moisture content, foliar moisture content, canopy base height, slope steepness, and wind reduction by the canopy. The higher the torching index, the better it meets the goal of reducing adverse effects from wildfires
- Potential mortality (% basal area) is the potential tree mortality measured as a percent of the basal area that would be killed under selected weather conditions (i.e., August for this exercise). The lower the potential mortality, the better it meets the goal of reducing adverse effects from wildfires.
- Fire type is the type of fire under August weather conditions. Definitions of fire types come from the National Wildfire Coordinating Group (NWCG) Glossary of Wildland Fire Terminology, and include surface, passive crown fire, and active crown fire (Table 10). Numerical fire type is an output of FFE-FVS and is based on vegetation density and is a good indicator of the effectiveness of fuel treatments.

Table 10. Fire Type Values and Interpretation

	Fire Type	Values	Interpretation
Surface Fire	Low	< 2	A fire that burns loose debris on the surface, which includes dead branches, leaves and low vegetation.
Passive Crown Fire	Moderate	2 -2.99	A fire in the crowns of trees with occasional torching of single trees and small groups of trees, ignited by the passing front of the fire. The torching trees reinforce the spread rate, but these fires are not basically different from surface fires.
Active Crown Fire	High	>3	A fire in which a solid flame develops in the crowns of trees, but the surface and crown phases advance as a linked unit dependent on each other, most of the crowns are burning.

The FFE-FVS simulations show pile burn treatments in CH units as the initial treatment, which would occur after 2011. The actual thinning would occur in 2009, 2 years prior to the burning of hand piles.

The FFE-FVS simulations show flame lengths that would be the result from the type of fire. Passive crown fires have occasional torching, which results in higher flame lengths than a surface fire. Active crown fires would generally have the highest flame lengths. FFE outputs for existing conditions of the CH units are predicted (based on flame lengths) as having active crown fire behavior. Fire behavior would be reduced to surface fire under the proposed action, and model outputs show that they achieve the desired future condition of reducing crown fire potential.

The Torching Index is an element associated with the units based on topography and slope position; however, treatment increased the Torching Index by up to 300%. The very large increase in Torching Index indicates that surface fuels and small ladder fuels have been reduced to result in the desired condition of this project. The increase in crown base height (in general from 23 to 29 feet) also indicates that the shorter ladder fuels would have been treated effectively. The Torching Index indicates conditions needed to initiate a crown fire. The models predicted extremely high wind speeds needed to initiate crown fires; however, these wind speeds would likely never be reached. Winds in excess of 100 mph would generally cause blowdown. The goal of treatments is to create a torching index that is greater than the typical August wind speeds.

The following table summarizes the pre-treatment (No Action) and post-treatment (Proposed Action) predicted fire behavior elements for the Commercial Treatment units.

Table 11. Average Fire Behavior Predictions for Commercial Harvest Units

	Flame Length (ft)	Torching Index (mi/hr)	Potential Mortality (% basal area)
Untreated CH Units	5.1	80	61%
Post Treatment	2.7	220	36%

Pre-Commercial Thinning /Activity Fuel Treatment (TSI Units)

Fuels information collected included fuel models and stand characteristics. Fire behavior was modeled using the BehavePlus 3.0.2 program. Fire behavior modeling in the TSI units with activity fuel treatment of hand pile and burn (76% of the TSI acres) shows a reduction in crown fire potential. TSI units with lop and scatter type fuel treatment would have neither a decrease nor an increase in potential fire behavior, and would remain near pre-treatment fire behavior potential. Those units treated with a lop and scatter prescription are more remote and inaccessible, and therefore generally have less potential for human caused ignitions. Fire behavior potential in the units with masticated fuel beds, are also reduced. Mastication would occur on approximately 30 acres of the 1,824-acre treatment acres (approximately 1.5%). Fire behavior in units treated by mastication is expected to be similar to fire behavior predictions of hand pile and burn units.

Fuel Reduction Treatment (F Units)

Fire behavior was modeled using BehavePlus. Fire behavior post treatment was modeled as a surface fire with a <3 foot flame length (down from 9.2-foot flame length with no treatment). The fire type in the fuel reduction treatment units (excluding the grass model) is estimated to be crown fire under the No Action; and fire type post treatment is estimated as surface fire. Fire Line Intensity (FLI) could reach 1,746 Btu/ft/s (the amount of heat released per foot of fire front per second) with no treatment. According to Rothermel (1983) a FLI of >1,000 Btu/ft/s would result in crowning, spotting, probable major fire runs, and ineffective control efforts at the head of the fire. After fuels reduction treatments the FLI is projected to be 28 Btu/ft/s which equates to fires that could generally be attacked at the head or flanks by persons using hand tools and hand fireline construction, effectively holding a fire (Table 12).

Using 10-year out modeling predictions, fire behavior transitions back to existing conditions (crown fire) based on anticipated re-growth of the shrub species without maintenance. Refer to Figure 3 in the Fuels Specialist Report for more details on projected re-growth.

Table 12. Fire Suppression Interpretations of Flame Length and Fireline Intensity*

Flame Length (ft)	Fireline Intensity (Btu/ft/sec)	Interpretations
< 4	<100	Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.
4-8	100-500	Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to hold fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective.
8-11	500-1,000	Fires may present serious control problems- torching out, crowning, and spotting. Control efforts at the fire head will probably be ineffective.
>11	>1,000	Crowning, spotting, and major fire runs are probable. Control efforts at head of fire are ineffective.

*Adapted from Rothermel et al, 1983.

Fuel modeling for timber stand improvement (TSI) and fuel reduction treatments were determined by using Scott and Burgan (2005). Fuel models are used to characterize the fuel loading and representative fuel type in an area.

Representative fuel models were used to predict Fire Line Intensity, Flame Length, and Rate of Spread for both pre-and post treatment units. TSI existing conditions or untreated units are based on two different fuel models (TU5 & SH7).

- **TU5 -** The primary carrier of fire in TU5 is heavy forest litter with a shrub or small tree understory. Spread rate is moderate; flame length moderate.

- **TU1** - The primary carrier of fire in TU1 is low load of grass and/or shrub with litter. Spread rate is low; flame length low.
- **SH7** - The primary carrier of fire in SH7 is woody shrubs and shrub litter. Very heavy shrub load, depth 4 to 6 feet. Spread rate lower than SH7, but flame length similar. Spread rate is high; flame length very high
- **SH2** - The primary carrier of fire in SH2 is woody shrubs and shrub litter. Moderate fuel load (higher than SH1), depth about 1 foot, and no grass fuel present. Spread rate is low; flame length low.
- **SB2** - The primary carrier of fire in SB2 is moderate dead and down activity fuel or light blowdown. Fine fuel load is 7 to 12 t/ac, evenly distributed across 0 to 0.25, 0.25 to 1, and 1 to 3 inch diameter classes, depth is about 1 foot. Blowdown is scattered, with many trees still standing. Spread rate is moderate; flame length moderate.

The following table summarizes fire behavior predictions (using Behave Plus) for TSI and fuel reduction units.

Table 13. Estimated Fuel and Fire Behavior Comparison of Alternatives 1 and 2

	Fuel Models	Fire Line Intensity (Btu/ft/sec)	Flame Length (ft)	Rate of Spread (ch/hr)
Timber Stand Improvement Units				
Untreated TSI Units	TU5	711	9.2	14.4
Post Treatment-After Hand Pile and Burn	TU1	32	2.2	4.3
Post Treatment-After Lop and Scatter	SB2	711	9.2	20.4
Timber Stand Improvement Units				
Untreated TSI Units	SH7	1971	14.7	49.5
Post Treatment-After Hand Pile and Burn	SH2	54	2.8	4.8
Post Treatment-After Lop and Scatter	SB2	1971	14.7	44.2
Fuels Reduction Units				
Untreated Fuels Units	TU5	711	9.2	14.4
Post Treatment-After Hand Pile and Burn	TU1	32	2.2	4.3

Summary

In general, the goal is to create conditions for fire resilient/resistant forests. All fuel treatment units would have at least a first treatment of thinning low ladder fuels (brush, and saplings <8" dbh), piling of the cut material and hand piling of natural fuels. Some units would receive a follow-up treatment of understory burning. Torching index is one of the indicators of success of treatments. The higher the torching index (which is the wind speed needed to initiate crown fires), the more effective the fuel reduction treatment on surface and ladder fuels. Flame lengths are also an indicator. Modeling done with FFE-FVS and BehavePlus on sampled units indicates torching index would be increased (positive effect) and flame length would be reduced (positive effect).

Accelerate Development of Late-Successional Habitat Characteristics in Plantations and Young Natural Stands

Two indicators modeled with the forest vegetation simulator (FVS) were used to compare the Proposed Action and No Action Alternatives. The first indicator was the predicted stand density index (SDI) in 50 years; and the second was the predicted average number of large diameter trees per acre in 50 years. First, some explanation of stand density concepts and terms is in order to better understand the use of SDI as an indicator of stand density and its effect on the growth and development of stands.

Stand Density Concept and Terms. The general term "stand density" is a measure of the amount of tree vegetation on a unit of land. It can be the number of trees or the amount of basal area, wood volume, leaf cover, or any of a variety of other parameters (Curtis 1970, Ernst and Knapp 1985). Stocking is the proportion that any particular measurement of stand density bears to a standard expressed in the same units. In other words, stand density is an absolute measure and tells us what actually exists, whereas stocking tells us whether a stand in question is understocked, adequately stocked or overstocked from a tree growth and development standpoint.

Silviculturists commonly use a relative density index to characterize stocking levels. A popular index in the western United States is *stand density index* (SDI), which is based on the relationship between tree size and the number of trees per acre (Daniel and others 1979, Reineke 1933). Perhaps the greatest advantage of SDI is its independence from site quality and stand age. This means that stands with the same average stand diameter (ASD) and number of trees per acre are "more alike in every way than stands of the same site and age" (McArdle and others 1961). SDI is an overall indicator of inter-tree competition for limited site resources, such as moisture, light and nutrients as affected by differing stand densities; and are reflected in individual tree growth, development and form.

Reineke (1933) discovered that any pure, fully-stocked, even-aged stand of a given ASD had approximately the same number of trees per acre as any other pure, fully-stocked, even-aged stand of the same species and ASD; he further found that the number of trees per acre at any ASD could be converted to an equivalent density at an ASD of 10 inches DBH. Thus Reineke's stand density index is the number of trees per acre at an ASD (or reference diameter) of 10 inches. This discovery was significant in that it allowed

comparison of stand stocking levels between stands with different density levels and ASDs. For example, if one stand has 200 trees per acre at an ASD of 9 inches and a second stand has 40 trees per acre with an ASD of 20 inches for an effective comparison of densities, the two density measures need to be reduced to equivalent densities at the same ASD, or 10 inches. In the first stand example the SDI is 185 and the second is 121. So in this example the first stand is denser; yet the basal area would indicate that the density is almost the same: 88.3 and 87.3 basal area, respectively. Thus, SDI is a more precise measure of stand density than is a basal area measure.

Finally, Reineke's work (1933) also showed that the growing space occupied by trees growing in fully-stocked, even-aged stands increased at a constant exponential (straight line) rate as the ASD of the stand increased. This relationship between ASD and density has been referred to as the self thinning rule because some individuals in the population must eventually relinquish their growing space (e.g., die) if surviving trees are to continue increasing in size.

Stand Density Index Indicator: As previously mentioned, the first indicator used was the predicted SDI in 50 years. We based the desired SDI on the requirements of Douglas-fir because it occupies the most growing space in plantations and natural stands within the project area. If growing space, indicated by SDI, is adequate for Douglas-fir, then it is assumed to be adequate for other conifer and hardwood tree species. Proposed treatments that modify stand conditions to move SDIs into the range from 164 to 274 over the next 50 years would allow conifers and hardwoods to optimize site resources for growth and development. That is, the greatest potential to accelerate development of late successional habitat characteristics would occur if stands were maintained within this SDI range. These represent the site-specific minimum and maximum SDI limits (or optimum range for tree growth and development) for Douglas-fir plantations and natural stands within the project area. That is, below an SDI of 164 a stand is considered understocked and the numbers of trees per acre present are not fully capable of utilizing the site's full capacity for tree growth and wood production. Above an SDI of 274, a stand is considered overstocked and competition for limited site resources become more pronounced and the amount of tree mortality increases over time as a result of self thinning. Managing a stand within the stated SDI range optimizes its capacity to grow a greater number of larger trees sooner, then if left to natural processes such as self thinning. Currently, the SDI in proposed commercial thinning plantations and natural stands average 320 (per stand), with a range of 227 to 451, the optimum being 164 to 274. Table 14 displays current SDI and modeled SDI in 50 years for the Proposed Action and the No Action alternatives. (A complete description of the FVS modeling results for this project can be found in the project Forest Vegetation and Silviculture Report, July 2008.)

Large Tree Diameter Indicator: The second indicator is the predicted average number of trees per acre larger than 20, 25 and 30 inches DBH in 50 years. Three diameter size breaks were used to show the differing rates at which stands develop large trees in these 3 size categories, depending on beginning tree diameters and stand density, which is quite variable. In fifty years, most of the plantation and natural stands would be 90 to 95 years of age. By this age, we would expect to see some large trees within stands, if they are on a trajectory to developing late-successional characteristics. Currently, the number of large trees per acre in proposed commercial thinning plantations and natural stands average 2.86 (20"+ DBH), 0.44 (25"+) and 0.26 (30"+), with a range of 0 large trees per acre in all diameter size classes on the low end to 10.83 (20"+), 4.75 (25"+) and 3.00 (30"+

DBH) on the high end. Table 14 displays the current and predicted number of large trees per acre by the aforementioned size classes in 50 years.

Note: For purposes of this discussion, the proposed commercial thin plantation and natural stands data was combined. This was done because the number (and acres) of natural stands proposed for treatment is relatively small compared to plantation stands; and so there was insufficient data to run reliable statistical averages and to discuss the effects in natural stands separately. In addition, no stand exam data was available for the proposed pre-commercial thinning stands, and so they could not be modeled in FVS. Regardless, general statements made concerning the effects tree competition has on stand growth and development over time, or the benefits of thinning, applies whether the stands in question are commercial thin (currently 40-45 years of age) or pre-commercial thin (currently 20-30 years of age) size plantations or natural stands.

Alternative 1 (No Action)

Plantations and Natural Stands currently 40-45 years of age - If left untreated, the average SDI in plantations and natural stands would increase from 320 to 424 in 50 years, with a range of 357 to 512 (ideal range is 164-274). Stand SDIs increase 32% on average in 50 years, and remain well above the maximum recommended SDI. Stands would continue to grow, but at an increasingly slower rate over time. This happens in a number of ways. As stand density (measured by SDI) increases, trees would lose the lower portion of their live crown canopy through inter-tree shading, as well as developing shorter and smaller limbs, both of which results in a loss of photosynthetic capacity needed for sustained tree growth. That is, as trees grow and become larger they need an ever increasing amount of photosynthetic capacity (i.e. green needles) to maintain the larger tree form. Competition would remain strong for limited site resources, such as moisture, light and nutrients. And the tree's natural defense mechanisms to protect against insect attack would be reduced over time due to increasing competition induced stress, as well as other stresses, such as a warming climate. Overall stand growth and development would thus be reduced over time.

Under this alternative, in 50 years, plantations and natural stands would have an average of 39.4 (20"+ DBH), 10.7 (25"+) and 1.5 (30"+) large trees per acre; ranging from 0 large trees per acre on the low end in some stands for all large DBH classes to 53.7 (20"+), 21.6 (25"+) and 4.8 (30"+DBH) large trees per acre on the high end in other stands for the given DBH classes.

Plantations and Natural Stands currently 20-30 years of age – Although stand exam information was unavailable to model these younger stands, the effects associated with the older stands would apply here as well since these younger stands would follow a similar successional pathway; the only difference being they are 10 to 20 years younger. That is, stand growth and development suppression resulting from high stand densities would negatively affect the younger stands as it did the older stands. Overall stand growth would continue to slow with time until self thinning or other natural event occurred that would open up some growing space for trees to grow to larger sizes. But this would be a very slow process when left to natural processes.

Increase in large tree diameters would follow similar processes and develop similar numbers at the same comparative stand age as in the older stands, with the only difference being these stands are 10 to 20 years younger.

Alternative 2 (Proposed Action)

Plantations and Natural Stands currently 40-45 years of age - With the proposed treatments, the average SDI would decrease from 320 to 160 (range 148 to 172) following treatment and would increase to an average of 359 (range 282 to 494) in 50 years. Stand SDIs are reduced 50% on average following treatment, and remain within the optimum SDI range (i.e. 164 to 274) for about 25 to 30 years, before increasing on average to an SDI of 359 in 50 years. Within this early period of improved growing conditions and reduced competition trees are putting on accelerated growth, as compared to the No Action alternative where natural conditions of increasing competition persist. Trees developing under these more open-grown conditions would retain a larger live crown canopy for a longer period of time, and have larger limbs and more dense crowns. Competition would not be as severe for limited site resources, and so more would be available for sustained tree growth and accelerating development of late successional characteristics. Trees would experience less overall stress, and so would have better functioning defense mechanisms.

Under this alternative, in 50 years, stands would average 46.8 (20”+ DBH), 13.0 (25”+) and 2.1 (30”+) large trees per acre; ranging from 11.3 (20”+), 0 (25”+) and 0 (30”+) large trees per acre on the low end to 66.9 (20”), 25.1 (25”) and 5.6 (30”) large trees per acre on the high end for the given DBH classes. This represents on average a 19% , 21% and 40% increase over the No Action alternative in the number of large trees resulting from the effects of commercial thinning greater than 20, 25 and 30 inches DBH, respectively.

Plantations and Natural Stands currently 20-30 years of age – Although stand exam information was unavailable to model these younger stands, the positive thinning effects associated with the older commercially thinned stands would apply here as well since these younger stands would follow a similar successional pathway as a result of improved growth conditions and reduced competition. That is, trees developing under more open grown conditions as a result of pre-commercial thinning would retain a larger live crown canopy for a longer period of time, and have larger limbs and more dense crowns. Competition would not be as severe for limited site resources, and so more would be available for sustained tree growth. Trees would experience less overall stress, and so would have better functioning defense mechanisms. These benefits would not occur in the No Action alternative.

Increase in large tree diameters would follow similar processes and develop similar numbers per acre at the same comparative stand age as in the commercially thinned older stands. The only differences being these stands are 10 to 20 years younger, and so the average number of large trees per acre would be proportionately lower. However, the average stand diameter would be larger, in 50 years, as opposed to the No Action alternative.

Summary

The following table compares the No Action and Proposed Action alternatives relative to predicted SDI and estimated number of larges trees per acre in 50 years. The desired SDI range for growth and development of late-successional characteristics, including the presence of large Douglas-fir, is 164 to 274.

Table 14. Comparison of Alternatives Relative to Predicted Stand Conditions in Commercial Thinning Stratum

				Modeled SDI in 50 Years		Current # of Trees per Acre by DBH	Modeled # of Trees per Acre by DBH in 50 Years		Percentage Change in Large Trees
Strata	**Acres**	**Stand Type**	**Current SDI**	**No Action**	**Proposed Action**		**No Action**	**Proposed Action**	
CT	475	DF	320	407	359	>30 inches = 0.26	1.5	2.1	+ 40%
						>25 inches = 0.44	10.7	13.0	+ 22%
						>20 inches = 2.86	39.4	46.8	+ 19%
Code Definitions: CT = commercial thinning in plantations and natural stands; DF = Douglas-fir									

Ecological Restoration of Meadow Habitat

The meadow area associated with Unit 22 is approximately 5 acres in size and composed of a mix of naturalized European annual grasses (e.g. sweet vernal grass, orchard grass, silver hairgrass), non-native forbs (e.g. narrow leaf plantain), and to a lesser extent native perennial grasses (e.g. wild blue rye, California fescue and California oatgrass) and forb species (yarrow, clover). Encroachment by woody species is occurring on the edges adjacent to the surrounding forest. Scotch broom, an invasive, non-native species, occurs at one site (less than 0.3 acres) in the meadow.

Low intensity underburning in the meadow is proposed to reduce the thatch accumulation of dead grasses, stimulate basal sprouting of the grasses, and reduce the extent encroachment by woody species (e.g. Douglas-fir seedlings or saplings, coyote bush). These objectives would result in an expected shift in species abundance and possibly composition. The direction of that shift—native or non-native—depends on such variables as burn season, existing cover of native or non-native species, and individual species development.

Removing the thatch provides patches of growing space for other species, allows light to reach the soil which stimulates germination, and warms the soil surface which can breakdown seed coats. Anecdotal evidence from studies of grasslands in central California suggests that the thatch has insulating properties that promote non-native grasses and suppress native seedlings (Evans and Young 1970). Under burning that removes the thatch would be expected to stimulate both sprouting of the remnant perennial grasses in the meadow and germination of seed in the soil. The latter may include both non-native and native species.

