

**ENVIRONMENTAL ASSESSMENT (EA)  
FOR THE FOREST MANAGEMENT PLAN (FMP),  
YUOK INDIAN RESERVATION, CALIFORNIA**

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**October 22, 2012**

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### **Purpose and Need For Action**

The Yurok Tribe proposes to implement a 10-year Forest Management Plan (FMP) for the Yurok Indian Reservation. The FMP will provide a framework for the sustainable management of the forest resource, while also identifying, protecting and enhancing other forest related values such as water quality, cultural and economic needs, fisheries and wildlife considerations.

The BIA is required to manage the Tribal forest resource under a sustained yield basis, and in accordance with the National Environmental Policy Act (NEPA) as described in 53 BIAM and PL 101-630, 25 USCA 3101 et. seq. This Environmental Assessment (EA) will describe the context and intensity of a range of proposed actions, identify the nature and significance of the impacts of those actions to defined resources, and prescribe mitigation measures where appropriate. A preferred alternative is nominated that best meets the standard of not having the potential to "significantly affect the quality of the human environment", while also meeting the needs of the Tribe and the mandate of the agency. Most discussion will focus on the "preferred" alternative.

### **Description of Affected Area**

#### **General Area Description**

The Yurok Indian Reservation (YIR) was created by the Hoopa-Yurok Settlement Act of 1988, and was previously referred to as the "Extension" portion of the Hoopa Square reservation. There are approximately 59,000 acres in the entire YIR, and of these, approximately 3,320 acres are Tribal trust lands, and 2,171 acres are allotted lands held in trust. The remaining lands are fee lands (currently owned primarily by Green Diamond Resource Company), which are managed intensively for timber products. Restricted status Tribal owned forested fee land, managed as a sustained yield unit (SYU) within the Yurok Indian Sustained Yield Lands, consists of 31,146 acres both within the YIR and outside of the YIR boundary. Total forested Tribal ownership is 36,637 acres. This forest management plan includes elements for the management of all Yurok Tribal lands both within and outside of the reservation boundary.

The reservation extends approximately one mile on either side of the Klamath River from the Hoopa Reservation to the mouth of the Klamath River. Except for occasional side hill benches and riverside flats, reservation lands are all located on steep ground within the river gorge. Elevations range from sea level to 2,000 feet, and precipitation ranges from 40 to 80 inches per year. Deep soils and substantial rainfall has resulted in excellent conditions for timber growth.

Except for the last remaining old growth stands found on tribal trust lands and within the Redwood National Park, the entire Lower Klamath River watershed has been heavily logged over the past 70 years. Despite recent dramatic declines in populations, the Klamath River remains an important fishery. Any potential effects of logging on tribal trust lands will have to be analyzed in the context of all other harvesting within the watershed, which includes intensively managed industrial and allotment ownerships. Because old growth habitat is concentrated on tribal lands, special considerations (including limitations to harvesting) for wildlife species such as the Northern Spotted Owl and marbled murrelet may have to be made.

Tree species found on the trust lands are primarily Douglas-fir (90% by volume). Additional species include Sitka Spruce and Western Hemlock near the river mouth, redwood further upriver, and scattered ponderosa pine in the higher elevations. Hardwoods follow a similar pattern with red alder common near the river mouth, tanoak and madrone up river, and

black oak, white oak and canyon live oak further up river.

### **Climate and Air Quality**

Weather station data indicate that average annual temperatures ( $F^0$ ) are 53 at Klamath and 52 at Weitchpec. Peak temperatures in August average around 59 at Klamath and 68 at Weitchpec, and low temperatures in January average around 47 at Klamath and 38 at Weitchpec.

Precipitation in the lower Klamath River basin falls mainly as rain, and is usually associated with weather systems moving east from the Pacific Ocean between the months of October and April. The mountainous topography creates orographic lifting of moist air masses that result in intense local rainfall. The weather station at Klamath averages 84 inches per year, and 73 inches at Weitchpec. Winds typically blow out of the northwest, and are most intense during winter storms.

There are no stationary air pollution sources located within the YIR jurisdiction although there are numerous major sources within 50 miles of the reservation. By EPA 2006 standards, the YIR is classified "Attainment" for PM<sub>2.5</sub>. By California state standards the reservation is out of attainment for PM<sub>10</sub> and smaller in Del Norte and Humboldt counties which the YIR lays within both.