Burn season and burn interval would influence the direction of species abundance and composition. An increased cover of perennial grasses and forbs, forbs with underground roots (e.g. bulbs), and legumes, is a desired outcome. Mid to late-spring burns may target the non-native, annual grasses which at that time typically have undeveloped seed coats and are therefore in a vulnerable stage of development. Native forbs can maintain a year-round persistent seed bank, thus stimulated to germinate by spring burns.

Alternative 1- No Action

Under Alternative 1, no under burning would occur, therefore, there would be no direct or indirect effects as a result of treatment. However, with no intervention thatch would continue to accumulate which in turn would reduce incidence of seed bank germination and the amount of bare ground available for plant establishment and growth. This accumulation of thatch may perpetuate the cover of non-native annual species. Basal bud sprouting of native perennial grasses would not be triggered in the absence of disturbance or the stimulation of native bulb-producing plants. Woody species on the margins of the meadow would continue to grow and become established around the periphery.

While the benefits of reducing the cover of thatch, removing woody species and stimulating basal sprouting of remnant native perennial grasses would be lost under Alternative 1, the risk of potentially stimulating weed seed stored (i.e. annual grasses or forbs) in the soil is alleviated. Monitoring and treatment of the scotch broom site would not be consistently applied.

Alternative 2- Proposed Action

Under Alternative 2, desired outcomes related to reducing thatch and providing space and conditions suitable to plant germination and growth and removing encroaching woody species could be achieved. Burning in the spring would trigger sprouting of perennial grasses and subsequent development of a seed producing stalk. Spring burning may also result in germination of native forbs over non-native forbs.

Assuming the initial burn results in an increased cover of desirable species, regular burning (e.g. 5 year intervals) would be expected to continue the trajectory toward increased cover of native species over non-native.

Project design features pertaining to the site with scotch broom would kill the above ground (and reproductive) portion of the shrub and stimulate germination of seed stored in the soil at that site. Management of the seed bank with post-treatment monitoring and re-treatment of the seedlings over multiple years would be expected to fully contain if not eradicate the site.

Overall, implementation of Alternative 2 would be expected to have an overall beneficial effect shifting the abundance, distribution and composition of species in the meadow from a non-native dominated community to one with a higher cover of desirable native species than now exists.

Effects on Environmental Components that Warrant Mandatory Disclosure

Geology and Soil Productivity

The Big Flat project area is underlain by the Galice formation of the Western Jurassic Belt of the Klamath Mountains Geologic Province. The Galice formation is comprised of marine slate, meta-graywacke sandstones, and other sedimentary rocks metamorphosed to the green-schist facies. The western periphery of the project area is bounded by the Rattlesnake Fault, a northern extension of the South Fork Mountain Fault. This tectonic feature, known collectively as the Coast Range Thrust, separates the Coast Range

Geologic Province on the west from the Klamath Mountains on the east. The fault zone is exhibited as a broad, arcuate band of serpentenized rock. The Galice formation overlies ultrabasic marine rocks, primarily peridotite, of the Josephine Ophiolite sequence. This sequence of rock represents a deep crust/mantle interface.

Two large scale earthflow features were noted within the project area. One is near Muslatt Lake with its toe within the inner gorge of the south fork of the Smith River. The other underlies the South Kelsey trailhead. Neither of these features would be impacted by project actions with implementation of included project design features. Areas of active failures were noted within the inner gorge terrains of Blackhawk Creek, Jones Creek, and the South Fork of the Smith River.

The effects of each alternative on the soil resource will be assessed using the following Region 5 SQS (USFS, 1995a) and the Six Rivers NF's LRMP Standards and Guidelines USFS, 1995b). The assessment of each Standard and Guideline will be accomplished by the measurable parameters listed beneath each Standard and Guideline. The soil mitigation measures or project design features were developed to ensure that the project would meet these evaluation criteria.

1. **Maintain soil productivity by retaining organic matter on the soil surface and by retaining organic matter in the soil profile [LRMP Ch. 4, Sec. 3-3; SQS 1a, 1c, 1c (1)].**
   - Meet the recommended soil cover amounts (60-70%) in order to prevent accelerated erosion from exceeding the long-term soil formation rate.
   - Retain at least 50% cover as fine organic matter (<3 inch-diameter material) in all units.
   - Dedicate no more that 15% of a harvest unit to primary tractor skid trails, cable yarding corridors and landings.
   - Reuse existing skid trails and landings whenever practical.
   - Maintain at least 85% of the existing total organic matter in the upper 12 inches of soil.
2. **Minimize changes in the site's ability to cycle nutrients and maintain site productivity [LRMP Ch. 4, Sec. 6-14; SQS 1a, 1b, 1c (1)].**
   - Maintain at least 85% of the existing total organic matter in the upper 12 inches of soil.
   - Maintain 30-50% of existing duff mat (spatially).
   - Maintain at least 50% fine organic matter (<3 inches in diameter) on site.
   - Retain at least 60-70% soil cover in order to prevent accelerated erosion from exceeding the long-term soil formation rate.

3. **Retain Coarse Woody Debris (CWD) and protect existing CWD [SQS (2b); LRMP Ch. 4, Sec. 3-6].**
   - Protect existing CWD as much as possible by having machinery avoid larger diameter logs and using lower intensity fuel reduction methods.
4. **Minimize soil and litter disturbances resulting from ground based yarding and heavy equipment (LRMP Ch. 4, Sec. 3-5 and 6-16).**
   - Reuse existing skid trails and landings whenever practical.
   - No new constructed skid trails would be made.
   - Skidding equipment would be generally restricted to slopes <35%.
5. **Prescribed fire should be planned to minimize the consumption of litter and CWD [SQS 1a, 1c (2a), 1c (2b)].**
   - Prescribed underburning and hand piling would be used to maintain the recommend soil cover amounts and to protect appropriate levels of CWD.
   - Prescribed underburning and hand piling would be used to retain at least 50% cover as fine organic materials (<3 inches diameter).
6. **Maintain the functionality of the soil ecosystem by maintaining a sites ability to cycle nutrients and maintaining the biological components (fungi, arthropods, bryophytes) [LRMP 6-1, 6-2, 6-14(3c), 21-12 and 21-20].**
   - Dedicate no more that 15% of a harvest unit to primary skid trails and landings.
   - Maintain at least 50% fine organic matter on the soil surface and sufficient duff mat (30-50%)
   - Protect the existing CWD, especially the decomposition class 4 and 5 logs.

Each management activity will be rated for its ability to meet the applicable evaluation criteria by using descriptive terms (low, moderate, moderately high and high). A probability rating of moderate, moderately high or high is just an indicator on the likelihood of the evaluation criteria being met. This does not mean that the standard and guideline would not be met. The ratings are more like achievement expectations. As an example, not meeting the soil cover guideline does not imply that the standard and guideline was not met. It means that soil erosion would be a little higher than what management would like and that some soil material as well as nutrients would be lost. It would require a substantial departure from the cover guideline over an extended period of time to cause a significant reduction in soil productivity. A rating of low would imply that there is a strong likelihood that the standard and guideline would not be met.

Detrimental disturbance consists of two main types of disturbance: detrimental compaction and detrimental displacement. Detrimental compaction is compaction that results in a >10% decrease in soil porosity as measured at the 4-8 inch soil depth. Detrimental disturbance is where soil displacement of the topsoil removes greater than 15% of the soil organic matter in the upper 12 inches of soil (disturbed area must be greater than 1 square meter in size).

Alternative 1

Maintaining dense forest vegetation conditions in the project area increases the risk of more wildfire acres burned with moderate and high burn severities. Based on burn severity data from 1977-2002 on the Klamath NF, a future wildfire would burn approximately 14% of the project area with a high burn severity, 33% would be moderate severity and 53% would be a low severity. By doing nothing, the percent of high severity could increase to 20-25% depending on the amount of down larger fuels and weather conditions. Moderate severity could increase to 40% of the fire area. Wildfire surface erosion rates would vary from 0.45 to 5.7 tons/acre depending on slope, soil detachability and burn severity. Removal of the litter and duff layers in future fires would reduce soil mesofauna populations (organisms between 0.2 mm and 1 cm in size) and favor a fungal and bacterial system that reduces decomposition rates and nutrient cycling. Future wildfires would change the forest floor and increase the time frames for rebuilding the litter layer and mesofauna population recovery. Future wildfires would also cause organic matter decomposition rates to increase due to more sunlight and changes in organic litter composition.

Under this alternative, there would be no new soil disturbances. The level of existing detrimental soil disturbance within the project area would remain unchanged. Nutrient cycling would be maintained as fine organic matter increases as duff/litter layers. Soil fertility would be maintained in managed stands due to the increased organic matter on the soil surface and in the soil. Compacted soils (reduced porosity) in portions of old skid trails would slowly increase their porosity due to biological activities and thereby regain lost soil productivity over the next 30 years.

Future wildfire burn severities would increase high and moderate severity classes as ground fuels increase as well as the ladder fuels compared to current conditions. Erosion rates would increase as the burn severity distribution increase the high and moderate classes. These fires would change the forest floor and increase the time frames for rebuilding the litter layer and mesofauna population recovery. Future wildfires would also cause organic matter decomposition rates to increase due to more sunlight and changes in organic litter composition. Soil erosion would significantly increase after a wildfire.

Table 15. Probability of Alternative 1 Meeting the SQS Standards and Guidelines

Management Activity	Evaluation Standards and Guidelines					
	1	2	3	4	5	6
None	High	High	High	High	NA	High

Alternative 2

Direct effects on the soil ecosystem, by natural or man-caused activities, are primarily soil disturbance, redistribution of organic matter and changes in biological properties. The soil ecosystem properties that are affected are soil volume, soil porosity, soil water availability, soil chemistry and soil biology (Powers, 1989).

Ground-based Equipment Yarding using traditional systems would result in increased soil disturbance and reduced soil porosity but with proper layout of the skid trail system,

detrimental disturbance can be kept within Regional and Forest allowable limits (15% of each unit). Placing a high priority on reusing existing skid trails and using endlining on the steeper ground would ensure that increases in the number of new skid trails can be minimized. Some compaction (reduced soil porosity) would occur in other areas where machinery makes one or two passes but this increased compaction would not exceed threshold values as documented by Powers et al. (2002). Using endlining to keep the skidders on the skid trails would help to minimize additional detrimental disturbance on the steeper slopes. It is estimated that less than 10% of the tractor logged acres may exceed SQS soil porosity threshold values. Table 16 indicates that new ground disturbance overall has a high probability of not significantly impairing soil productivity because only those areas with slopes generally <35% would be tractor logged.

Cable yarding would cause small amounts of soil displacement in yarding corridors from dragging logs. The cable corridor can vary from 6 to 8 feet wide and could have an area in the center of the corridor that is down cut 9 to 12 inches deep (recent personal field observations on the nearby Klamath National Forest). When properly water barred, no significant erosion would leave the harvest units. The spatial area in yarding corridors has been measured as varying between 3 and 8% Tractor endlining from roads (no log suspension) can result in little to substantial soil displacement depending on size and number of logs hauled at each endlining set up. Table 16 indicates that this activity has a high probability of meeting all the applicable evaluation criteria

Underburning would result in a minor loss of nitrogen but this would have no measurable effect on soil productivity. The overall forest floor would be adequately maintained. The soil cover requirements would easily be met by this low intensity fuel treatment. This activity has a high probability of meeting all the applicable evaluation criteria (Table 16).

Hand piling would easily maintain sufficient fine soil cover without causing additional ground disturbance. The associated burning of this piled material should easily meet the required soil cover amount. It is estimated from recent data (Laurent, 2005a) that the burn piles would occupy approximately 25% of the area. Table 16 indicates that this activity has a high probability of meeting all the evaluation criteria.

Landings are needed for logging operations. The size of individual landings is guided by safety requirements. Generally, landings are kept to the smallest size practical, approximately 0.33 acres each. Landings are a management decision that makes the loss of soil productivity an acceptable loss. Landings can produce erosion and sediment if not properly designed and maintained, placing fill material on steep slopes increases the susceptibility to debris sliding. Post-project mitigations would provide for long-term erosion control. Table 16 indicates that landings have a high probability of meeting the applicable evaluation.

Road Reconstruction. Cuts and fills associated with road reconstruction can divert water flow, change mass-balance characteristics on unstable areas, and initiate landsliding, opening of old roads can have the same effects, but generally to a smaller degree. Lastly, there is some potential for continued sediment production from pre-existing roads if mitigations are not implemented.

Rock Quarries. Existing rock pits would be used and not extended into Riparian Reserves. Geologic site investigations would precede development of any existing rock quarries addressing quantity and quality of material, landslide potential, and potential for

asbestos fugitive dust. Rock pit development plans would be prepared for all sites involving more than 5000 cubic yards of material, or where significant resource damage may occur as a result of the quarry. Asbestos-containing aggregate may be used as road surfacing material, if the asbestos level falls within the standards established by the State of California.

Course Woody Debris would be partially affected by the tractor yarding, underburning, and hand pile burning. Some of the more decomposed logs may be disturbed by heavy equipment operations and could therefore lose some of their effectiveness. Sufficient number of trees would remain on site in the project area and CWD increase over time by natural falling of standing trees and snags.

Table 16. Probability of Alternative 2 Meeting the Soil Resource Evaluation Standards and Guidelines

Management Activity	Evaluation Standards and Guidelines					
	1	2	3	4	5	6
Ground-Based Equip. Yarding	High	High	High	Mod-High	NA	High
Cable Yarding	High	High	High	Mod-High	NA	High
Landings	High	High	High	NA	NA	NA
Hand Piling	High	High	High	NA	High	High
Underburning	High	High	High	NA	High	High

Direct and Indirect Effects

Overall, Alternative 2 has a high probability of meeting the soil resource evaluation criteria and therefore maintaining long-term soil productivity. The main areas of concern are mechanical ground disturbed areas. Tractor logging could result in soil compaction and/or soil displacement that exceeds Soil Quality Standards (SQS) but this only occurs on highly used main skid trails or around large slash piles. Soil disturbance and compaction is minimized when logging operations occur when the soils are dry. The amount of area that is in highly used main skid trails and around slash piles that may exceed the SQS guidelines is estimated to be approximately 16 acres. This is below the 76 acres that are allowable under the SQS's 15% threshold guideline. Cable yarding and underburning would have minimal negative effects on soil productivity. Overall, this alternative would meet the LRMP and SQS guidelines for soil cover, porosity, soil organic matter content, surface organic matter levels, soil moisture regime, soil hydrologic function, buffering capacity and maintain a well functioning soil biological system. Overall, this alternative would not significantly decrease short or long-term soil productivity.

Indirect effects on the soil ecosystem are secondary reactions to direct effects. The most common secondary reactions are increased surface erosion (from ground disturbance, soil

cover removal), reduction in fertility (compaction, removal of fine organic materials), and reduced vegetative growth (compaction, loss of fine organic materials).

Ground-based yarding could cause a loss of nutrients in the skid trails due to soil displacement and skid trail erosion. Reduced soil porosity would reduce growth of any trees and other vegetation that would grow on these skid trails, post-harvest. Installing water bars on all skid trails is very effective in controlling runoff and preventing off-site sedimentation. Recent BMP monitoring of skid trails revealed that water bars were very effective in controlling erosion and preventing sediment from reaching a stream course. Monitored water bars were 96-100% effective (USDA-FS, 2001-2007). Mitigation measures pertaining to skid trails are designed to minimize erosion.

Cable yarding could result in 3 to 8% of the area within a unit being disturbed. There could be a loss of nutrients and soil organic matter in the drastically disturbed portion of the corridor. The amount of reduced soil productivity would be measurable within the more drastically disturbed portion of the corridor but would not be measurable on an acre bases due to the narrow size of the disturbance. This amount of area with reduced soil productivity is within the Region's and Forest's guidelines which is 15% of the activity area. Installing water bars on all cable corridors is very effective in controlling runoff and preventing off-site sedimentation. Mitigation measures pertaining to skid trails are designed to minimize erosion.

Landings usually are drastically disturbed sites that have significant lower site productivity due to compaction and loss of nutrients. There would be a change in the types of vegetation grown on these sites, more towards grass and brush with stunted trees slowly reoccupying these sites. Rehabilitation of non-road prism landings as described in the mitigation measures would minimize short and long-term erosion. The amount of area in landings is very small and meets the Region's and Forest's guidelines.

Hand piling and subsequent burning of the piles would occupy 1 to 25% of the piled area depending on the amount of material to be piled (Laurent, 2005a). The nutrient loss from the burned pile area would not have a significant effect on soil productivity (loss of nitrogen). Other nutrients, such as cations, would increase in the soil due to leaching. This activity has a high probability of meeting all the evaluation criteria.

Underburning would not disturb additional soil within harvest units or in units outside of the harvested units. Heat penetration into the surface soil during burning would be minimal to none. Generally, soil pH, P, and exchangeable K, Ca, and Mg increase in the soil immediately after fire (Wells et al., 1979). Also, some of the seedbed in isolated spots may be disturbed and cause less vegetative growth over the short term. Erosion would be minimal to none because this low intensity burn would retain sufficient cover to protect the soil (Laurent, 2005a). Required soil cover is 60-70% depending on slope steepness. This would result in a first-year surface erosion rate of 1.3 to 0.8 tons/acre. These rates would lower to 0.2 tons/acre in a few years. Soil productivity would be maintained.

CWD would experience some loss of function when the more decomposed logs are disturbed from heavy equipment use. Increases in CWD from this project and through time would benefit long-term soil productivity.

Summary of Indirect Effects

Overall, Alternative 2 has a high probability of meeting the soil resource evaluation criteria and therefore, maintaining short and long-term soil productivity. The main area of concern would be tractor logging. Tractor logging could result in increased soil erosion and reduction in soil fertility (compaction and soil displacement), mainly in primary skid trails. The amount of ground that is in highly used skid trails should be below the SQS guidelines of 15%. This alternative would meet the LRMP and SQS guidelines for soil erosion and fertility. Overall, this alternative would not significantly decrease short or long-term soil productivity.

Cumulative Effects

Cumulative effects on the soil ecosystem are based on the number and types of management activities occurring within an individual stand over time and are measured by effects on soil productivity. The number and types of management activities and their distribution occurring within a watershed are analyzed using the Forest's Cumulative Watershed Effects (CWE) model process, which considers processes such as surface erosion and subsequent sedimentation. This project Geology and Soil Report (Snavely, 2008) discusses cumulative effects on the soil ecosystem. The CWE discussion in the Hydrology and Fisheries Assessment (Black and McCain, 2008) analyzes the distribution of management activities.

Soil Productivity

With no new management activities, potential cumulative effects would be the effects of a wildfire burning the vegetation in plantations. The cumulative effects would be the combined effects of compaction from past tractor logging, machine piling or burning, accelerated erosion from past activities and with a future wildfire, site nutrient removal from logging and future wildfire. Complete removal of surface organic matter due to a wildfire can lead to statistically lower amounts of carbon and nitrogen availability in the upper 10 inches of the soil but absolute mass of soil carbon would show little change (Powers et. al., 2005). These changes in soil carbon and nitrogen would have no general effect on standing forest biomass after 10 years of growth (Powers et. al., 2005).

The effects of soil compaction in skid trails on soil productivity would be highly variable due to differences in soil moisture. These generally loamy soils would show some negative effects on biomass growth based on the level of competing vegetation combined with increased soil bulk density (Powers et al., 2005). Powers et al. (2005) showed that detrimental compaction had no statistically measurable effect on biomass production (conifer trees) when there was no competing vegetation.

Erosion

Surface erosion from existing disturbed areas, such as existing skid trails, landings and non-system roads would be higher that undisturbed areas after a wildfire due to compaction and channeling of runoff. But overall amount of increased erosion from these disturbed areas after a wildfire would be minor when compared to the amount of wildfire caused accelerated erosion over a larger area.

Soil Biology

Removal of the litter and duff layers in future fires would reduce soil mesofauna populations (organisms between 0.2 mm and 1 cm in size) and favor a fungal and bacterial system that reduces decomposition rates and nutrient cycling. Future wildfires would change the forest floor and increase the time frames for rebuilding the litter layer and mesofauna population recovery. As the debris on the forest floor increases in thickness, surface soil temperatures would decrease approximately 4 degrees C. Future wildfires would also cause organic matter decomposition rates to increase due to more sunlight and changes in organic litter composition.

Management Unit Scale

Units within the project area that have a potential to have cumulative effects on the soil resource are managed units that were subjected to past management activities. The proposed management treatments are for the most part, low impact actions that should not contribute any significant negative effects on these already impacted units. Overall, the low intensity of planned vegetation management and fuel reduction activities would minimize any cumulative effects on nutrient cycling and soil productivity by minimizing the consumption of the fine organic component (duff mat) and soil disturbance. The dynamic and highly variable nature of the soil ecosystem and its strong buffering capacity reduce the possibility of having any measurable negative long-term cumulative effects on soil productivity.

The underburning of slash would have no long-term cumulative effects on soil erosion, nutrient availability and soil productivity. This slash treatment would be closer to the natural fire regime in which the soils of the area developed. Reduction of surface fuels helps to reduce the severity of wildfires by reducing the amount of high and moderate burn intensities. Increased amounts of low burn severity retain more cover and have lower erosion rates than would the moderate and high burn severities.

Thinning the forest vegetation and reducing ground fuels by underburning reduces the risk of more acres burned with moderate and high burn severities. Based on burn severity data (Laurent, 2005b), a typical wildfire would burn approximately 14% with a high burn severity, 33% would be moderate severity and 53% would be a low severity. By implementing the proposed action, burn severities in a future wildfire would be moved to increased low burn severity with less moderate and high burn severities. Potentially, the future burn severities would be 75% low, 20% moderate and 5% high such as the Stanza wildfire (Laurent, 2005b). Wildfire surface erosion rates would still vary from 0.45 to 5.7 tons/acre but would have more acres producing lower amounts of soil erosion depending on slope, soil detachability and burn severity.

Removal of the litter and duff layers in future fires would reduce soil mesofauna populations (organisms between 0.2 mm and 1 cm in size) and favor a fungal and bacterial system that reduces decomposition rates and nutrient cycling. Future wildfires would change the forest floor and increase the time frames for rebuilding the litter layer and mesofauna population recovery. Future wildfires would also cause organic matter decomposition rates to increase due to more sunlight and changes in organic litter composition.

Watershed Scale

The proposed units where management activity would occur occupy only 1.5 percent of the analysis area. Impacts to soil productivity in these management units would be minimal. The use of predominately cable yarding systems, thinning harvest prescriptions and underburn prescribe fires would have a very small, insignificant short-term impact on soil productivity.

Summary of Cumulative Effects

Overall, Alternative 2 has a high probability of meeting the soil resource evaluation criteria and therefore, maintaining short and long-term soil productivity. The main area of concern is with tractor logging in areas that have been subjected to past wildfires and logging. The reuse of existing skid trails would minimize areas of new compaction and minimize the cumulative effects of multi-harvest entries over time. Currently, existing detrimental soil disturbance ranges from 0-11% and averages 4% for the project area. New logging disturbances combined with existing detrimental disturbances would not exceed the SQS threshold for detrimental disturbance (15% of the project acres).

The cumulative effects of past wildfires, prescribed fires, harvesting, underburning and future wildfires would not significantly decrease short or long-term soil productivity. Overall, this alternative would meet the LRMP and SQS guidelines for maintaining long-term soil productivity.

Hydrology and Water Quality, Riparian Reserves, and Fisheries

The Smith River Watershed Analysis (U.S. Forest Service, 1995) describes the water quality of the Smith River as exceptional and one of the driving issues behind the designation of the Smith River NRA Act. The Smith River is a designated Tier 1 Key Watershed under the Northwest Forest Plan and has outstanding fisheries values. *None* of the watersheds in the Smith River basin are listed as impaired under Section 303(d) of the Federal Clean Water Act.

Background

The following is summarized from the Hydrology and Fisheries Report (Black and McCain, 2008). Water temperature in the project area ranges from 5 degrees C in winter and early spring to 20 degrees C in late summer (USFS 1976 to 1985). Shade is provided mainly by red alder, bigleaf maple, and Douglas-fir. In the anadromous reaches of Hurdygurdy and Jones Creeks, shade canopy ranges from 20 to 83 percent (USFS 1991). Turbidity levels are very low in the project area streams and are reflective of the coarse substrate that dominates streams of the Smith River basin. The highest turbidity recorded that is on record is from Hurdygurdy Creek at 5.5 (Hach FTU) on January 14, 1980. This was at a flow of 1600 cubic feet per second (cfs) and a suspended sediment load of 157 milligrams per liter (USFS 1980).

Fine sediment (<.85 millimeter particle size) in gravel bars associated with salmon spawning habitat was measured from 1976 to 1984 and ranged from 3.5% to 5% (USFS 1976 to 1985). The Fox Unit Study reports indicate that for Hurdygurdy Creek, a fine sediment percentage of 20% is a threshold where salmon egg mortality begins to greatly

increase (Reiser and Bjornn 1979, Bjornn and Reiser 1991). Although channel aggradation is evident in Hurdygurdy and Jones Creeks, substrate composition is dominated by cobble and gravel and embeddedness is less than 20% (Fox Unit Monitoring Fishery Reports, USFS 1976 through 1985). Sources of sediment mainly originate from natural debris, rotational, and translational landslides. Channel aggradation is also influenced by the legacy of hydraulic mining that occurred in and along Hurdygurdy Creek from the 1880s through the 1920s, which washed out lower hillslopes and delivered material to the lower reach in the project area.

Stream flows range from 9 cubic feet per second (cfs) to peaks of 5,000 cfs in winter for 10-year return interval storms in Hurdygurdy and Jones Creeks (USFS 1979). Regardless of the land use history and the associated disturbance in the watershed, a significant portion of the land area is undisturbed to the point where the peak/base flow has not been measurably altered.

Past hydraulic mining, primarily for gold, has had a significant impact on Hurdygurdy Creek (USFS 1976 through 1985). The lower four miles of Hurdygurdy Creek were at the heart of the Big Flat Mining District, which was most active from 1878 to 1889 and again between 1932 and 1939. This mining district encompassed approximately 1,500 acres, and contained two major ditch systems, ten hydraulic pits, numerous placers, and smaller ditches and penstock sections (USFS 1976 through 1985).

The primary beneficial uses in the project area are domestic water sources and aquatic resources. There are no impoundments or significant water withdrawals except for limited domestic use. Management-related sediment delivery is the primary water quality indicator that is of concern in the project area. These topics are explored in greater detail the Hydrology and Fisheries Assessment (Black and McCain, 2008) located in the project file,

The following table compares the measurable indictors between alternatives and is described in greater detail by alternative.

Table 17. Water Quality Indictors for the Big Flat Project

Measurable Indicators	Alternative 1 No Action	Alternative 2 Proposed Action
Proposed Treatments		
Commercial Harvest Acres (Endlining and Ground-based Cable Entry) within Riparian Reserves	0	47.7
Roads and Landings		
Temporary Use of Existing Non-system Roads (miles)	0	4.26
Number of Temporary Road Stream Crossings	0	0
Temporary Upgrade of Existing System Roads (miles)	0	2.5
Acres of new landing construction	0	0
Potential Wildfire		
Estimated Sediment Delivery (yd^3)*	7,786	795

* Estimated sediment delivery rates are derived from the WEPP model and are described in the Soils and Geology Specialist Report

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Under this alternative there would be no proposed treatments and therefore no direct, indirect or cumulative effects to water quality and management-related sediment delivery. There is the possibility that if a high severity wildfire were to occur within the project area that an order of magnitude more sediment would be delivered to stream channels than would occur if proposed treatments were implemented (Table 17). It is always very challenging to predict the level of potential sediment delivery associated with a future wildfire. Post fire erosion is affected by geological substrate, burn severity of the fire and weather/precipitation patterns. The WEPP (Watershed Erosion Prediction Project (US Forest Service, 2002) model, available at http://forest.moscowfsl.wsu.edu/fswepp/, is a tool that estimates the likely sediment delivery for a given hill slope in the event of a low intensity fire versus a high intensity fire, all other parameters being equal. The WEPP model indicates that sedimentation rates associated with a high intensity wildfire are typically an order of magnitude higher than sedimentation rates associated with a low intensity fire. Under the no action alternative, it is likely that a substantial portion of the project area would be lost primarily because these plantations have unusually thick concentrations of pole size trees. Wildfire could rapidly spread in these areas where the canopies are interlocked and ladder fuels are present, increasing the risk of elevating peak flows and subsequently increasing sedimentation to water courses. The No Action alternative would not promote attainment of Aquatic Conservation (ACS) objectives within the project area.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Based upon analysis of direct, indirect, and cumulative effects, the proposed action alternative would result in a minor short-term impairment to water quality or quantity and would have no measurable effect on aquatic resources and domestic water sources. Combined with effects of past, present and foreseeable future actions, the proposed action may result in localized increases in suspended sediment during the first few precipitation runoff events following project implementation. However, the proposed activities would not result in cumulative watershed effects that threaten impairment of long-term water quality objectives (see cumulative watershed effects section). The implementation of specific project design features such as designated no-treatment zones within riparian reserves, no new or reconstructed roads (beyond minor upgrading of OML 1 to OML2 roads) and landings, and 75 percent of all treatments would be accomplished by hand. The proposed action complies with the Clean Water Act, Porter-Cologne Water Quality Control Act, applicable water quality control plans, and the Regional Board waiver (Order No. R1-2004-0015).

This alternative would not require new roads (temporary or permanent) to be constructed. Approximately 4.26 miles of existing roadbed (Table 17) would be utilized as temporary roads for heavy equipment access. Utilization of existing skid trails would be limited to no more than 15 percent of each harvest unit. Ground disturbance associated with the utilization of existing roads and skid trails would be limited to roadside brushing and travel way clearing to accommodate access for heavy equipment. All roads designated for short term use are located along near or on ridge tops and have no stream crossings and are not hydrologically connected to the stream system. The average temporary road length proposed is 0.25 miles long (1,300 feet) and these roads would be decommissioned and closed after project completion. There is a very low to no risk of sedimentation of stream channels associated with the re-opening of these roads because most are located in the upper third of the ridgetop or on flat ground where there is minimal to no cut and fill areas and have no stream crossings, which are the primary sediment source associated with roads in the project area. There is a very low risk of sediment from the reconstruction (temporary upgrade) of less than 2.5 miles of OML 1 roads to OML 2 for the project because the roadbed and culverts are pre-existing and require very minor ground disturbance to bring the roads up to standards. There is a very low to no risk of sedimentation of stream channels associated with the utilization of existing landings and skid trails since these sites are located outside of core (no treatment zones) riparian reserves areas where minor soil displacement is not likely to reach stream courses. Most landings are located at wide spots, adjacent to existing roads and would require very little ground disturbance to be functional. The proposed treatments are of such small extent (i.e. thinning from below compared to clear-cutting) that changes to water quantity (peak and low flows) would not be measurable or detectable.

Sediment delivery associated with all proposed treatments is estimated to be less than three cubic yards based on the WEPP model (Table 17 and Soils/Geology Report). This includes sediment delivery associated with ground disturbance (tractor endlining and cable yarding) and fuel treatments (hand cut and pile, pile burning and underburning within and adjacent to riparian reserves). The WEPP model is known to overestimate erosion and sediment delivery. The estimated sediment delivery from the WEPP model is best used as a comparative tool among alternatives rather than as an absolute number or estimate of sediment that would actually be delivered. The WEPP model indicates that

there would be potentially an average increase of less than 7 percent in sediment delivery over background associated with all proposed treatments. Typically, the potential for sediment delivery is largest the first year following treatments and declines rapidly in the years following as surface cover is re-established. While the WEPP model estimates that there would be slight increase of sediment delivery over background levels associated with the fuel reduction treatments, past Best Management Practice (BMP) effectiveness monitoring indicates that there has been little to no sediment delivery associated with past fuels and vegetation treatments on the Six Rivers (2001-2007 Six Rivers BMP reports). The results of the WEPP model should therefore be considered as a worst case scenario relative to sediment delivery and realize that actual observed delivery of sediment associated with past treatments is likely considerably less and not measurable. In the event that a future wildfire occurs within the project area and assuming that all proposed treatments have been implemented under Alternative 2, there is a greater probability that the risk and extent of high severity fire would be reduced when compared to no treatments at all under Alternative 1. With a reduction in acres impacted by high severity fire, there would be a reduction in sedimentation rates.

Ground disturbing activities such as ground-based yarding systems have the potential to result in erosion and potentially result in sedimentation of adjacent stream channels. These activities can move and expose soil and create the potential for surface erosion. However, not all soil erosion results in direct sediment delivery. The likelihood of management-related sedimentation and impacts to water quality are predicated largely on the proximity of these ground disturbances to riparian areas and stream channels and slope steepness. Generally speaking, ground-based activities such as endlining are conducted on gentle slopes (less than 35% which have a lower potential to mobilize sediment) and combined with equipment exclusions of 160 ft (riparian reserve design criteria), the risk of sediment delivery is very low. The risk of sedimentation associated with endlining or ground-based cable yarding is limited because to the dragging of small diameter trees (7-12” dbh) in the outer portions of the riparian reserve (50 feet on either side of the channel or to the break in slope, whichever is greater). It is not anticipated that extensive yarding corridors or bare ground patches would develop as tree limbs would suspend the bole as it is dragged, with the lightest part of the tree being on the ground and due to the relatively low harvest level. The Six Rivers Best Management Practices Monitoring reports dating back to 2001 show that streamside management zones (riparian reserves) associated with vegetation treatments has been 100% effective in preventing sediment delivery.

Several studies have examined effectiveness of buffers in controlling sediments from clear cut timber harvest on forested lands. Broderson (1973) concluded that buffer widths of 15 meters (50 feet) controlled most sediment on slopes less than 50 percent and buffers of 61 meters (200 feet) were effective on extremely steep slopes. Corbett and Lynch (1985) recommended buffers of 20-30 meters (66 to 100 feet) for controlling sediments. Lynch et al. (1985) concluded that buffers of 30 meters (100 feet) removed 75 percent to 80 percent of suspended sediments draining areas that had been cleared and burned. The FEMAT Report (1993), citing these same studies, concluded that buffers of approximately one site potential tree height from the edge of the floodplain are adequate to control sediments from overland flow in most situations. Clear cut timber harvest (referenced in these studies) generally involves a relatively higher level of disturbance intensity and severity than thinning to 60% canopy, and a higher likelihood of surface erosion and sedimentation. Therefore, it is determined that for the proposed thinning and fuel treatment actions, 50 feet would be adequate to filter and trap sediment (and retain

the sediment within the buffer) and prevent any significant amount from entering watercourses and ultimately being transported downstream to fish habitat occupied by federally listed salmonids.

The project design standards of canopy cover to be maintained at 40-60% in the treatment units is expected to protect the existing streamside shade canopy and help maintain stream temperature. Fuel treatments such as understory burning would involve low intensity surface fire that would consume surface fuels while limiting damage to the residual stand. No firelines would be constructed in riparian reserves. No mastication would occur in riparian reserves. Understory burning and pile burning would not occur within the core no-treatment zones in riparian reserves. The potential for ash to enter channels from understory burning would be minimized and the effects to water quality would be negligible.

Overall there is high confidence that potential impacts to water quality and quantity associated with Alternative 2 would be very small and not measurable based on the facts that: 1) All existing roadbeds and landings to be utilized for temporary use are not hydrologically connected and do not have any stream crossings, 2) the majority of proposed treatments within riparian reserves would be implemented by hand, without the use of ground disturbing machinery, and 3) riparian reserves would have very limited ground disturbance associated with endlining and cable yarding (less than 48 acres) and would occur only in the outer portion of riparian reserves where treatments are designed to meet the Aquatic Conservation Strategy (ACS) objectives.

Riparian Reserves

The Big Flat project area encompasses portions of Lower Hurdygurdy Creek, Lower and Middle Jones Creek and Blackhawk-Yellowjacket Creek watersheds. Stream channels within and adjacent to treatment units are headwater ephemeral or intermittent streams and lower valley perennial streams. Perennial streams within the project area are: Hurdygurdy Creek, Haydens Gulch, Jones Creek (including Davis and Muzzleloader Creeks), Blackhawk Creek, Horse Creek and South Fork Smith River.

Plantations proposed for treatment within the project area are mostly 35-45 years old and therefore predate the Northwest Forest Plan and the Six Rivers LRMP. These plantations are the result of clear cut harvest with few if any large legacy trees. In addition many of the streamside areas constituting riparian reserves within these plantations were also completely harvested with no streamside buffers. Therefore, very few if any large trees remain in these plantations and riparian reserves. The riparian reserves (intermittent and ephemeral channels) within these plantations have been significantly altered relative to vegetation composition and age (Table 18). The effects of these management actions have reduced large woody debris recruitment potential over the long-term within these riparian reserves. Currently, much of the riparian network is flanked by young monotypic Douglas-fir stands with low species diversity, even within the immediate vicinity of stream channels.

Table 18. Riparian Reserve Acres by Stand Type/Seral Stage in the Project Area

Stand Type/Seral Stage (acres/%)					Total (acres/%)
Plantation/Pole	**Pole/Shrub Stage**	**Early Mature**	**Mid Mature**	**Meadow**	
72.6	72.2	26.2	22.4	4.8	**198.2**
37%	36%	13%	11%	2%	**100%**

Past timber harvest activities within riparian reserves have also resulted in a legacy of high fuel loads particularly within plantations. The stem densities within these plantation riparian reserves are such that it is difficult in most areas to walk through and there is limited light reaching the forest floor.

Management within riparian reserves must demonstrate how activities would maintain or benefit riparian reserves and meet the ACS objectives. The Northwest Forest Plan recognized the need to manage within riparian reserves to address legacy issues of old silvicultural practices that encroached or even eliminated large trees within riparian areas and adjacent stream channels such as in plantations (LRMP, IV-110, IV-49). Silvicultural activities within riparian reserves must encourage the growth of larger trees to accelerate cover, shade and large woody debris necessary for stream channel structure and sediment routing. Silvicultural practices must maintain or benefit riparian areas and therefore any treatments must leave the largest trees intact and thin out smaller trees that result in excess stand densities, high fuel loads, and retard the recovery of the native riparian reserve stand characteristics. Mechanical entry such as tractor logging into riparian reserves would not benefit riparian reserves due to potential for ground disturbance, soil compaction and sediment delivery. However, selected endlining of small diameter trees (7-12” dbh) from the outer edges of riparian reserves would result in very low levels of ground disturbance and the remaining portion of undisturbed ground would provide more than adequate buffer to protect water quality from sedimentation. In the project area, most of the riparian and channel characteristics have been heavily altered due to past timber harvesting (Table 18). About 85% of the riparian reserves in all treatment units are plantations, pole/shrub stages or early mature stages of development. About 10% of riparian reserves designations overlap areas in the mid mature seral stage of development. These units are F-2, F-3, F-15, F-20, and F-21 and generally coincide with the shaded fuelbreak locations. Only hand applied fuel reduction treatments are proposed in these units because mid mature and older seral stages tend to be more resilient to wildfire.

The following table lists the commercial harvest units which have designated riparian reserves within the Big Flat project area.

Table 19. Riparian Reserve Acres Treated in Commercial Harvest Units by Logging System

Logging System	Commercial Harvest Units	Riparian Reserve Acres Treated
Cable	CH-1, CH-20, CH-24, CH-35, CH-37, CH-49	8.44
Tractor w/Endline	CH-13, CH-19, CH-26, CH-28, CH-42, CH-46, CH-50, CH-58, CH-59, CH-60	39.3

Proposed treatments in riparian reserves are also designed to accelerated recovery or re-growth of large diameter trees in plantations for the purposes of future large woody debris recruitment. A key riparian component that has been altered due to past management activities within the project area is the reduction in large woody debris (LWD) recruitment potential. The principal mechanism for woody debris recruitment in stream channels is trees falling into riparian areas through natural mortality, landslide movement, wildfire or windthrow. In headwater tributary channels, which are characteristic of most stream channels within the project area, woody debris recruitment is an important function providing in-channel structure, sediment routing, and wildlife and fisheries habitat. Past management activities have reduced the potential for large woody debris recruitment in many of the headwater streams within the project areas, mostly associated with plantations.

A comparison of the measurable indicators for assessing potential impacts to riparian reserves by alternatives is displayed in Table 20.

Table 20. Riparian Reserve Treatment Acres by Type and Large Woody Debris Recruitment Potential by Alternative

Alternative	Treatment Type (acres)			Large Woody Debris Recruitment Potential (plantation acres treated)
	Cable	Tractor w/Endline	Hand	
No Action	0	0	0	0
Proposed Action	8.40	39.20	150.60	198.2

Alternative 1 – No Action

Direct and Indirect Affects

Under this alternative there would be no management within riparian reserves and therefore no potential (zero acres of ground disturbance) for direct and indirect effects of sedimentation of stream channels associated with ground disturbing activities (Table 20). An indirect effect of not managing in riparian reserves, particularly in plantations, it that

there would be no improvements (selective thinning) to encourage the growth of larger healthier trees for the purposes of LWD recruitment potential as well as shade and cover. Due to high stem densities, a wildfire in plantations that affects riparian reserves has a high probably of being a stand replacing fire. Such a wildfire has the potential to significantly reduce vegetation that provides shade, cover and delay the recovery of LWD recruitment potential, not to mention the significantly increased potential for sediment delivery. The No Action alternative would not promote attainment of ACS objectives within the project area.

Cumulative Effects

Cumulative effects under the no action alternative are the baseline for effects under the proposed action alternative and are discussed in the next section.