The FY 2011 Environmental Beta Attenuation Monitor summary for Klamath and Weitchpec report a yearly average of 10.6  $\mu\text{g}/\text{m}^3$  and 3.41  $\mu\text{g}/\text{m}^3$ , respectively, for PM<sub>2.5</sub> which is well below the annual National Ambient Air Quality Standard of 15  $\mu\text{g}/\text{m}^3$ . Although no air quality data is available between Klamath and Weitchpec, it is reasonable to infer that the geography and topography of the Yurok Indian Reservation combined with the general absence of industry and urban effects, results in air quality that is generally excellent.

### **Geology, Soils and Topography**

The central and western portions of the Yurok Indian Reservation lies within the Coast Ranges physiographic province, the eastern portion lies within the Klamath Mountains province. Reservation lands located in the Coast Ranges province are typically underlain by Galice and Franciscan formations and Pre-Cretaceous metasedimentary rocks. Slope stability is generally poor due to extensive fracturing and high erodibility of these shales and serpentine rocks. Reservation lands located within the Klamath Mountains province are typically underlain by the Franciscan formation. This formation is composed primarily of arkosic sandstones, dark sandy shales and dark clay shales. Rock formations are typically folded and faulted, consequently, slopes are generally unstable, and landslides are common.

Soil data is generally lacking for the Yurok Indian Reservation, but inferences can be made from vegetation, geology and data from the Hoopa Reservation to the southeast, U.S Forest Service to the east and from Green Diamond Resource Company. Most soils on the reservation are Quaternary, non-marine deposits of gravels, sands, and fine grained sediments. Near the ocean, soils are derived from recent sandy deposits and are similar to the Orick, Empire and Sites series. Soils are generally deep and well drained, and high rainfall amounts have created a high potential for timber production.

The YIR extends for approximately 1 mile on either side of the Klamath River, from the confluence of the Trinity River to the ocean. Topography on the YIR is mountainous and steep, typical of the Coast Ranges and Klamath Mountains provinces. Except for benchy areas and sandbars, slopes are generally greater than 50%, and well incised with many face streams and more extensive tributaries. From the river, the Klamath gorge rises an average of 2,000 feet to

the reservation boundary.

### Water Resources

The main stem of the Klamath River and affected tributaries (see below) are the main watercourses on the reservation, and range from moderate to high confinement. Most of these tributaries flow in deep narrow canyons. The Klamath headwaters are located in southern Oregon and the Trinity River flows into the Klamath at Weitchpec on the southern boundary of the reservation.

Table 1.

Planning Watershed Name	Drainage Area (sq mi)	Area in Acres	Tribal Ownership acres	% of WS in Tribal Ownership
Ah Pah Creek	16.8	10,771	315	3
Aikens Creek	14.4	9,204	2,058	22
Bear Creek	10.6	6,801	6,104	90
Bens Creek	13.8	8,849	5,223	59
Bull Creek	10.4	6,686	38	1
Cappell Creek	9.0	5,791	2,943	51
E. Fork Pecwan Creek	13.2	8,423	6,119	73
High Prairie Creek	5.9	3,773	12	0
Hoppaw Creek	4.8	3,085	14	0
Indian Creek	11.1	7,122	6,085	85
Johnson Creek	7.8	5,024	1,952	39
Lower Blue Creek	5.5	3,491	3,491	100
Lower Bluff Creek	24.1	15,409	4	0
Lower Roach Creek	9.4	6,004	482	8
Lower Tectah Creek	9.5	6,070	214	4
Lower Tully Creek	8.8	5,610	43	1
Lower Turwar Creek	11.5	7,373	9	0
West Fork Hunter Creek	14.1	9,028	30	0
Mawah Creek	11.6	7,392	2,669	36
McGarvey Creek	21.0	13,441	13	0
Mettah Creek	16.0	10,251	1,535	15
Miners Creek	10.8	6,941	818	12
Moreck Creek	4.0	2,590	63	2
Nikowitz Creek	16.7	10,671	31	0
Potato Patch Creek	13.5	8,655	5,274	61
Requa	2.9	1,862	138	7
Slide Creek	6.4	4,109	248	6
Snow Camp Creek	13.3	8,533	3,705	43
Surpur Creek	9.8	6,286	472	8
Tarup Creek	19.4	12,428	3,834	31
W. Fork Pecwan Creek	14.4	9,214	7,913	86

\*Note: Ah Pah, Bear, Indian, Lower Blue, Potato Patch, and Tarup Creeks are not owned by the Yurok Tribe but are a part of the Phase II planned acquisition.