Alternative 2 – Proposed Action

Direct and Indirect Affects

Under this alternative, proposed treatments in riparian reserves would occur (Table 20). The limited extent of proposed ground disturbance within riparian reserves and the potential sedimentation associated with ground disturbance is anticipated to be negligible (see Water Quality Section). It is extremely unlikely given the small acres of potential ground disturbance within riparian reserves (less than 48 acres of endlining and cable yarding) that the small quantity of sediment that might be delivered to these intermittent and ephemeral streams would ever be detectable or have any measurable effect compared to the natural background levels of sediment delivery. The effects of the proposed riparian reserve treatments would barely be detectable at the site scale and certainly not detectable downstream where beneficial uses exist. Beneficial effects to riparian reserves of the proposed treatments would primarily be an acceleration of recovery of vegetation characteristics needed to attain ACS objectives (e.g. accelerated growth of larger diameter and taller trees that would provide better shade, cover and future large woody debris, and more diverse riparian vegetation.)

Cumulative Effects

In assessing cumulative watershed effects for the proposed action alternative, all past, current and reasonably foreseeable actions on both private and public lands were assessed within all affected watersheds and related to beneficial uses and sensitivities within these watersheds (LRMP p. IV-71, 1-10 and 11) (FSH 2509.22 Ch.20). The cumulative watershed effects analysis and associated assumptions and methods are written in greater detail in Big Flat Vegetation and Fuels Project, Hydrology and Fisheries Assessment (Black and McCain, 2008). The timeframe for the analysis is the past 30 years and into the future 10 years. The following figure displays the cumulative effects analysis boundaries for the affected watersheds.

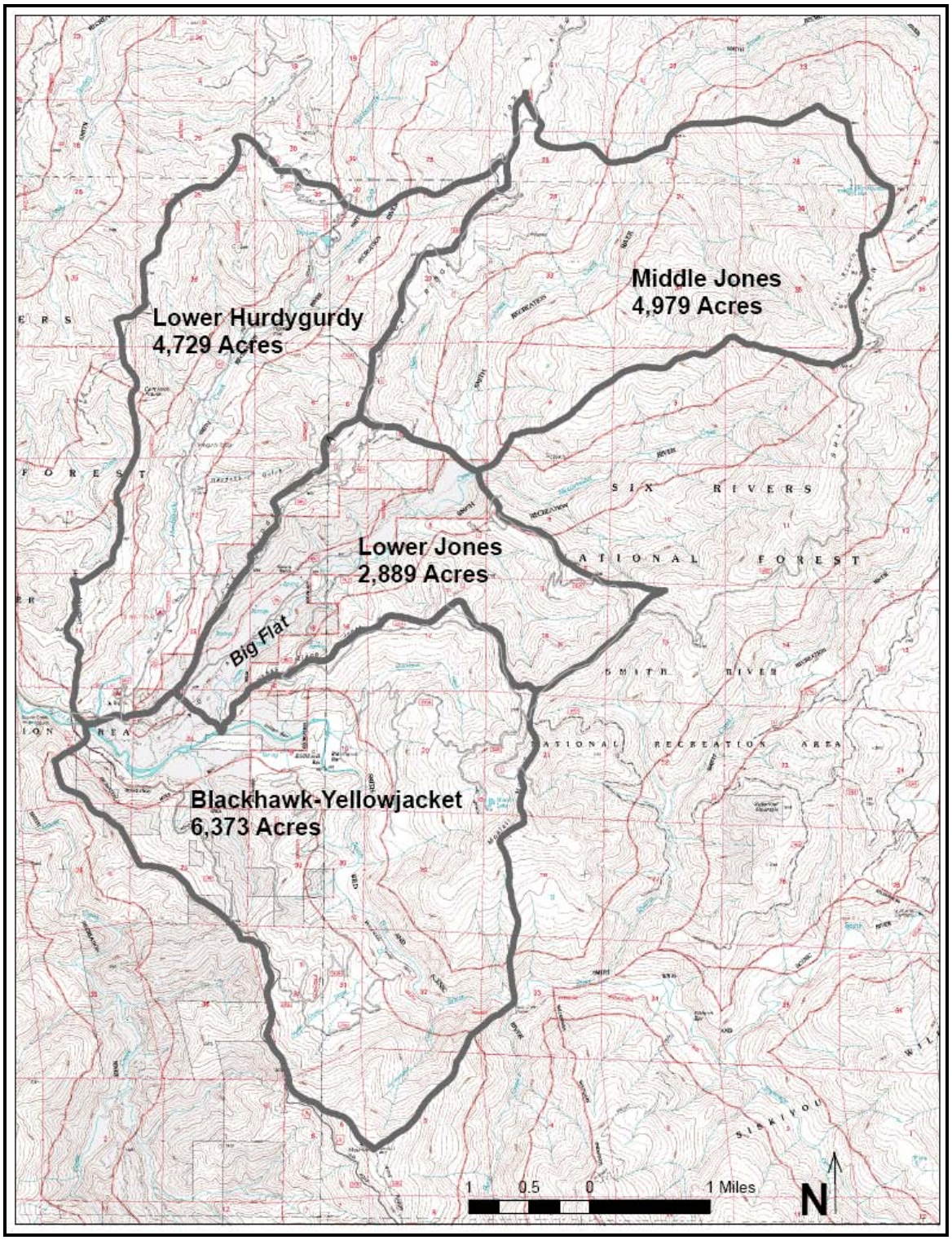

Figure 1. Cumulative Effects Analysis Boundaries for Affected Watersheds

The cumulative affects of past management activities such as timber harvesting, road building and fire suppression has resulted in many riparian areas with altered function and processes. Riparian reserves within plantations have had much of their large trees removed which in turn results in less shade, cover and large woody debris. The high

stem densities also results in greater fire risk. Fire suppression activities have significantly reduced the amount of fire in riparian areas over the past 50 years leaving high fuel loads in places which threaten the resiliency of the riparian areas in the event of a wildfire. In addition to these past activities, road building has cut across numerous riparian reserves in multiple locations throughout the project area which has the potential to alter the sediment routing within the riparian reserve. As a result of these cumulative actions within riparian areas there has been impact on selected riparian areas.

In summary, proposed riparian reserve treatments would reduce the cumulative impacts of past management activities by accelerating the recovery of vegetation in plantations and help promote the attainment of ACS objectives. The slight potential risk of sedimentation associated with the proposed treatments is far outweighed by the reduced risk of wildfire which could potentially result in orders of magnitude more sediment. The proposed actions would not result in added detrimental cumulative effects to riparian reserves.

Cumulative Watershed Effects

In assessing cumulative watershed effects (CWE) for the Big Flat project, all past, current and reasonably foreseeable actions on both private and public lands were assessed within all affected watersheds and related to beneficial uses and sensitivities within these watersheds (LRMP p. IV-71, 1-10 and 11) (FSH 2509.22 Ch. 20). The R-5 Equivalent Roaded Acres (ERA) Model was used to calculate the percent ERAs for the analysis area. The total percent ERA was compared to the Threshold of Concern (TOC) for the affected watersheds.

Spatial and Temporal Scope of Cumulative Watershed Analysis

All watersheds affected by the project were assessed for cumulative watershed effects at the 7th field watershed scale. The project area overlaps the Lower Hurdygurdy Creek (4,729 acres) watershed to the north, Lower and Middle Jones Creek watershed (2,889 and 4,979 acres) to the east, and Blackhawk-Yellowjacket Creek watershed (6,373 acres) to the south (Figure 1). All past, present, and reasonably future management activities were assessed which include timber harvest activities and roads on both private and public lands. Timber harvesting and associated activities dating back 30 years were considered in the cumulative watershed effects (CWE) analysis.

Beneficial Uses and Key Physical and Biological Parameters

There are many beneficial uses of water within the South Fork Smith River watersheds (see fisheries section for more details). Impacts to beneficial uses such as resident and anadromous fish can sometimes result from upslope land management activities (e.g. roads, timber harvest) by increasing sediment delivery rates, altering the timing and quantity of water, and impacting riparian areas by altering channel morphology. Other activities such as mining and illegal OHV use can have impacts to water quality. However, there is no active mining within the affected watersheds and the extent of illegal OHV use is not known but is limited due to the steepness of the surrounding terrain.

Cumulative Watershed Effects R-5 ERA Model

In order to determine the potential for the Big Flat project to result in added cumulative effects, the extent of road miles and acres of timber harvest, including wildfires, within all affected watersheds were tallied. This model is designed to be an initial red flag for earth scientists to determine whether or not past and present land management activities in a given watershed approach or exceed a threshold of concern (TOC). Where ERAs approach or exceed a given watershed's TOC, further field work would be necessary to ascertain whether cumulative watershed effects are present and if land management activities would adversely add to those effects and result in detrimental impacts to beneficial uses.

The ERA methodology has both strengths and weaknesses. The strength of the ERA methodology is the ease with which the analysis can be duplicated and understood. It is also a CWE model that incorporates rates of land management disturbance and recovery times associated with those disturbances, an attribute which is missing in many other CWE analysis models. A weakness of the ERA CWE model is that it is mostly an office exercise, based only on management-related hillslope disturbance. It does not directly assess physical or biological processes in stream channels, nor does it account for the time lag associated with routing sediment delivered from a given activity. Recovery times in the ERA model apply only to the site of a given treatment, not to the recovery of downstream impacts.

Cumulative Watershed Effects Findings

Lower Hurdygurdy Creek, Lower and Middle Jones Creek and Blackhawk-Yellowjacket Creek watersheds are below the threshold of concern, indicating that these watersheds are at a very low risk of for additional detrimental cumulative effects associated with Alternative 2. The proposed action alternative shows little change in the total ERA values as compared to the no action alternative (Table 21).

Table 21. Equivalent Roaded Acres in the Affected Watersheds by Alternative

Watershed	No Action	Proposed Action*
Lower Hurdygurdy	174 (3.7% ERA)	202 (4.3% ERA)
Lower Jones	34 (0.9% ERA)	37 (1.0% ERA)
Middle Jones	8 (0.2% ERA)	14 (0.3% ERA)
Blackhawk -- Yellowjacket	147 (2.3% ERA)	273 (4.3% ERA)

*Includes miles of road and acres treated under the project.

Field investigations within the project area revealed little legacy impact to watershed processes from previous timber harvest activities. There has been no harvest-related sediment delivery from new or enlarged landslides on National Forest System land in this watershed after 1975. Since 1998, there has been no logging or new road construction in the project area. The implementation of the Smith River NRA Road Management and Route Designation Project is a future action in the project area that would lower the total ERA by decommissioning almost 14 miles of existing road in the Big Flat project area watersheds. These 14 miles would be subtracted from the total ERAs (Table 22).

Table 22. Cumulative Watershed Effects and Percent ERAs compared to the Thresholds of Concern on Affected Watersheds

Watershed	Current Condition	Proposed Action	Future Actions	Total ERA	Threshold of Concern (% ERA)
Lower Hurdygurdy	174 (3.7% ERA)	202 (4.3% ERA)	-17.86	184 (3.9% ERA)	12.0%
Lower Jones	34 (0.9% ERA)	37 (1.0% ERA)	-12.56	24 (0.8% ERA)	12.2%
Middle Jones	8 (0.2% ERA)	14 (0.3% ERA)	0	14 (0.3% ERA)	12.2%
Blackhawk -- Yellowjacket	147 (2.3% ERA)	273 (4.3% ERA)	-26.01	247 (3.9% ERA)	13.6%

The cumulative watershed effects ERA analysis reveals that none of the watersheds are over or approaching the threshold of concern. Based upon analysis of direct, indirect and cumulative effects, the proposed activities would result in a minor short-term impairment to water quality conditions. Combined with effects of past, present and foreseeable future actions, the proposed action may result in localized increases in suspended sediment during the first few precipitation runoff events following project activities. However, the proposed activities would not result in cumulative watershed effects that threaten impairment long-term water quality objectives. Recovery of soil surface cover would occur rapidly through leaf fall and needle cast soon after the first fall following implementation of project activities. Implementation of project design standards and use of specific erosion and sediment control measures through Best Management Practices are incorporated in the proposed action. The proposed action complies with the Clean Water Act, Porter-Cologne Water Quality Control Act, applicable water quality control plans, and the Regional Board waiver (Order No. R1-2004-0015).

Fisheries

Information regarding baseline conditions of fisheries and aquatic resources in the project area is derived mainly from these sources: 1) the Fox Unit Monitoring Fishery Reports (USFS 1976 through 1985), 2) the SRNF fish habitat inventory (USFS 1991), 3) stream survey reports from the California Department of Fish and Game (CDFG) for 1963, 1972, and 1978 (CDFG 1963, 1972, 1978), and 4) the Smith River Ecosystem Analysis (McCain et al. 1995). Fish habitat inventories conducted in Hurdygurdy and Jones Creek (USFS 1991) serves as the basis for much of the baseline information on physical habitat parameters. The Fox Unit Reports of 1976 to 1985 (consisting of Hurdygurdy Creek and adjacent Jones Creek watersheds) provides information on watershed scale conditions, disturbance history, flow regime, and management history.

The following fish species are known to occur in the project area (Fuller 1995, McCain 1994).

Federally Threatened Fish Species

Coho Salmon (*Oncorhynchus kisutch*) Southern Oregon/Northern California Coasts (SONCC) Evolutionary Significant Unit (ESU), and designated Critical Habitat (CH).

The USDC National Marine Fisheries Service (NMFS) designated CH for SONCC coho salmon on May 5, 1999 that encompasses Coho-accessible reaches of all rivers (including estuaries and tributaries) between Cape Blanco, Oregon and Punta Gorda, California. Analysis of SONCC coho CH in the project area is based on known or suspected coho habitat found within the Blackhawk, Hurdygurdy, Jones, and South Fork Smith watersheds. CH excludes reaches located above longstanding natural impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). SONCC coho CH is derived from available historical fish species inventories, and habitat assessments.

Forest Service Sensitive Fish Species

Steelhead (*Oncorhynchus mykiss*) Klamath Mountain Province (KMP) ESU

Chinook salmon (*Oncorhynchus tshawytscha*) Southern Oregon/Northern California Coastal (SONCC) ESU

Coastal cutthroat trout (*Oncorhynchus clarkii*) Southern Oregon/ California Coasts (SOCC) ESU

Direct and Indirect Effects

The effects of the Big Flat Vegetation and Fuels Management Project to salmonid species listed as threatened under the ESA and to FS sensitive salmonids are discussed together, and not to each listed/sensitive species individually, because of their similar life history and habitat requirements.

The Big Flat Vegetation and Fuels Management Project is designed to avoid adverse effects on anadromous fish and their habitat. Potential direct and indirect effects to fish and their habitat include: 1) shade canopy reduction (and stream temperature increases and microclimate alteration), 2) loss of large woody debris, 3) concentrations of ash entering streams following burning and impacting water quality, 4) sedimentation from

bare soils resulting from thinning operations, fire lines, and burning, and 5) ground disturbance and sedimentation from mechanized equipment.

Shade Canopy and Water Temperature

In the short term following thinning treatment in RRs, tree canopy cover would be maintained above 60%. Over the long term, canopy conditions would improve as tree crowns increase due to less competition. Therefore, any potential for increases in water temperature from thinning, or any of the other proposed actions, would be discountable. Water temperature would continue to be within the range that is beneficial for salmonid growth, reproduction, egg incubation, and survival and would move towards properly functioning in the long term.

Sediment/Turbidity

Due to the project design standards, including the minimum 50 foot no-treatment sediment buffer filters along each RR, the proposed vegetation management and fuel treatments are not expected to generate or result in any disturbance that would result in measurable amounts of sediment to be transported to channels or result in a measurable increase in turbidity. The project would also not produce any effects that could potentially decrease turbidity. Therefore, sediment and turbidity would continue to properly function. Hurdygurdy and Jones Creeks would maintain a low turbidity range that allows for a high rate of success in salmonid incubation, rearing, feeding, and spawning. Percentage of fine sediment in the substrate would remain low (<12%) and would not impede spawning success, egg incubation, and fry emergence.

Substrate, Sediment, and Channel Aggradation

The four primary sediment sources: landslides, channel bank erosion, erosion from roads, and erosion from hill slopes, (Gallegos and Barnes, 1993) would not be altered as result of implementation of the proposed action. Thinning in RRs would improve long term large woody debris conditions by accelerating the development of larger trees that are important for metering and routing sediment in intermittent and ephemeral channels. The reduction in tree density is not likely to decrease short term availability of neither LWD nor its ability to route and meter sediment.

Due to the minimum 50 foot no-treatment sediment filter buffers in each treated RR, the proposed action would result in negligible amounts of sediment into RRs, and the other activities would not result in any sediment. Therefore, until the existing sediment sources are stabilized, and substrate becomes distributed and stored in equilibrium along the channel, the substrate indicator would be maintained in the current status.

Large Woody Debris

LWD reduction in RRs would be negligible. LWD would be retained through project design standards. Mechanical treatments would not physically remove large woody debris, and prescribed fire would not consume greater than 10% of the current amount of large woody debris. Therefore, the effect of the proposed actions on reductions in LWD recruitment and amounts would be negligible. In addition, the effects of thinning in young RRs are anticipated to be beneficial over the next centuries by accelerating the development of potential LWD.

Water Quality Impacts from Ash

During and after burning (understory and pile) the potential exists for ash to enter streams that can increase turbidity and change water chemistry. The amount of ash that results from understory burning is related to fire intensity, fuel moisture, and fuel type. In RRs, understory burning would involve low intensity surface fire that would consume surface fuels while limiting damage to the residual stand. Also, this low intensity understory burning in RRs would occur in the shade of a riparian overstory canopy and would not be within the no-treatment buffer. Therefore, the potential for ash to enter channels from understory burning would be minimized and the effects would be negligible.

The potential for ash entering channels from pile burning would be minimized by limiting the size of hand piles to 6 x 6 feet to keep burn intensity low. In addition, a 50 foot no-treatment buffer would be maintained for hand piles. Therefore, limiting pile size and keeping piles at least 50 feet from channels would result in negligible effects from ash entering a channel.

Ground Disturbance and Sedimentation

Sediment can potentially be produced from denuded soils created by ground disturbance through thinning operations, burning or from firelines. There is some potential for short term ground disturbance within RRs from the cutting, felling, and yarding of trees. Potential for direct sedimentation to stream channels from yarding would be negligible due to the relatively low harvest level. Thinning would be beneficial to unstable RRs such as toe zones, inner gorges, and active landslide areas that are recovering from past wildfire, timber harvest or landslide events, and would not detrimentally affect slope stability.

Since fire line construction would not occur within RRs, any potential for sedimentation is negligible. With regard to ground disturbance from thinning activities, a 50-foot no-treatment buffer would minimize the potential for any generated sediment to reach channels (Figure 2). In RRs, understory burning would involve low intensity surface fire to consume surface fuels and not result in denuded soil and potential sediment. Low intensity understory burning in RRs would occur in the shade of a riparian overstory canopy and would not be within the 50-foot no-treatment buffer. Therefore, any level of sediment generated and reaching stream channels from thinning, burning, and fire lines would be negligible.

As stated above in the Water Quality discussion, it is determined based on current scientific research, that for the proposed thinning and fuel treatment actions, 50 feet would be adequate to filter and trap sediment (and retain the sediment within the buffer) and prevent any significant amount from entering watercourses and ultimately being transported downstream to fish habitat occupied by federally listed salmonids.

Summary of Direct and Indirect Effects

In the short term, tree density (and 60% canopy cover) would be maintained to provide a stand density more reflective of a natural fire disturbance regime. Over the long term, canopy conditions would improve as tree crowns increase due to less competition. Heavy equipment exclusion zones would protect soil cover and provide a sediment filter buffer. Slope restrictions (35% or less) for heavy equipment would protect slopes from erosion. Project design standards would minimize disturbance within RRs and downstream fish

and habitat to a negligible level by maintaining shade canopy, minimizing the potential for sediment transport to streams, and maintaining potential future large woody debris sources, which are important to the function and quality of the ephemeral and intermittent RRs within treated areas.

Interrelated and Interdependent Effects

Fire risk: A short-term (less than 5 years) fuel hazard would occur with lop and scatter portion of the thinning and release actions. The fuels take approximately three to four years to break down to where only the larger boles are left. If a fire occurs before the fuelbreaks down, an increase in sediment may result. Depending on the size and location of the fire, this may have an effect on the fishery by removing riparian vegetation and microclimate, and set the area up for an increase in sedimentation from erosion and/or landform failure.

Chipping and mastication of activity fuels would provide a lower fire risk than lop and scatter due to the compact nature of the resulting fuels and quicker fuels decomposition. The chipped and masticated vegetation would most likely be six to twelve inches in depth and would allow much less air circulation within the resulting fuels. The compact nature of the fuels along with reduced air circulation, reduce the risk of fire starting or carrying rapidly.

Effects to Fish and Fish Habitat

No measurable effects to cutthroat trout, steelhead, coho salmon, or Chinook salmon survival rates and spawning, incubation, rearing, feeding or migration success in the project area are likely to result from the proposed actions. Sediment increases would be discountable and would not be sufficient to reduce spawning substrate quality or impact egg survival, nor would it affect turbidity to a point of impacting juvenile salmonid feeding success and behavior. Water temperature increases would be negligible from the treatment of ephemeral and intermittent streams and would not affect dissolved oxygen or impact egg survival and juvenile fish health in streams in the project area. As streamside vegetation recovers in watersheds from past disturbance and matures, LWD would continue to accumulate through natural recruitment processes within the treated RRs and function to store and meter sediment, as well as throughout the watershed to provide important fish habitat components.

Endangered Species Act (ESA) and Forest Service Sensitive Species Determinations

Based on the size, nature, and duration of this proposed action, it is the determination of the fisheries biologist that this project may affect, but is not likely to adversely affect ESA Federally Threatened coho salmon and would not impact its designated critical habitat.

The proposed action may impact Forest Service Sensitive cutthroat and steelhead trout, and Chinook salmon individuals, but would not lead to trend towards listing. See the Biological Assessment/Biological Evaluation Programmatic Tiering Document for Federally Threatened and Endangered, and Forest Service Sensitive Species potentially affected by the Big Flat project (Devlin and McCain, 2008) for more information regarding the effects determinations for ESA listed and Forest Service Sensitive species within the project area.

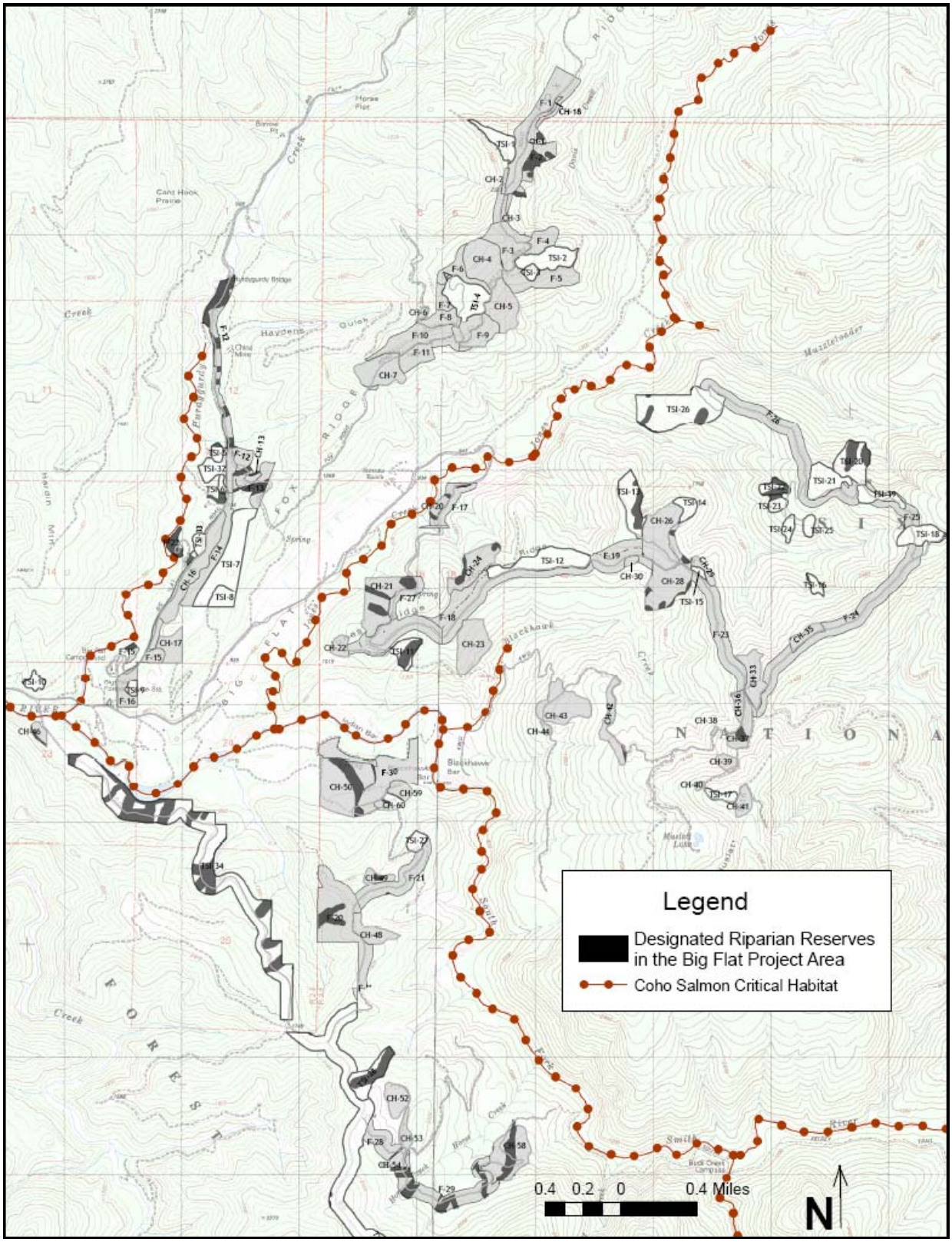

Figure 2. Designated Riparian Reserves

Aquatic Conservation Strategy Objectives

The Six Rivers LRMP requires that all projects demonstrate compliance with the ACS objectives that were set forth in the Northwest Forest Plan. The four components of the ACS, as given on pages 4-34 through 4-36 of the LRMP, are: 1) Riparian Reserves, 2) Key Watersheds, 3) Watershed Analysis and 4) Watershed Restoration. None of the treatment areas are within key watersheds. Watershed Restoration, which includes decommissioning and storm damage repair, is an ongoing program on the District and the Forest.

1. **Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.**

Due to past harvest activities, many riparian stands in the project area have been altered. The Big Flat Hydrology and Fisheries Assessment (Black and McCain, 2008) and Soils and Geology Report (Snavely, 2008) discusses existing riparian conditions, and the effects of the proposed action in detail. Treatments proposed within riparian reserves are designed to accelerate the growth of large trees and help riparian reserves be more resilient to wildfire. The Proposed Action would both maintain and restore the distribution of trees, and thus habitat complexity across these watersheds. Fuel treatments would help maintain the distribution, diversity, and complexity of watershed and landscape-scale features. Thinning of some of the stands, while underburning in others, would reduce fuel loading and simultaneously leave material to provide diversity and complexity. Reduced fuel loading would help stands progress to toward conditions where the natural fire regime is restored.

2. **Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.**

Past timber harvest activities reduced connectivity for a number of riparian-dependent species. The project would help protect future connectivity through accelerating the growth of large trees in plantations through selective thinning and improving the resiliency of the riparian areas and adjacent landscapes in the event of wildfire.

3. **Maintain and restore the physical integrity of the aquatic system, including shorelines, banks and bottom configurations.**

Riparian reserve and water quality design features protect the existing physical integrity of the aquatic system by keeping all ground-disturbing activities well away from channel banks and riparian vegetation (no mechanical entry of heavy equipment within riparian reserves).

4. **Maintain and restore water quality necessary to support healthy riparian, aquatic and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and**

benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

This project is consistent with riparian reserve guidelines, which prohibit and regulate activities in the riparian reserves that may prevent or retard attainment of the Aquatic Conservation Strategy. Water quality is expected to remain at pre-fire conditions. Maintenance of water quality would be achieved through minimizing sediment delivery to stream courses. The majority of proposed treatments within riparian reserves are hand treatments that would result in more fire resilient riparian areas and would result in little to no sedimentation of adjacent headwater stream channels. No heavy equipment would enter riparian reserves. In addition, no new road construction would occur that involves a stream channels or riparian areas.

5. **Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate and character of sediment input, storage, and transport.**

Reducing the risk of stand-replacing fire and implementing a natural fire regime in the long term would have the most influence on maintenance and restoration of the sediment regime. Soil erosion occurs when soil cover is burned off. In the short term, post-fire soil erosion could show an increase. This is being mitigated to a certain extent by the Project Design Measures presently as proposed. The long term total sediment production is predicted to be lower if areas are thinned and burned under controlled conditions, as compared to another wildfire. Delivery of sediment into stream channels is expected to be at discountable levels due to the RR project Design Standards. Tractor logging is limited to gentle slopes and the majority of riparian reserve treatments are hand thinning. Riparian Reserve widths are 160 feet on either side of stream channels which provides a very large buffer to prevent any potential erosion from adjacent stand treatment from entering adjacent stream channels. There would be no entry of heavy equipment into riparian reserves and no new road construction would occur that involves stream channels or riparian areas.

6. **Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.**

The project would maintain the timing, magnitude, duration and spatial duration of in-stream flows. Selective thinning treatments outside and within riparian reserves would not have measurable effects on instream flows. The potential level of ground disturbance and compaction is expected to be very low and not alter rates of surface runoff due to the application of standards and guidelines limiting tractor to 15% of unit treatment areas. The proposed project includes the thinning of fire stands, controlled introduction of fire, and post-harvest fuel treatment, no activities are planned that would directly divert or reduce stream flows. There may be a short term lessening of evapotranspiration levels in the area, resulting in an increase in phreatic and vadose flows. This would be countermanded in the long term by increased stand vigor and fire resiliency.

7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table in meadows and wetlands.

The project would protect water tables in meadows, wetlands, seeps, and springs. These areas are buffered from any treatment related disturbance and heavy equipment would be excluded. Since this project only proposes the harvest of thinned timber, any effects to the water table would be negligible, because the remaining stand would be more vigorous and efficient as an evapotranspiration mechanism.

8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

The project would maintain or improve the thermal regulation of riparian reserves by accelerating the growth of larger trees in young stands and improving shade canopy and microclimate conditions. Fuel reduction treatments would not alter surface erosion rates nor result in bank erosion or channel migration such that the physical complexity and stability of the stream channel would be adversely affected. Thinning within riparian areas, particularly within plantations, would accelerate the recovery and growth of future large woody debris that is an essential component of the physical complexity and stability of stream channels. Within harvest areas, 2-5 snags/acre and 5 – 20 pieces of Coarse Woody Debris (CWD) would be maintained. Fuel treatment within Riparian Reserves would be designed to create conditions that minimize disturbance of riparian ground cover and vegetation. Opportunities to deliver key wood to streams would be maintained by leaving at least 5 – 8 snags/acre in upslope riparian reserves. All snags would be left in those riparian reserves well connected to suspected fisheries habitats.

9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

The project would maintain habitat for riparian dependent species. As discussed in Black and McCain (2008), recovery of riparian areas for riparian-dependent species would take many decades, particularly in young stands. A well-distributed mix of riparian habitats would maintain the riparian distributed species. Reducing the risk of a stand replacing fire would increase the likelihood of a well-distributed mix of habitats.

Compliance with the Northcoast Basin Plan

The Basin Plan for the Smith River contains water quality objectives, implementation plans for meeting those objectives, and other policies of the State Water Quality Control Board and the Federal Government, which are applicable to fuel treatment projects. While there are several water quality objectives in Section 3 of the Basin Plan which apply to all projects, the following turbidity objective is the most applicable for fuel treatment and fire salvage projects: “Turbidity shall not be increased more than 20 percent above naturally occurring background levels”. The Smith River is not listed as impaired under Section 303(d) of the Federal Clean Water Act.

Controllable water quality factors include minimizing new road construction, removing any temporary roads at the completion of the project, and emphasizing yarding systems

that minimize disturbance such as skyline cable or helicopter. Additional measures to mitigate water quality impacts should be included such as restoration treatments that decommission or upgrade roads and erosion control at actively eroding or unstable sites.

In designing site-specific fuels reduction prescriptions for this project, considerable attention has focused on water quality issues and the need to minimize delivery of management-related sediment. All controllable water quality factors were incorporated into project designs features.

- No new roads (permanent or temporary) would be constructed.
- No stream crossings or riparian reserves would be affected by proposed temporary road reconstruction, nor are these roads located in unstable ground. All temporary roads would be closed again after the completion of the project and returned to their condition prior to the project.
- Riparian Reserve treatments are extremely limited (see Chapter 3 and Hydrology and Fisheries Assessment).
- Fuel treatments are designed to minimize further impacts to soils by burning under wet weather conditions and only after soils have become moist or wet.
- All applicable Best Management Practices would be employed to protect on-site water quality. (see Soils and Geology Specialist report for complete list of BMPs)
- Due to the small amounts of sediment that potentially would be generated from treatments within riparian reserves, there should be no detectable change in the amount of stream sedimentation or the degree and duration of turbid conditions. Whatever small fraction of sediment that actually reaches a stream would certainly be well below the 20%-above background threshold as outlined by the North Coast Water Quality Control Plan. The proposed action complies with the Clean Water Act, Porter-Cologne Water Quality Control Act, applicable water quality control plans, and the Regional Board Waiver (Order No. R1-20044-0015).

Wildlife

The project occurs in the Lower Hurdygurdy Creek (4729 acres), Lower Jones Creek (2889 acres), Middle Jones Creek (4,979 acres), and Blackhawk/Yellowjacket Creek (6373 acres) watersheds. The majority of the project also occurs in the Haines Late-Successional Reserve (LSR 303; 40,602 acres). One of the objectives for the project is to improve conditions within the LSR; therefore, the analysis area for wildlife includes not only the affected watersheds, but also the entire LSR. The Grande and Jones subdivisions occur within the LSR, but the South subdivision is outside the LSR. Seral stage acreages described below includes information from LSR 303 and the South subdivision combined.

The objective of the proposal is both short- and long-term in its aim. The short-term aspect is to manage for protection from stand-replacing fire and prevent further habitat fragmentation. The long-term aspect is to improve the function of LSR 303 as habitat for late-successional and old growth associated species.

Vegetation within the LSR 303 (and the South Subdivision) is described in terms of vegetation series and seral stage (Smith River LSRA 1995). Seral stages are based on size class, age and structure. Plant series and seral stages have been identified that best provide late-successional forest structure, function and processes. Generally, the late-mature and old-growth seral size classes contribute most to late-successional species. The mid-mature seral size class also contributes to late-successional species, but while it may provide adequate tree size (usually greater than 21" dbh) and canopy closure it may lack some structural components (deformed trees, large logs) necessary to provide habitat. The shrub, pole, and early-mature seral stages lack all late-successional characteristics.

The LSRA determined that due to past management activity, LSR 303 was deficit in late-successional habitat. Silvicultural prescriptions can be applied to early-mature stands in order to accelerate their development toward late seral conditions. These treatments can increase the amount of late seral vegetation quicker than would occur naturally.

Late-successional dependent species may have different patch size requirements; however, in general larger patch sizes with low perimeter to interior ratio are preferred due to the greater amount of interior habitat. Combining the mid-mature, late-mature, and old-growth seral stages, the greatest frequency of patch-size across the LSR (91%) is in patches of 200 acres or less, with the lowest patch-size frequency (4%) occurring in patches of 500 acres or greater.

Currently, there is 19,948 acres (49%) of suitable habitat for late-successional habitat species such as the northern spotted owl (NSO) in LSR 303 and 1190 acres (28 %) in the South subdivision. The plantations and natural pole-sized stands proposed for treatment are even-aged and lack the horizontal and vertical diversity components associated with late-mature stands. These young stands have the potential to achieve rapid diameter and height growth with commercial thinning. As these stands develop, the acres suitable for spotted owls and other late-successional associated species should increase. By treating currently unsuitable habitat adjacent to existing late-successional habitat, larger patches would develop.

Currently, the LSR is categorized as having a high risk of catastrophic or stand replacing fire (Smith River WA and LSRA 1995). Existing late-successional habitat is at risk. Early seral vegetation is highly susceptible to loss in a fire (dense, interlocking canopy). Treatments that reduce the time stands are in early seral stages may reduce the risk of stand replacing fire. In addition, construction of the fuelbreaks would reduce the fuels along road systems bisecting the LSR and serve as a control point for suppression activities. Removal of the ladder fuels would reduce the potential of intense heat and crown fires continuing unabated into the LSR. The creation of these shaded fuelbreaks would assist suppression efforts in several ways: it would provide safe access for fire suppression crews; it would reduce the chance of a human-caused roadside fire from spreading into the LSR; and it would create a break in the continuity of fuels to slow down the progress of any fire that might start within the LSR. Shaded fuelbreaks in strategic areas would provide greater protection to existing late-successional habitat. This project would reduce fuel loads that could result in high-intensity wildfires that could negatively impact suitable wildlife habitat.

All Riparian Reserves (RR) within proposed units have a no-treatment buffer at a minimum width of 50 feet established, with equipment exclusion requirements in the

remaining RR (approximately 160' total RR width; Figure 2). In addition, there are more restrictive buffer widths on the larger creeks and the river in the project area (660 feet on lower Hurdygurdy Creek, 300 ft on Blackhawk, Jones, and Muzzleloader creeks and 0.25 mile on the South Fork Smith River). Little to no true riparian habitat exists within the proposed treatment units given the lack of riparian vegetation associated ephemeral and intermittent stream courses within the project area. However, in the long term, project implementation has the potential to improve riparian habitat conditions through the release of conifer and hardwoods/shrubs from thinning, generating a secondary canopy. The project would maintain high levels of coniferous canopy closure within the project area adjacent to RRs. Project activities would not occur within riparian habitat. Implementation of the project would maintain and improve riparian habitat conditions.

Implementation of this project would protect and improve habitat conditions for numerous species including Threatened, Endangered, and Forest Service Sensitive species (TES), Management Indicator species (MIS), Survey and Manage species (S&M) and Neotropical migrant species (NTM).

Threatened, Endangered and Forest Service Sensitive Species

Direct, indirect and cumulative effects to threatened, endangered, and Sensitive species (TES) are disclosed in the Biological Assessment/Biological Evaluation (BA/BE; located in the project file) for the Big Flat Vegetation and Fuels Management Project, and the results are summarized here. The BA/BE contains the list of species considered, local population information, survey results, and suitable habitat descriptions on which effects of proposed projects are evaluated. Known or suspected species occurrence is based on historic records, current sightings, field review, and formal surveys. Presence of suitable habitat is based on the Six Rivers National Forest Vegetation Layer, aerial photographs, and field reviews conducted by fish and wildlife biologists and botanists.

No Action Alternative

Under the No Action alternative, no commercial or pre-commercial thinning, shaded fuelbreak construction, or activity fuel treatments would occur. The No Action alternative would not change the current conditions. No suitable or Critical habitat for any TES species would be degraded through commercial thinning or shaded fuelbreak construction. There would be no disturbance to TES species during the breeding season. However, the No Action alternative would not accelerate development of late-successional conditions in younger stands throughout the LSR. The Six Rivers' Land Management Plan used computer growth models to determine the effects of thinning prescriptions designed to mimic natural disturbance on stand age. The results of this modeling showed that succession could be accelerated by as much as 30 years per seral stage, depending on site specific conditions. Treatments of shrub, pole, and early mature stands could accelerate the development of late-mature and old growth stands by as much as 90 years. The No Action alternative could delay the development of late-successional habitat by as much as 90 years, which in turn would delay the reduction of fragmentation and delay achieving larger habitat patch size in the LSR.

The No Action alternative would also not help alleviate the fuels problem in the LSR. Plantations that are left untreated would be a greater fire hazard in the long run because they are greatly overstocked (many trees per acre with dense, interlocking canopies). Treatments within stands would reduce existing fuels. Thinning in plantations improves

growing conditions for the remaining trees by reducing competition for light and nutrients. Without treatment, tree-to-tree competition may cause far greater mortality in the stand. Periods of competition-induced die-offs could generate large amounts of fuel in shorter time frames.

There are heavy fuels along the roads in the project area. Many of these areas contain a sufficiently dense fuel ladder (moving from the ground up to live limbs of a trees) to allow fire to easily make its way from the ground to the canopy. Under the No Action alternative no treatment would occur along these roads and the risk of a fire doing catastrophic damage to the LSR would remain high.

Proposed Action Alternative

Northern Spotted Owl (*Strix occidentalis caurina*), Threatened

Suitable northern spotted owl (NSO) habitat (nesting/roosting habitat) is composed of multi-storied mature and old growth stands having multi-layered conditions, a canopy closure of 60 percent or greater, and obvious decadence (large, live coniferous trees with deformities such as cavities, broken tops, and dwarf-mistletoe infections). The overstory should be comprised of conifer trees 21 inches or greater dbh and should comprise at least 40 percent of the total canopy closure (Forest-wide Reference Document 2008). The Forest's local definition of suitable habitat also includes stands with overstory canopy closure of at least 40 percent because these stands typically have a hardwood understory which increases total canopy closure to 60 percent or greater.

The habitat conditions are considered low quality for NSO throughout much of the project area. Past management has removed large tracts of suitable habitat and fragmented remaining patches. Extensive areas of 40+ year old plantations occur throughout the project area. There are 503 acres proposed for commercial harvest and 581 acres of TSI that would be treated using conventional harvest systems. All commercial and pre-commercial thinning would occur in plantations and young natural stands (40+ years old). None of the commercial or precommercial treatments occur in suitable habitat for the NSO. LRMP modeling showed that succession could be accelerated by as much as 30 years per seral stage, depending on site specific conditions. Treatments of shrub, pole, and early mature stands could accelerate the development of late-mature and old growth stands by as much as 90 years. Treatments would change the stand structure and allow large trees to develop, accelerating the development of functional late-successional habitat. Silvicultural prescriptions (such as group retention where areas within the stand are left untreated) would ensure retention of existing stand structure, species composition, snags, and downed logs.

Direct and Indirect Effects

Two historic NSO activity centers (AC; nest core areas) are located within 1.3 miles of the proposed units, although no unit or treatment area is located within 0.25 miles of an AC. Surveys for NSO in the project occurred in 2007 and 2008. Single NSO were detected in three different areas; however, none of the detections were repeated on subsequent surveys or in subsequent years. This is indicative of a non-territorial owl. No new activity centers were identified. No limited operating periods (LOP) would be required for project implementation.

No suitable habitat would be removed during this project; however, portions of the roadside shaded fuelbreak would occur in suitable NSO habitat. The project area occurs adjacent to County Road 405, and Forest roads 16N02, 16N03, 15N38, and 15N39. Roads 405, 16N02, and 16N03 are major access routes that receive heavy use. Road 15N38 accesses private land and 15N39 accesses the South Kelsey trailhead. Both roads also receive high-use. Suitable habitat along these roads is considered to be of low to moderate value for many wildlife species due to high ambient noise level and human presence.

Shaded fuelbreaks would be constructed along approximately 19.75 miles (approximately 740 acres) of high use roads in the project. Of this, approximately 2.58 miles occurs in suitable NSO habitat. Shaded fuelbreak construction may degrade 65 acres (0.3%) of the currently suitable NSO habitat; however, no overstory trees would be removed, no overstory canopy would be reduced, no understory trees over 8” dbh would be removed, and snags and downed logs (20” dbh or greater) would be maintained unless they pose a safety hazard. The habitat would remain suitable post project. Fuel treatments are designed to reduce ground and ladder fuels to limit the risk of fire disturbance on a large scale. Although multi-layered conditions contributing to suitable nesting habitat would be slightly reduced by removing brush and understory trees (8” dbh or less), they would result in a greater assurance of long-term maintenance of late-successional habitat. Fuel treatments in strategic areas would reduce the risk of fire ignitions along high use roads and provide greater protection to existing late-successional habitat.

Understory burning is expected to reduce the quantity and quality of downed woody material to various degrees regardless of the season of burning. However, the wetter the conditions during the burn, the less the impact would be to the surrounding habitat components. Understory burning is designed to produce the least damage to the boles of the trees in the unit and to prevent fire from getting into the crowns of the overstory. Tree mortality would be minimal and mainly in the smaller size classes. Understory burning projects would be conducted when weather and fuel moisture conditions are appropriate to achieve a "cool" underburn. Fuel moistures and humidity are monitored to assure that the prescriptions are met. Burn prescriptions are designed to prevent severe burn levels, maintain a cover of fine organic matter on at least 50% of the burn area (USFS Region 5 Soil Quality Standards and Guidelines), retain large down woody material, snags, and to result in light impacts to the canopy level of conifers and hardwoods. The objective is to keep flame lengths low, to minimize mortality of residual live trees.

In the long run, habitat conditions for the NSO would be improved in the project area by accelerating the development of late-successional characteristics in young stands and protecting existing late-successional habitat from stand replacing fire.

Northern Spotted Owl Critical Habitat

The entire project area occurs within a NSO Critical Habitat Unit (CHU). Primary constituent elements (PCE) of the CHU include forested stands that qualify as nesting/roosting (“suitable habitat” described above), foraging (early-mature stands 71-110 years old, with trees an average 18” dbh), or dispersal habitat (trees > 11 inches dbh with > 40% canopy closure). Most of the plantations that would be commercially thinned meet the definition of dispersal habitat and are considered low quality because they are densely stocked and even-aged. Thinning may degrade 503 acres of dispersal habitat; however, the project would maintain 40% or greater canopy closure in all units.

Dispersal habitat would remain functional post project. The project would treat younger stands to accelerate the development of late-successional habitat, which would decrease fragmentation and increase patch-size of existing late-successional habitat. The project would improve and accelerate habitat conditions for the NSO in the CHU

In addition, although multi-layered conditions contributing to suitable and foraging habitat in CHU may be slightly reduced during shaded fuelbreak construction by removing brush and small diameter understory trees (less than 8”dbh), it may result in a greater assurance of long-term maintenance of late-successional habitat in the CHU. Nesting/roosting and foraging habitat would remain functional post project. The project would not remove any PCE of the CHU. Fuel treatments in strategic areas would reduce the risk of fire ignitions along high-use roads and provide greater protection to the CHU.

The project may affect, but is not likely to adversely affect the NSO or NSO Critical Habitat. The US Fish and Wildlife Service concurred with this determination.

Marbled Murrelet (*Brachyramphus marmoratus*), Threatened

Nesting habitat is characterized by stands of large trees (greater than 32 inches dbh). Trees must have large branches or deformities, usually covered with moss or lichen, for nest platforms. Nest platforms typically require moderate to high canopy closure, which may come from the nest tree or surrounding trees (Forest-wide Reference Document 2008). Most observations are below 2000 feet (610 m) elevation, with some detection at 2000-3000 feet (610-914 m). The farthest inland nest in California was located 18 miles (29 km) from the ocean.

The habitat conditions are considered low quality for MAMU throughout much of the project area. Thinning would treat younger stands to accelerate the development of late-successional habitat, which would decrease fragmentation and increase patch-size of existing late-successional habitat. Fuel treatments would reduce the risk of fire ignitions along high use roads and provide greater protection to blocks of suitable MAMU habitat.

Direct and Indirect Effects

Surveys for MAMU occurred in selected areas throughout the project area. No MAMU were detected, nor have MAMU been detected in nearby project areas surveyed in past years. The likelihood of MAMU occurring within 0.25 miles of project units is low due to the low quality of the habitat (small patch size, low canopy cover, few large trees with large branches suitable for nesting). Surveys were conducted in the best available habitat in the project area with no detections; however not all potential habitat was surveyed. The project would occur during the breeding season of the MAMU. It is possible (although unlikely) that project implementation may disturb nesting MAMU within 0.25 miles of a treatment unit. Due to the low likelihood of MAMU occurring in the project area, no LOP would be required for project implementation.

No suitable habitat would be removed during this project; however, portions of the roadside shaded fuelbreak would occur in suitable MAMU habitat. The project area occurs adjacent to County Road 405, and Forest roads 16N02, 16N03, 15N38, and 15N39. Roads 405, 16N02, and 16N03 are major access routes that receive heavy use. Road 15N38 accesses private land and 15N39 accesses the South Kelsey trailhead. Both roads also receive high-use. Suitable habitat along these roads is considered to be of low

to moderate value for many wildlife species due to high ambient noise level and human presence.

Shaded fuelbreak construction fuels may degrade 65 acres of currently suitable MAMU habitat; however, no overstory trees would be removed, and no overstory canopy would be reduced. Fuel treatments are designed to reduce ground and ladder fuels to limit the risk of fire disturbance on a large scale. Although the project may remove small diameter trees within suitable habitat, overstory canopy closure in potentially suitable MAMU habitat would be maintained in all areas. No predominant or potential nest trees would be removed. Potential nesting habitat for MAMU would not be removed. Fuel treatments in strategic areas would reduce the risk of fire ignitions along high use roads and provide greater protection to existing late-successional habitat.

Marbled Murrelet Critical Habitat

The Jones and Grande subdivisions occur in a MAMU CHU. The PCE for MAMU Critical Habitat is forested lands of at least one-half site potential tree height within 0.5 miles of individual trees with potential nesting platforms. The project would not remove trees that meet the criteria. No overstory trees would be removed and overstory canopy closure in suitable nesting habitat would not be reduced. Although multi-layered conditions contributing to suitable MAMU habitat in the CHU may be slightly reduced during shaded fuelbreak construction by removing brush and small diameter understory trees (less than 8”dbh), it may result in a greater assurance of long-term maintenance of late-successional habitat in the CHU. No PCE would be removed. Accelerated development of late-successional habitat and protection of the LSR and CHU from fire would beneficially affect Critical Habitat in the long-term.

It was determined that the project may affect but is not likely to adversely affect the MAMU and MAMU CHU. The USFWS agreed with this determination.

Forest Sensitive Species

All Forest Service Sensitive wildlife species known or thought to occur in the project area (based on habitat and range), were evaluated for this project. It was determined that the project would have no impact on certain Forest Service Sensitive species, based on either the lack of habitat, lack of detections during surveys, or the fact that habitat would not be impacted. Species that would not be affected by this project include the bald eagle (*Haliaeetus leucocephalus*), American peregrine falcon (*Falco peregrinus anatum*), Townsend’s big-eared bat (*Corynorthinus townsendii*), California wolverine (*Gulo gulo luteus*), American marten (*Martes Americana),* western pond turtle (*Clemmys marmorata*), foothill yellow-legged frog (*Rana boylii*) southern torrent salamander (*Rhyacotriton variegatus*), and northern red-legged frog (*Rana aurora aurora*). The following environmental consequences section focuses on those Forest Service sensitive species and/or habitat that may be affected by this project.

Pacific Fisher (*Martes pennanti pacifica*)

Direct and Indirect Effects

Fishers occupy mid-elevation, multi-storied mature and old-growth mixed conifer and deciduous-riparian habitats with moderate to dense canopy closure (greater than 50 percent), scattered patches with six to eight large snags per acre, and abundant down logs

(Forest-wide Reference Document 2008). Fishers use cavities in large trees, snags, logs, rock areas, brush piles, and concentrations of downed woody debris for denning and nesting. They forage primarily in dead wood. Therefore, both standing and down log densities are important indicators of habitat quality. Fishers use ridges and streams, covered by closed canopy forests, when moving between quality habitat areas.

No project specific surveys have been completed for the fisher, although surveys have been conducted in the affected watersheds. Although no sightings have been recorded for fisher in or near the treatment units, the fisher is known to occur in the affected watersheds. There are no known den locations in the project area; therefore no LOP would be imposed. The project would occur during the breeding season for this species. Project implementation during the breeding season may disturb fisher at undetected den locations.

Thinning in young stands is expected to accelerate development of late successional habitat characteristics. In the long-term, the project would improve habitat conditions for the fisher within the area by accelerating the development of late-successional characteristics.

No suitable habitat would be removed during this project; however, shaded fuelbreak construction may degrade 65 acres (0.3%) of the currently suitable fisher habitat. The project area occurs adjacent to County Road 405, and Forest roads 16N02, 16N03, 15N38, and 15N39. Roads 405, 16N02, and 16N03 are major access routes that receive heavy use. Road 15N38 accesses private land and 15N39 accesses the South Kelsey trailhead. Both roads also receive high-use. Suitable habitat along these roads is considered to be of low to moderate value for many wildlife species due to high ambient noise level and human presence. No overstory trees would be removed, no overstory canopy would be reduced, no understory trees over 8” dbh would be removed, and snags and downed logs (20” dbh or greater) would be maintained unless they pose a safety hazard. Fuel treatments are designed to reduce ground and ladder fuels to limit the risk of fire disturbance on a large scale. Although multi-layered conditions contributing to suitable fisher habitat would be slightly reduced by removing brush and understory trees (8” dbh or less) it would result in a greater assurance of long-term maintenance of late-successional habitat. Fuel treatments in strategic areas would reduce the risk of fire ignitions along high use roads and provide greater protection to existing late-successional habitat.

Understory burning is expected to reduce the quantity and quality of downed woody material to various degrees regardless of the season of burning. However, the wetter the conditions during the burn, the less the impact would be to the surrounding habitat components. Understory burning is designed to produce the least damage to the boles of the trees in the unit and to prevent fire from getting into the crowns of the overstory. Tree mortality would be minimal and mainly in the smaller size classes. Understory burning projects would be conducted when weather and fuel moisture conditions are appropriate to achieve a "cool" underburn. Fuel moistures and humidity are monitored to assure that the prescriptions are met. Burn prescriptions are designed to prevent severe burn levels, maintain a cover of fine organic matter on at least 50% of the burn area (USFS Region 5 Soil Quality Standards and Guidelines), retain large down woody material, snags, and to result in light impacts to the canopy level of conifers and hardwoods. The objective is to keep flame lengths low, to minimize mortality of residual live trees.

The Pacific fisher is a federal candidate species (as well as a FS Sensitive Species), currently being considered for listing under the ESA. Implementation of this project may impact individual fisher by causing disturbance at an undetected den site, but would not appreciatively diminish the recovery options for this species on the SRNF. The project is expected to benefit the fisher in the long-run. The USFWS concurred with this determination.

Northern Goshawk (*Accipiter gentiles*)

Direct and Indirect Effects

Goshawks in northern California prefer mature and old-growth conifer forests that are at middle to high elevations, have relatively dense canopy closures, usually have little understory vegetation, are in close proximity to riparian corridors, and have flat or moderately sloping terrain ((Forest-wide Reference Document 2008). Interspersed meadows or other openings are also required. Moderate and high quality habitats contain abundant large snags and logs that provide prey habitat and plucking perches. Suitable habitat is used for nesting, foraging, and roosting.

There is suitable goshawk habitat in and within 0.25 miles of the proposed project area. Surveys for goshawk in the project are in progress and would be completed in mid-summer 2008. If nesting goshawks are found within 0.25 miles of any treatment units, a limited operating period (no activities between March 1 and August 31) would be imposed.

Sixty-five acres occur in suitable goshawk habitat. Suitable habitat for the goshawk may be degraded by project implementation, but it would remain suitable post-project. No predominant trees (potential nest trees) would be removed, and at least 60% canopy closure would be maintained in suitable habitat. Removal of dense understory vegetation may improve foraging conditions for the goshawk.

No suitable habitat would be removed during this project; however, shaded fuelbreak construction may degrade 65 acres (0.3%) of the currently suitable goshawk habitat. The project area occurs adjacent to County Road 405, and Forest roads 16N02, 16N03, 15N38, and 15N39. Roads 405, 16N02, and 16N03 are major access routes that receive heavy use. Road 15N38 accesses private land and 15N39 accesses the South Kelsey trailhead. Both roads also receive high-use. Suitable habitat along these roads is considered to be of low to moderate value for many wildlife species due to high ambient noise level and human presence. No overstory trees would be removed, no overstory canopy would be reduced, no understory trees over 8” dbh would be removed, and snags and downed logs (20” dbh or greater) would be maintained unless they pose a safety hazard. Removal of dense understory vegetation may improve foraging conditions for the goshawk. Fuel treatments are designed to reduce ground and ladder fuels to limit the risk of fire disturbance on a large scale. Fuel treatments in strategic areas would reduce the risk of fire ignitions along high use roads and provide greater protection to existing late-successional habitat.

Thinning in young stands is expected to accelerate development of late successional habitat characteristics. In the long-term, the project would improve habitat conditions for the goshawk within the area by accelerating the development of late-successional characteristics.

Implementation of this project may impact individual goshawk but would not cause a trend towards listing.

Management Indicator Species and Neotropical Migrant Bird Species

Management Indicator Species (MIS) and Neotropical Migrant Bird Species (NTM) were addressed based on their potential to occur within the project area based on habitat suitability, survey results, or incidental sighting records. Habitat suitability evaluations were made using the California Wildlife Habitat Relationships System, Version 8.0 software, developed by the California Department of Fish and Game. In addition habitat evaluations were made utilizing Six Rivers National Forest Wildlife Sighting Database, Six Rivers National Forest Vegetation Layer, field reviews, and Forest GIS vegetation layers.

No Action Alternative

Under the No Action alternative, no commercial or pre-commercial thinning, shaded fuelbreak construction, or fuel treatments would occur. The No Action alternative would not change the current conditions. No suitable habitat for any MIS or NTM species would be degraded through commercial thinning or shaded fuelbreak construction. However, the No Action alternative would not accelerate development of late-successional conditions in younger stands throughout the project area. The No Action alternative would also not help alleviate the fuels problem in the project area.

Proposed Action Alternative

MIS

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)). The 1982 regulations implementing NFMA require that "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area." (36 CFR 219.19) Management Indicator Species (MIS) is a concept used by the agency to serve as a barometer for species viability at the Forest level. Population changes of MIS are believed to indicate the effects of management activities.

The Forest Land Management and Resource Plan for the Six Rivers National Forest use MIS to assess potential effects of project activities on the various habitats and habitat assemblages with which these species are associated. Forty-one fish and wildlife species have been selected as MIS or assemblages for a variety of habitats that are potentially affected by resource management activities on the Forest (LRMP IV-97).

The potential impacts to MIS were analyzed and the results are summarized here. The full report is located in the project file.

The majority of the project area was intensively managed in the past. Seral stages range from shrub to mid-mature stands with small patches of late-mature and old growth. The project is designed to improve habitat conditions through the acceleration of late-successional habitat characteristics, while still maintaining current functional habitat. Canopy closure would be maintained in late-successional habitats, vegetation species

diversity and composition would be maintained, and retention of snags and downed logs would be retained at 80-100% of the average numbers found within mature and old growth stands within the Forest.

This project would degrade a total of 1084 acres of early seral stage habitat due to commercial and pre-commercial thinning in shrub and pole sized stands. For species that utilize early seral habitat (such as the lazuli bunting) this represents 6% of the early seral stage habitat in the project area.

No commercial harvest would occur in late-successional habitat; however shaded fuelbreak construction would occur in late-successional habitat along the main roads. Fuel treatments would occur in 65 acres that are considered suitable for late successional associated species. Fuel treatments would degrade approximately 0.3% of the suitable habitat for these species available in the project area. The shaded fuelbreak would be approximately 150 ft wide on either side of the road. Only brush and small diameter trees (less than 8” dbh) would be removed during any stage of the project. No overstory trees would be removed. All exiting snags and downed wood would be retained, unless the former poses a safety hazard. There would be minor habitat degradation for understory species such as the winter wren and ruffed grouse within the project areas through the removal of brush and small diameter (less than 8” dbh) trees; however in the long term, reduction of fuel ladders in these areas would improve adjacent habitat areas resilience to fire disturbance. Overstory canopy closure would be maintained, ground disturbance would be limited to existing roads and skid trails, vegetation species diversity and composition would be maintained, and retention of snags and downed logs would be retained at 80-100% of the average numbers found within mature and old growth stands within the Forest.

All Riparian Reserves (RR) have a no-treatment buffer established of a minimum of 50ft, with equipment exclusion requirements in the remaining RR (approximately 160' total RR width). In addition, there are more restrictive buffer widths on the larger creeks and the river in the project area (660 feet on lower Hurdygurdy Creek, 300 ft on Blackhawk, Jones, and Muzzleloader creeks and 0.25 mile on the South Fork Smith River). Little to no true riparian habitat exists within the units given the lack of riparian vegetation associated ephemeral and intermittent stream courses within the project area. However, in the long-term project implementation has the potential to improve riparian habitat conditions through the release of conifer and hardwoods/shrubs from thinning, generating a secondary canopy. The project would maintain high levels of coniferous canopy closure within the project area adjacent to RRs. Project activities would not occur within riparian habitat. Implementation of the project would maintain and improve riparian habitat conditions.

Understory burning may also cause short-term habitat degradation through the loss of small woody debris; however, burning would occur under specific weather and moisture condition designed to minimize damage to the residual stand, maintain large woody debris, and maintain at least 50% of the duff layer. Some minor local increases in fuels may occur from project generated slash, but due to proposed post-harvest fuel treatments, fuel loading would not be a threat to the treated areas. In the long term, reduction of fuel ladders would improve stand resilience to fire disturbance.

Understory burning the special habitat area (5 acre meadow) would reduce encroachment and protect the habitat in the long-term. MIS such as the black-tailed deer would benefit from burning the meadow.

The Big Flat Vegetation Management Project would not adversely impact MIS. Although shaded fuelbreak construction would degrade habitat for species such as the winter wren and ruffed grouse, the majority of the project would improve/restore habitat conditions for all MIS by thinning (both commercial and precommercial) young, homogenous stands, accelerating the development of multi-storied conditions and other late successional habitat characteristics. In addition, development of strategic fuelbreaks would help protect existing habitat from stand replacing fire.

NTM

The potential impacts to NTM were analyzed and the results are summarized here. The full report is located in the project file. The project would not adversely impact migratory species or their associated habitats.

Project design standards would minimize potential impacts to migratory species. The project is designed to improve habitat conditions through the acceleration of late-successional habitat characteristics, while still maintaining current functional habitat. Although there would be minor habitat degradation for understory species through the removal of brush and small diameter (less than 8” dbh) trees, in the long term the reduction of fuel ladders in these areas would improve adjacent habitat areas resilience to fire disturbance. Overstory canopy closure would be maintained, ground disturbance would be limited to existing roads and skid trails, vegetation species diversity and composition would be maintained, and retention of snags and downed logs would be retained at 80-100% of the average numbers found within mature and old growth stands within the Forest.

Survey and Manage Species

A January 9, 2006 court order (NEA et al. vs. Ray et al., Civ. No. 04-844P) concluded that ground-disturbing activities need to comply or demonstrate consistency with the 2001 Record of Decision (ROD) and Standard and Guidelines for Survey and Manage (S&M) Species (USDA and USDI 2001) as amended by the 2003 Annual Species Review (Table 1-1; Species Included in Survey and Manage Standards and Guidelines and Category Assignment December 2003). Compliance with the 2001 ROD as amended by the Annual Species Review was affirmed by a February 18, 2008 Ninth Circuit Court order that concluded the 2007 Survey and Manage Final Supplemental Environmental Impact Statement satisfied the condition set forth by a February 12, 2007 Ninth Circuit Court decision pertaining to two Bureau of Land Management timber sales. The February 18th order thus vacated the February 12th order.

Consistency with the 2001 ROD as amended includes application of existing Management Recommendations to any known sites of survey and manage species potentially affected by project activities and pre-disturbance surveys for those species listed as Category A or C (USDA and USDI 2001).

With the 2003 Annual Species Review, the red tree vole (RTVO) was removed from management under the Survey and Manage Standards and Guidelines in the mesic survey zone of the species range. The mesic survey zone encompasses the Smith River National

Recreation Area. Under this direction, pre-disturbance surveys are no longer required within the mesic zone.

There are no known sites of RTVO in the Big Flat project area; however, no commercial harvest would occur in stands over 80 years of age, and only brush and small diameter trees (less than 8” dbh) would be removed from older stands during fuelbreak construction,. No overstory trees or overstory canopy would be removed. The project would not adversely impact the RTVO.

The Big Flat Vegetation and Fuels Management Project is in compliance with the 2001 ROD as amended.

Cumulative Effects to TES, MIS, NTM, and S&M Wildlife Species

The project occurs in the Lower Hurdygurdy Creek (4729 acres), Lower Jones Creek (2889 acres), Middle Jones Creek (4,979 acres), and Blackhawk/Yellowjacket Creek (6373 acres) watersheds. The majority of the project also occurs in the Haines LSR (LSR 303; 40,602 acres). One of the objectives for the project is to improve conditions within the LSR; therefore, the analysis area for wildlife not only included the affected watersheds, but also the entire LSR. The Grande and Jones subdivisions occur within the LSR, but the South subdivision is outside the LSR. Seral stage acreages described below includes information from LSR 303 and the South subdivision combined.

Past management activities in these watersheds have included timber harvest, grazing, and mining. The negative impacts from timber harvest and mining have included habitat removal and fragmentation, which affected not only nesting habitat, but also important foraging and dispersal habitat.

Mining

Past mining, primarily for gold, has had a significant impact in the Big Flat area. The lower 4 miles of Hurdygurdy Creek, which were at the heart of the Big Flat Mining District, were hydraulically mined. This area was most active from 1878 to 1889 and again between 1932 and 1939. This mining district encompassed approximately 1,500 acres, and contained two major ditch systems, ten hydraulic pits, numerous placers, and smaller ditches and penstock sections. This hydraulic mining altered the channel and riparian areas significantly. Huge volumes of hillslope sediment were washed down to riparian and streamside areas and large woody debris (LWD) was removed from the channel to facilitate the mining of alluvial gold placer deposits within the substrate and near the channel. The removal of LWD reduced stream and riparian habitat complexity, LWD recruitment potential, and the ability of the channel to store and route the introduced sediment. In addition, gold was mined at seven other sites and chromium was worked at 10 sites in the LSR.

Timber Management

The Forest Service timber program on the present day Smith River National Recreation Area did not fully commence until the early 1950s. In the early 1960s and 1970s timber production was at the highest. Of the four LSRs on the Smith River NRA, the Haines LSR has had the most acres harvested (Table 23; approximately 17%). In addition, 1,160 in the Haines LSR were harvested by private landowners and the land then sold to the Forest Service. In the South Subdivision, 706 acres of National Forest system land was

harvested, primarily in the 1980's. There are also approximately 718 acres of private land in the South Subdivision, most of which has also been harvested.

Table 23. Acres Harvested in the Haines LSR

Ownership	Haines LSR	South Subdivision
National Forest System	5,869	706
Private Land	1,160	718
Totals	**7,029**	**1,424**

The timber harvest that occurred in the last 40 years has reduced the amount of late-successional habitat in the LSRs. The majority of the habitat was harvested in the seventies and is currently in the pole stage. Late-seral dependent species populations may have declined due to the rigorous timber program although there is no survey information to confirm this assumption. The landscape was fragmented from the timber harvest and associated road construction which may have resulted in the failure of late-seral species to disperse, an increase in predation by invasive edge specialists, an increase in mortality from road kill, and an increase in the amount of sediments going into the streams.

Impacts from the proposed thinning and fuels reduction actions are considered to be minor and short term, and therefore would not create adverse effects when combined with past activities on the Forest and those on adjacent private land. Thinning and fuel treatments may result in a greater assurance of long-term maintenance of late-successional habitat. In the LSR and CHU the combined effect of the proposed actions (thinning in young stands and establishing fuelbreaks and other fuel treatments) would result in a lower fire risk and hazard in the short-term, and an acceleration in the development of late-successional characteristics in current early seral stands in the long term. Thinning and shaded fuelbreak construction would degrade 0.3% (late successional habitat) to 6% (early successional habitat) acres of potential habitat, depending on species-specific requirements, in the short-term but it would remain suitable post-project and is expected to improve habitat conditions in the long term.

The project area occurs adjacent to County Road 405, and Forest Roads 16N02, 16N03, 15N38, and 15N39. Roads 405, 16N02, and 16N03 are major access routes that receive heavy use. The 15N38 access private land and 15N39 access the South Kelsey trail. Both roads also receive high use. There would continue to be use along these Forest roads post project. Ongoing public use and continued routine road maintenance is expected. Temporary roads reused for the project and reopened OML 1 roads would be closed after project completion. The project is not expected to substantially add to the existing or foreseeable use of roads in the area. The habitat along these roads is expected to continue to be of low to moderate value for many wildlife species due to high ambient noise level and human presence.

Due to the scope, size, and intent of this project, there are no concerns of further exacerbation of negative cumulative watershed effects for TES, MIS, NTM, or S&M wildlife species. This proposed project is designed to attain LSR objectives and contains

implicit measures to reverse cumulative watershed effects over the long term in the treated areas.

Reasonably Foreseeable Actions

Reasonably foreseeable future actions include private, county, state, and federal actions that are in any stage of project planning and those for which decisions have been made and are awaiting implementation.

The project area incorporates the community of Big Flat. Private land activities include agriculture, grazing, domestic use, timber harvest, and fuel treatments. Timber harvest has occurred and is expected to continue on the privately owned timber ground. There are no known proposed Timber Harvest Plans being considered in the project area.

A Forest Service action is scheduled to be implemented in the project area. Planning for the Coast to Crest Trail was completed in 2007 and the project is scheduled to be implemented in 2009. A portion of the trail will be constructed or reconstructed (much of the historic trail still exists) in the Big Flat project area. Only brush and small diameter trees (less than 6” dbh) will be removed during any stage of the project. No overstory trees will be removed. All exiting snags and downed wood would be retained, unless the former poses a safety hazard. Any snag felled for safety reasons will be left on site as downed woody debris.

The entire trail will be approximately 3 feet wide and 10.65 miles, and cover approximately 3.8 acres total. Approximately 2.96 miles of the 10.65 mile trail will occur in the Big Flat project area. Many sections of the trail already exist with little or no vegetation to be removed. The trail is located in potential habitat for species such as the winter wren and ruffed grouse that use understory vegetation. It is expected that less than one acre of brush and small diameter trees will be removed. No suitable habitat for any late-successional species will be removed.

Another project is currently in the planning phase. The Smith River Road Management and Route Designation (RMRD) Project is not yet completed; however the proposal is to remove approximately 200 miles of system and non-system routes, 14 miles of road are proposed to be removed in the project area. The RMRD project is expected to benefit wildlife TES, MIS, NTM, or S&M wildlife.

Due to the scope, size, and intent of the Coast to Crest Trail and Smith River RMRD projects there are no concerns of further exacerbation of negative cumulative watershed effects for TES, MIS, NTM, or S&M wildlife species when combined with the Big Flat Vegetation Management and Fuels Reduction Project.

Botany

Forest Sensitive Species

Based upon the presence of potential habitat, approximately 1,265 of the 1,824 unit acres (70%) were surveyed for vascular and non-vascular Sensitive. Units or portions thereof not subject to survey were plantations and those portions of natural stands characterized

as even-aged early seral stands with little stand structure. The list of units and rationale for partial or no survey is included in the administrative file.

Surveys resulted in the finding of a new site of the sensitive species *Ramalina thrausta*. *Sowerbyella rhenana*, a Forest Sensitive fungi species, was previously documented during strategic survey efforts associated with the Northwest Forest Plan's Survey & Manage Program (note: this species is both Forest Sensitive and Survey & Manage) (Table 24). No other Sensitive species were located or known to occur in areas potentially affected directly or indirectly by the project. Sensitive species accounts for the species carried forward are included in Appendix A of the Biological Assessment/Biological Evaluation for this project (Hoover 2008).

Table 24. Sensitive Species Detected or Known to Occur in the Project Area

Species	Taxonomic Group	Number of Occurrences	Units
Ramalina thrausta	Lichen	1	F-22
Sowerbyella rhenana	Fungus	1	F-15

Ramalina thrausta (RATH) is a fruticose lichen that can occupy various species and dead twigs in forests influenced by coastal fog. The body of the organism or thallus appears thinly filamentous and pendulous hanging from the substrate. RATH reproduces primarily by asexual means either through thallus fragmentation or soredia (mass of algal cells surrounded by fungal hyphae) development. Of the nine occurrences in California, eight are on the Smith River National Recreation Area (NRA). Where it occurs, the species abundance is considered rare consisting of few thalli at each site.

Limitations to dispersal coupled with its low abundance increase the importance of maintaining substrate and habitat conditions for this species where it is found. Local changes in air quality (e.g. smoke and particulates) and humidity levels may affect RATH. Highly branched fruticose lichens such as RATH have a high surface to volume ratio that results in rapid drying and wetting patterns (Nash 1996). They differentially prefer wet to moist conditions or the other extreme, with RATH preferring the former.

Lichens are well-adapted to temperatures experienced in their micro-habitat (Nash 1996), but exposure to heat outside the natural range of variability can trigger a stress response in the lichen. Generally speaking, lichens are most susceptible to changes in their environment when the thallus is hydrated. In this condition, lichens are most photosynthetically active, contrarily, no gas exchange occurs in air-dried lichens (Nash 1996). In a relatively dry state, lichens have the capacity to tolerate heat stress, but when hydrated that tolerance diminishes.

Sowerbyella rhenana, the one fungus documented in the project area, is a saprobe meaning that it is a decomposer, thriving on the litter and duff of the forest floor. This ecological function can also be assigned to *Otidea smithii*, which has the potential to occur in the mid-late mature stands in the project area. Litter saprobes, such as these species, can extend over a large area, via mycelial networks. Relatively shady and moist

to mesic mature stands with various sized litter (including some coarse woody debris) describe the habitat for saprobes. *Boletus pulcherrimus* and *Phaeocollybia olivacea* are mycorrhizal. Mycorrhizal fungi form interdependent relationships with their host tree or shrub, exchanging nutrients, mineral and water.

Common to all of the fungal groups are habitat conditions characterized by shady, mature stands with conifer or hardwood hosts and ample organic substrate (e.g. leaf, needle, woody debris). The above-ground portion of the fungus is the fruiting body which produces spores that are dispersed in the wind or by small mammals that feed on the fruit. Underground are networks of fungal hyphae (strand-like structures) when grouped together form mycelium. The mycelium is the body of the fungal individual. These networks scavenge nutrients from the surrounding soils, acting as an extension to the root system. Hyphae can grow to infect nearby plant roots and can eventually connect neighboring plants.

Management that retains living trees or shrubs (the host) and the important underground linkages for mycorrhizal fungi via the myceliel network would maintain habitat parameters for mycorrhizal species (Amaranthus and Perry 1994). Likewise, management that retains overstory canopy and the litter and coarse woody debris of the forest floor would maintain habitat parameters for saprobes (Norden et. al. 2004).

No Action Alternative

The no action alternative would maintain the occupied substrate of *Ramalina thrausta*; therefore, there are no direct effects to this species. This alternative would also maintain existing environmental conditions for *Ramalina thrausta*, thus eliminating any potential short-term indirect effects caused by smoke generated by burning the adjacent grassland.

For Sensitive fungi species, the no action alternative would not disturb the forest floor environment and maintain existing habitat components for fungi species.

Proposed Action Alternative

The measure of effect for Sensitive species is the extent to which habitat is altered by the various activities and the extent to which project design features would reduce or alleviate the effects of habitat alteration.

Ramalina thrausta

Direct and indirect effects are those that remove the occupied substrate and thus the organism, alter humidity conditions around the occupied substrate or reduce dispersal potential by isolating the site. The proposal for Unit F-22 is to underburn the grassland therein. This activity would not directly affect RATH which occurs in the forest near the grasslands edge. Smoke generated from the burning may have short-term indirect effects to the thallus if burning occurs when the thallus is hydrated, however, this would not be considered significant effect due to the short duration of smoke generation resulting from burning grasses and other small forbs and other variables pertaining to wind and air temperature during the time of burning.

Since there are no direct effects, and any indirect effects have been reduced to an insignificant level by virtue of the project design and the habitat subjected to burning,

there would be no cumulative effects to analyze. The action alternative would not affect *Ramalina thrausta*.

Sensitive Fungi Species

Surveys were not conducted for Sensitive fungi due to their ephemeral habit and the expected retention of habitat components important to most fungi across the units. Effects are discussed in light of the magnitude of changes in the habitat as a result of project implementation and by the biology of the organism.

Of the activities planned for this project only those associated with fuels management are occurring in habitats considered suitable for Sensitive fungi. Fuels management activities that may affect the Sensitive fungi, *Boletus pulcherrimus, Dendrocollybia racemosa, Otidea smithii, Phaeocollybia olivaceae*, or *Sowerbyella rhenana* include hand-cutting and subsequent pile burning, hand-line construction, understory burning in the harvest units, removal of forest floor organics, and use of ground-based equipment for mastication purposes.

Direct and indirect negative effects of these activities pertain to removal or severance of mycelial segments (which comprise the fungal organism) residing in the organic or topsoil layer, reduction in canopy shade, reduction in the availability and distribution of host trees and refuge species to sustain inoculum through periods of successional change in the stand, removal or reduction of forest floor organics and coarse woody debris which form the primary micro-habitat for saprobic species, and breakdown of soil structure (e.g. compaction) which not only affects the mycelium therein but also damages fine root tips to which the mycelium attaches (Amaranthus et. al. 1996).

The effects to each of the fuels management activities are discussed in detail in the Biological Assessment/Biological Evaluation (Hoover 2008a) for this project. In summary, due to the a) project design features pertaining to maintenance of coarse woody debris, b) maintenance of litter and duff (Soil Productivity), and c) low intensity burning, coupled with the expected sprouting vigor of vegetation removed and the fact that the body of the organism is essentially residing in the humus and topsoil layers as mycelium, activities associated with fuels management are not considered significant alterations of habitat components necessary for Sensitive fungi.

Since there are no direct effects or indirect effects there would be no cumulative effects to these species. The action alternative would not affect any of the Sensitive fungi.

Survey and Manage Species

Compliance with the 2001 ROD as amended by the Annual Species Review was affirmed by a February 18, 2008 Ninth Circuit Court. More detail of the compliance history for Survey and Manage species is addressed under Wildlife.

Compliance or consistency with the 2001 ROD as amended includes application of existing Management Recommendations to management of any known sites of Survey and Manage (S&M) species potentially affected by project activities and pre-disturbance surveys for those species listed as Category A or C (USDA and USDI 2001).

From a botanical perspective the project is in compliance with the 2001 ROD as amended in that (a) pre-disturbance surveys were conducted for those Category A or C species for

which ranges and potential habitat overlap the project area and (b) management is provided for known sites of Category B or Category E species.

Pre-disturbance surveys resulted in 47 detections of *Lobaria oregana* (LOOR) in the initial project area, of which three were known sites (e.g. from strategic surveys). Of those, only 22 ended up within project units. Pre-disturbance and known site information resulted in the detection of five *Usnea longissima* sites. All of these detections are outside of the proposed project units. There was one known site of a Category B fungus, *Sowerbyella rhenana*. This species is also a Sensitive species and is addressed in detail in the Biological Assessment/Biological Evaluation for Sensitive species (Hoover 2008a). No other Survey and Manage botanical species were detected or known to occur in the project area.

Table 25. *Lobaria oregana* Sites found within the Project Area

Species	# of Sites	Unit # (# Sites > 1 within Unit)
Lobaria oregana	22	F-1, F-2 (2), F-8, F-10, F-11, F-13, F-15, F-16 (2), F-20 (5), F-22, F-23, F-24, F-29, TSI-7, TSI-29, CH-4

The following information is drawn from the Survey and Manage report for this project (Hoover 2008b).

LOOR is a foliose lichen that in the Klamath Range of California is most often associated with legacy, old-growth or predominant trees in stands ranging in seral stage development from early to late-mature. On the Six Rivers National Forest, there are two known sites on the Orleans Ranger District which represent the eastern-most occurrence of this species documented on the Forest. The remaining occurrences are on the Smith River National Recreation Area, where the species occurs in the Shelley Creek Watershed, Myrtle Creek Watershed and in the Big Flat area (Hurdygurdy, Jones and Horse Creek watersheds).

If observed in the canopy, LOOR is typically distributed on the inner portion of the branches close to the bole; however, position in the crown is influenced by environmental and micro-climatic conditions of a given geographic setting. The distribution of LOOR within and across stands depends on propagule availability and its ability to disperse. LOOR reproduces primarily by fragmentation, whereby pieces of the thallus (the body of the lichen) break off and become established on lower branches or other conifer trees in the sub-canopy, regardless of the age of the substrate. So while LOOR can become established on a variety of substrates if environmental conditions are favorable, its ability to disperse across and between stand is limited. In terms of environmental conditions, factors that might play a role in the resiliency of LOOR under a given set of light conditions and thus its distribution in a tree or across a stand include seasonal temperature, adaptive capability of individuals in a population to adjust to differing environments (Shirazi et al. 1996) and oceanic or riverine influences.

No Action Alternative

The no action alternative would maintain the occupied substrate of *Lobaria oregana*; therefore, there are no direct effects to this species. This alternative would also maintain existing environmental conditions for Lobaria oregana, thus eliminating any potential indirect effects caused by understory or pile burning or removal of sub-canopy trees that provide shading to the lower crown of the substrate tree and provide potential dispersal sites.

Proposed Action Alternative

The measure of effect for Survey and Manage species is the extent to which habitat is altered by the various activities and thus the influence on the persistence of a species at a known site, and the extent to which project design features would provide for persistence at a site.

Activities which remove or damage the substrate upon which LOOR is attached and growing, remove sub-canopy trees which serve as local sites for thalli fragment establishment, isolate "parent" trees thus reducing dispersal opportunities across a stand, and alter the existing shade/lighting conditions beyond the threshold tolerated by LOOR, are those that would negatively affect the persistence of LOOR at a site.

Across the project area, none of the activities proposed for this project would remove the primary substrate for LOOR. All but three of the known sites are associated with fuel treatment units in which the existing canopy cover and associated canopy crown shading would be maintained. The targeted material for removal includes shrub vegetation and suppressed saplings; thereby, retaining sub-canopy trees for potential dispersal sites. Canopy closure in the timber stand improvement units would be reduced to a minimum 40% cover from it current closure but the trees targeted for removal are not those that comprise the upper canopy, specifically trees up to 6" diameter breast height (DBH).

To alleviate potential impacts from a) pile burning (specifically heat or smoke), b) fuelwood or biomass utilization in unit F-15 where LOOR occupied a 6" DBH tree, c) understory burning, and d) removal of sub-canopy trees in the vicinity of an occupied tree, a project design feature specific to this species is the establishment of a 25' radius buffer in which no activities, with the exception of dead fuel removal, would occur.

Canopy closure in the one commercial harvest unit (CH-4) would also be reduced to a minimum 40% canopy closure and trees up to 20" DBH could be removed. Trees of this diameter form the sub-canopy in the commercial harvest units and provide shade to the lower and middle crown position favored by LOOR. The application the project design feature calling for a 30-50 foot radius no disturbance buffer would reduce indirect impacts potentially caused by removal of sub-canopy trees in Unit CH-4.

In summary, stand level prescriptions, project design features, and specific to *Lobaria oregana*, establishment of a minimum 25' radius no-disturbance buffers around the occupied substrates, would provide for persistence of *Lobaria oregana* known sites in the project area. Measures addressed in the Sensitive species portion of this document would also provide for persistence of *Sowerbyella rhenana* at the known site.

Cumulative Effects

Logging is the primary activity in this area that would cumulatively affect LOOR. There have been no past (last 15 years) Timber Harvest Plans (THPs) on private land in the project area or are any proposed; therefore logging activities would be generally discussed for National Forest system land only.

Records indicate that between 1979 and 1988 (10 years), 945 acres were logged in the affected watersheds, of which 90% of them were clearcut harvested using a mix of cable, helicopter and tractor logging systems. Past clearcutting and even shelterwood cutting prescriptions (the 10% not clearcut) essentially removed sites of S&M species or significantly compromised their habitat.

LOOR was not uncommon in the project area and likely occurs at more sites than could be detected by reliance on litter fall. Most of the detections on the Forest are located on the Smith River National Recreation Area with occurrences north of the project area in the Shelley, Myrtle and Rowdy Creek drainages and the South Fork Smith River. There are occurrences south of the project area in the Bluff and Camp Creek drainages of the Orleans Ranger District. It is conceivable, that unsurveyed suitable habitat is located between the geographic locales of LOOR on the forest and additional sites of LOOR are likely.

So locally, past Forest Service activities have very likely removed sites of LOOR and restricted dispersal. Existing known sites can provide a propagule source for dispersal into adjacent plantations if conditions are suitable for establishment and growth. Given the apparent ecological amplitude of LOOR to occur in young stands and the protection of known sites of LOOR in the project area units, in the long-term, new sites may arise in the stands surrounding known sites.

Invasive and Noxious Weed Species

The measure of effect for invasive and noxious weed species is the extent of clearing and ground disturbance caused by the various activities and the extent to which project design features would reduce or alleviate the effects of these activities.

Scotch broom and French broom are Forest priority weeds detected in the proposed action area in association with roadsides and previously disturbed areas. Target weeds sites in the project area have been treated over the course of the past 3 years. In 2007, weed sites were either fully or partially retreated. Sites of either scotch or French broom were flagged within fuel treatment unit F-22 and roadside adjacent to the following project units: F-3, F-15, F-17 (2 sites), F-18 (2 sites), F-20, F-21, F-24, CH-34, and TSI-29.

Noxious and invasive species (hereafter referred to as “weeds”) have an enormous capacity to spread into newly disturbed areas and proliferate. Through their reproductive capacity, growth habit, methods of dispersal and seed bank capacity, weeds readily displace native plant species and persist in the environment. For example, seeds of broom species exist in the soil (termed “seed banking”) until the soil is adequately disturbed or up to 30 years.

Once established, weeds can spread into adjacent disturbed areas. Repeated treatments in the project area have significantly reduced the number of large, adult plants. Most of

what occurs in the project area is the result of seed germinating from the bank or re-sprouting from the base when adult plants were not fully removed. These residual sites occupy less than 0.3 acres per site and most exist as a few plants.

No Action Alternative

The no action alternative would not create potential weed establishment sites, specifically there would be no new ground disturbance or clearing of existing vegetation for landings or temporary roads. Weed seed import on equipment or on foreign material used in the course of project implementation would not be an issue.

While issues pertaining to new ground disturbance, vegetation removal, and heavy equipment vectors for seed import are eliminated under the no action alternative, unmanaged, it is likely that weeds associated with road edges or openings (e.g. in the meadow), would continue to spread away from existing sites in association with routine road maintenance.

Proposed Action Alternative

The measure of effect for invasive and noxious weed species is the extent of clearing and ground disturbance caused by the various activities and the extent to which project design features would reduce or alleviate the effects of these activities.

New ground disturbance proposed by this project, including any necessary clearing of existing landings or temporary roads, subsequent use of landings, mechanical harvesting and depending on the overstory, even hand removal of competing vegetation, creates a setting vulnerable to weed seed introductions. If the disturbance activity occurs near a known site, noxious weeds may also spread from that site into the disturbed setting. Inadvertent weed introductions are often caused by weed seed import on equipment or vehicles that have been operating in an infested area, or the use of weed seed infested gravel or other foreign material. Weed seed imported on equipment or vehicles that come in contact with disturbed soil would readily germinate and if left untreated would become established and spread where conditions are suitable. Infested gravel or other materials used in road maintenance or private land developments becomes a primary source of weed seed introduction which subsequently germinates and spreads from the source along roadways that are chronically disturbed.

The risk of spread or introduction of weed species is considered moderate overall. Activities near roadsides and clearings for landings propose a high risk; whereas activities occurring within the interior of fuel treatment units with mature trees and a minimum of 60% canopy closure propose a low risk.

Any project having a moderate to high risk would include project design features or other measures to reduce the risk. Project design features identified under that section include equipment cleaning to reduce the risk of weed seed importation, pile burning of woody material on top of a known site where underburning is to occur in order to stimulate the seed bank, post-treatment monitoring and treatment of seedlings at that site, treatment of mature plants at select sites, and use of weed-free sources of foreign material if applicable. These measures would reduce the risk of weed introduction and spread.

Port-Orford-Cedar Root Disease Risk Assessment

A risk analysis of Port-Orford-cedar root disease *(Phytophthora lateralis)* is required under the Six Rivers LRMP for proposed projects that occur within watersheds containing Port-Orford-cedar (POC). A Risk Assessment and Disease Control Strategy Report specific to this project is included in this EA as Appendix D.

All proposed treatment units were evaluated for the presence of POC in or adjacent to the unit. The project area contains POC, with the majority located within riparian zones. Portions of Horse, Hurdygurdy, and Jones Creeks, and South Fork Smith River within the project area contain infected stands of POC (refer to the map in Appendix D). Due to the proximity of POC to roads in the project area, the risk to further import, export, or spread the POC root disease is medium to high without POC root disease control prescriptions in place. The risk for this area could be reduced to low by the implementation of the prescriptions of the control strategy.

Mitigations measures, as described in the project design features in Chapter 2, were applied during the design of the project. The mitigation measures used to protect POC are applied to the project area as a whole, which is critical to successfully protecting POC. Requiring any vehicles or equipment be washed prior to entering the project area, limiting operations to the dry season, and requiring operation occur in uninfected areas before infected areas have all proven to be effective in preventing the spread of POC into new areas. In addition to these general mitigation measures, POC stands in units were primarily found within RR and were included in RR equipment exclusion buffers. Other units were dropped during the field review and planning stage due to POC concerns. The risk of spreading POC root disease through project implementation is low. In summary, with the design features in place there is a low risk of root disease spread and infection of uninfected areas associated with the proposed action.

Economic Analysis

This section presents the outcome of an economic analysis conducted for the Big Flat Vegetation and Fuels Management project from two perspectives: 1) economic viability relative to the product removal portion of the project, and 2) the financial efficiency of implementing all proposed activities, as required under Forest Service Handbook 2409.18 (USDA FS 2002).

Economic Viability

Treatment units (CT units), in which conifers greater than or equal to 8 inches DBH would be harvested and removed, were analyzed using the Timber Sale Economic Evaluation program (R5_SALE_EVAL V 2.0 – R5 – January 2008) to determine timber sale viability (i.e. whether or not a purchaser would bid on a timber sale) and potential harvest revenues. This program uses estimates of current values and costs to determine the projected total timber value, and the total timber value at base rates. Base rates are the minimum values at which timber can be sold. A sale is considered economically viable when the projected total timber value exceeds the total value at base rates. The analysis for the Big Flat project assumes that all CT units would be sold under one timber sale.

Delivered Log Value. Delivered log value is based on average prices for the northern region of California as of July 2008. Approximately 95 to 97 percent of the volume to be harvested is Douglas-fir. Therefore, for this analysis it is assumed that 100 percent of the volume harvested is Douglas-fir. The estimated delivered log value for Douglas-fir is $452/MBF.

Costs. Key costs incorporated in the analysis include logging, hauling, specified road reconstruction, re-utilization of existing temporary roads and post-harvest decommissioning, purchaser road maintenance, purchaser fuel treatments, purchaser BD deposits, and purchaser road maintenance/surface replacement deposits. Table 26 lists the volumes and key cost elements used in the Timber Sale Economic Evaluation program.

Table 26. Timber Sale Volume and Key Cost Elements

Value/Cost Element	Unit	Tractor	Cable
Acres	Acre	356	147
Estimated Net Volume	MBF	2,952	1,176
Logging	$/MBF	$197.40	$246.75
Haul	$/MBF	$47.94	$47.94
Specified Road Reconstruction	$/MBF	$6.26	$9.80
Temporary Road Re-utilization & Post-harvest Decommissioning	$/MBF	$4.59	$4.92
Purchaser Road Maintenance	$/MBF	$4.10	$4.10
Purchaser Road Maintenance and Surface Replacement Deposit	$/MBF	$7.35	$7.35
Purchaser Fuel Treatment	$/MBF	$15.52	$23.47
Purchaser BD Deposit	$/MBF	$22.04	$33.33

Logging: Logging cost is based on input from local operators and average costs used in developing the California State Board of Equalization Harvest Value Schedules for the period of January 1 through June 30, 2008 in Timber Value Area 1 (TVA1 - Humboldt, Del Norte, and southwestern Trinity counties). Average logging costs are $188/MBF for tractor, and $235/MBF for cable logging systems. In order to account for additional un-utilizable volume removed via whole tree yarding or yarding tops, logging costs were applied to an estimate of total gross volume rather than net volume. The resulting average logging cost when applied to net volume is $197.40/MBF for tractor and $246.75/MBF for cable systems.

Haul: Haul cost is based on an average one-way haul distance of 45 miles to Brookings, Oregon (90 miles round trip), with an average of 4 MBF hauled per load.

Specified Road Reconstruction: NFS roads or road segments currently closed to vehicular traffic would be reopened, reconstructed or temporarily upgraded to facilitate the logging and hauling of sawtimber, and then closed upon completion of the project. Reconstruction would consist of brush and tree clearing, blading, and minimal drainage maintenance work. Average reconstruction cost would be $12,400/mile.

Temporary Roads: Temporary road costs include the cost of reopening/re-utilizing existing non-system roads and decommissioning these roads once harvesting is completed. The average cost for reopening/re-utilizing and decommissioning temporary roads is $4,600/mile.

Purchaser Road Maintenance: Road maintenance costs include work performed on Forest Service system roads by the purchaser during harvest operations such as pre and post-haul surface blading, brushing of roadside vegetation, and dust abatement.

Purchaser Road Maintenance and Surface Replacement Deposit: Road maintenance and surface replacement deposits paid to the Forest Service, by the purchaser, to cover the cost of deferred road maintenance and surface replacement work on FS system roads used for logging and hauling operations.

Activity Fuel Treatments: Activity fuel treatments include work performed by the purchaser during harvest operations such as whole tree yarding (WTY), yarding tops (YT), and hand piling (HP) of harvest generated fuel. Costs associated with WTY and YT are included in logging costs; the average cost for purchaser hand piling of harvest generated fuel is $17.79/MBF.

Purchaser BD Deposit: Purchaser BD is a deposit, paid by the purchaser to the Forest Service, to cover the costs associated with treatment of harvest generated slash. BD deposits are based on prescribed post-harvest activity fuel treatments. The average BD deposit paid to the Forest Service to cover the cost of burning hand piles is $25.26/MBF.

Alternative 1 (No Action)

No timber would be harvested, therefore no value would be realized or costs incurred under this alternative. Both the projected total value and total value at base rates would be $0.00. This alternative would not be financially attractive to potential bidders nor would it generate harvest revenues that could be applied to vegetation and fuel treatment work in non-commercial (TSI and F) units.

Alternative 2 (Proposed Action)

An estimated 4,128 MBF would be harvested under this alternative. When adjustments are made for costs associated with this alternative, competition, and profit and risk, the projected total timber value would be $455,731. The estimated total timber value at base rates would be $82,560. The value above base rates would be $373,171. This alternative would be economically viable under current market conditions and generate harvest revenues that could be applied to vegetation and fuel treatment work in non-commercial (TSI and F) units.

Financial Efficiency

Present net value (PNV) is a measure of financial efficiency used by the Forest Service that provides one index for comparing alternatives. PNV is determined by deducting the

present value of costs from the present value of revenues associated with a project. Costs include those associated with preparing and implementing a given project alternative; they do not include planning costs as these do not vary by alternative. Revenues include the value of products and uses amenable to monetary quantification (commodities with established market values, like timber); revenues are not assigned to non-quantifiable resources such biodiversity, wildlife, clean air, and water. Revenues and costs over time are discounted to the present at a four percent rate of return (present value).

Present net value can be either positive or negative depending on the balance of revenues received versus costs incurred over the life of the project. The alternative that produces the highest PNV is the most economically efficient solution. The reduction in financial PNV relative to the alternative with the highest PNV also represents the financial trade-off, or opportunity cost, of implementing a given alternative.

Revenues incorporated in the financial efficiency analysis include the estimated total harvest revenue, purchaser BD deposits, and purchaser road maintenance and surface replacement deposits presented above in the section on Economic Viability. Costs include Forest Service timber sale preparation and administration; hand cutting of vegetation in non-commercial (TSI and F) units; Forest Service fuel treatments in both commercial (CT) and non-commercial (TSI and F) units including: lop and scatter (L&S), mastication (MAS), roadside chipping (RC), hand piling (HP), burning hand piles (BP), hand line construction (HLC), and understory burning (UB); and Forest Service deferred road maintenance and surface replacement. Revenues and costs are expected to occur over a nine year period between 2008 and 2017. Table 27 lists the key revenue and cost elements used in the PNV analysis and the time period over which they are expected to occur.

Table 27. Present Net Value (PNV) Analysis – Key Revenue and Cost Elements

Revenue/Cost Element	Unit	Total Units	Revenue or (Cost) per Unit	Time Period
Sale Preparation	MBF	4128	($24.00)	2008
Sale Administration	MBF	4128	($12.15)	2009 – 2011
Harvest Revenues	MBF	4128	$110.40	2009 – 2011
BD Deposit	MBF	4128	$25.26	2009 – 2011
Road Maintenance/Surface Replacement Deposits	MBF	4128	$7.35	2009 – 2011
Hand Cutting Sub-merchantable Material	Acre	1275	($310.50)	2009 – 2011
Lop and Scatter	Acre	109	($34.50)	2009 – 2011
Mastication	Acre	30	($862.50)	2011
Roadside Chipping	Acre	12	($345.00)	2011

Revenue/Cost Element	Unit	Total Units	Revenue or (Cost) per Unit	Time Period
Hand Pile	Acre	1485	($361.17)	2009 – 2011
Burn Piles	Acre	1485	($507.42)	2010 – 2012
Hand Line Construction	Acre	591	($28.75)	2012 – 2013
Understory Burn	Acre	291	($575.00)	2012 – 2013
Road Maintenance/Surface Replacement	MBF	4128	($7.35)	2013 - 2017

Alternative 1 (No Action)

Under the no action alternative, no treatments would be conducted, therefore no value would be realized or costs incurred. This alternative would rank first in terms of financial efficiency with a PNV of $0.

Alternative 2 (Proposed Action)

Under the proposed action alternative, approximately 1,824 acres of vegetation and fuel treatments would occur over the next 10 years. This alternative would rank second in terms of financial efficiency with a PNV of -$1,335,440. The opportunity cost associated with implementing this alternative would be $1,335,440.

Total PNV for the proposed action is negative primarily due to the fact that monetary benefits (revenues) cannot be assigned to treatments that would occur regardless of whether or not merchantable timber volume is harvested as part of the project. This does not mean, however, that there are no future benefits associated with these treatments. The primary benefit would be the reduction of fuel loading, and a lower risk of catastrophic fire, in forest stands adjacent to private property in the Big Flat community.

Roads Analysis

15N38 is currently an OML 2 road necessary for project activities. The Smith River National Recreation Area Roads Analysis (RAP) and Off-Highway Vehicle Strategy (November 2005) recommends to keep and maintain the road, however there are some inconsistencies for an associated lower road segment between the map location and both public comment and agency recommendations. The system road is shown correctly on the map; however the descriptive comments and recommendations indicate they were intended for a non-system road that leads to private property and public lands along the South Fork Smith River known as Indian Bar. Therefore to correct the discrepancy in the previous analysis and follow management direction and public comment, this non-system road would be added to the National Forest road system (as 15N38A). This road segment is needed for the project to access unit CH 50. No construction is required, only maintenance. The road is currently open to the public and is functioning like an OML 2

road. The road has future management needs for fire, private property access, and recreation. The Smith River NRA Road Management and Route Designation Project EA that analyses the recommendations of the RAP is under review and pending a decision.

Heritage Resources

A Cultural Resource Inventory was conducted for the Big Flat Vegetation and Fuels Management Project to determine if cultural or heritage properties were present in the Area of Potential Effect (APE), and if such properties would be affected by project actions. Forest Plan objectives and Forest wide standards and guidelines are designed to ensure protection of archeological and historic sites. An archaeological assessment is required for any areas where the Forest is considering activities that have the potential to impact cultural resources. Section 106 compliance with the National Historic Preservation Act (NHPA) is required for all lands within projects conducted by or funded by Federal agencies.

Archaeological inventories have been conducted in the past within the project area. Additional pedestrian surveys were conducted specifically for the Big Flat Vegetation and Fuel Management Project to identify, record, and assess potential effects on heritage resources on National Forest system lands. This analysis is in conformance with regulations of the National Historic Preservation Act (NHPA), 1966, as amended (P.L. 89-665); the National Environmental Policy Act of 1969 (P.L. 91-190), the Archeological and Historic Preservation Act of 1974 (P.L. 86-523), the Archaeological Resources Protection Act (ARPA) of 1979 (P.L. 96-95), the Native American Grave Protection and Repatriation Act (NAGPRA) of 1990 (P.L. 101-601), and as called for by the *2001 First Amended Regional Programmatic Agreement Among The USDA Forest Service, Pacific Southwest Region California State Historic Preservation Officer, And Advisory Council On Historic Preservation Regarding The Process For Compliance With Section 106 Of The National Historic Preservation Act For Undertakings On The National Forests Of The Pacific Southwest Region* (Regional PA), and the *2004 Interim Protocol for Non-Intensive Inventory Strategies for Hazardous Fuels and Vegetation Reduction Projects* (Interim Protocol).

Within the immediate project area, there are few known cultural sites, six recorded archeological sites: two prehistoric sites and four historic sites. Cultural Resource Inventory Report # 05-10-1020 is on file in the Six Rivers National Forest Supervisor's Office. All of these sites would be protected through site avoidance, a Standard Resource Protection Measure.

Environmental Justice

Executive Order 12898 relating to Environmental Justice requires an assessment of whether minorities or low-income populations would be disproportionately affected. Potentially affected Native American Tribes were contacted about this Proposed Action and did not express any concerns. Although a high proportion of Native Americans and lower income people live in this portion of the State, this project would not affect them

any differently than any other member of the public. Project design features associated with the project would protect heritage resource values.

In conclusion, there are no environmental justice concerns affecting human health or the environment that would have an adverse effect on minority or low-income populations through the implementation of the action alternative considered in this EA. Conversely, the no action alternative, by virtue of not creating any new work opportunities, could disproportionately adversely affect low-income and minority populations living in North Coastal portion of California.

Chapter 4 - Consultation and Coordination

The Forest Service consulted the following individuals, Federal, state and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

Interdisciplinary Team Members:

Ruben Escatell - Team Leader

Mary Kay Vandiver - District Ranger

Syndy Zerr / Sheila Balent - Fuels Specialists

Mike McCain - Fisheries Biologist

Corrine Black – Hydrologist

William Snavely – Soil Scientist and Geologist

George Panek - Silviculturist

Lisa Hoover-Botanist

Kurt Werner – Transportation Engineer

Ana M Dittmar – Archeologist

Brenda Devlin-Wildlife Biologist

Lenore Crippa – Logging Systems Specialist

Michelle Harley-Lloyd – GIS Specialist

Shirley Rech – Economics Analyst

Federal and State Agencies:

USDI Fish and Wildlife Service

California Regional Water Quality Control Board -- North Coast Region

Tribes:

Elk Valley Rancheria

Smith River Rancheria

Other Parties:

American Forest Resource Council (AFRC)

Del Norte County Board of Supervisors

Del Norte County Fire Safe Council

Environmental Protection Information Center (EPIC)

Klamath Siskiyou Wildlands Center (KSW)

Northcoast Environmental Center (NEC)

Rough and Ready Lumber Company

Sierra Pacific Industries

Smith River Alliance

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Appendices

Appendix A: Maps

Vicinity Map

Proposed Action Alternative Map

Appendix B: Disposition of Scoping Comments

Appendix C: Best Management Practices

Appendix D: Port-Orford-Cedar Root Disease Risk Assessment