Watersheds have been delineated and entered into a Geographic Information System (GIS), and acreages calculated for total area and ownership. Eight watersheds contain over 20% Tribal trust ownership, and would be subject to the watershed area control constraints proposed in the Forest Management Plan. Refer to the Yurok Indian Reservation Planning Watersheds Map.

About one-half of the reservation residents obtain potable water from numerous domestic springs and streams throughout the YIR. The other half of the residents gets their water from wells or public water systems. Nearly all houses on the YIR use septic/cesspool sewage systems.

### Wildlife and Fisheries

A wildlife survey of most of the YIR in 2012 indicates several species that are listed. Among the species detected were:

Type	Scientific Name	Common Name	Category	Critical Habitat
<b>Fish</b>				
*	<i>Acipenser medirostris</i>	green sturgeon	T	Y
*	<i>Oncorhynchus kisutch</i>	S. OR/N. CA coho salmon	T	Y
*	<i>Oncorhynchus tshawytscha</i>	CA coastal chinook salmon	T	Y
<b>Birds</b>				
	<i>Brachyramphus marmoratus</i>	marbled murrelet Western yellow-billed	T	Y
	<i>Coccyzus americanus</i>	cuckoo	C	N
	<i>Strix occidentalis caurina</i>	northern spotted owl	T	Y
<b>Mammals</b>				
	<i>Martes pennanti</i>	fisher, West Coast DPS	C	N

#### KEY:

(PE) Proposed Endangered Proposed in the Federal Register as being in danger of extinction

(PT) Proposed Threatened Proposed as likely to become endangered within the foreseeable future

(E) Endangered Listed in the Federal Register as being in danger of extinction

(T) Threatened Listed as likely to become endangered within the foreseeable future

(C) Candidate Candidate which may become a proposed species Habitat Y = Designated, P = Proposed, N = None Designated

\* Denotes a species Listed by the National Marine Fisheries Service

In addition to these species, many more common species of animals were detected or are known to be present, such as deer, bear, fox, raptors, skunks, woodpeckers, songbirds, quail, bats, and bobcats.

In addition a query of the United States Fish and Wildlife Service Data Base (last updated April 2011) was performed and appears in the Appendix.

Recommendations from the Yurok Tribal Fisheries Program are incorporated into all timber sale projects. The Tribal Fisheries Program is also consulted on all other projects undertaken by the Forestry Department.

Wildlife surveys will be required for all timber harvesting and significant ground disturbing activities.

## **Cultural Resources**

Many cultural features of the YIR are discussed in the Yurok Forest History. Most features are associated with riverside benches and gravel bars, although there are numerous upland sites. All management activities must include some sort of cultural review. Depending on the scope, intensity and context of planned activities, the BIA may be required to comply with Section 106 of the National Historic Preservation Act (NHPA). As provided under NHPA, the Yurok Tribal Historic Preservation Officer (THPO) will be afforded the opportunity to review BIA undertakings that could affect cultural resources.

The Tribe has developed a policy statement regarding cultural resources, including ancestral cultural resources. All projects must be reviewed by the Tribal Cultural Resources Office. All projects must receive approval prior to the start of operations.

The rich cultural history of the Yurok people is an essential element of the Tribe's identity, and protection of these resources (and information that pertains to them) should be carefully protected under any forest management approach undertaken.

## **Recreational and Visual Resources**

Recreation on the YIR is mainly limited to fishing (drift boat and river side), raft/kayak/boat rides, picnicking, and hunting. Because access beyond Johnson's (Pecwan) is limited, public use of the area is very limited. There is no recreational plan currently instituted by the Tribe, however, the FMP should be re-evaluated should a plan be initiated.

One of the most striking visual elements of the YIR is the distinction between the many unharvested trust parcels, and surrounding private timberlands and allotments. Most vistas are up and down the river gorge from Highway 169, and from residences on open ridges. Other vistas are also afforded along Highway 101.

There are five nationally designated scenic byways (Bigfoot, Redwood Highway, Smith River, State of Jefferson, and Trinity) in the Yurok Tribe land holdings region. The closest of these scenic byways, the Redwood Highway – located in Del Norte State Park, is more than eight straight line distance miles away from the nearest planned timber activity site. The Yurok Transportation Program has proposed that three local roads be designated as tribal scenic byways. These roads all have scenic, cultural, natural, and recreational values.

The roads proposed for tribal scenic byway (TSB) designation are: Highway 101, Highway 196, and Bald Hills road. The Highway 101 TSB stretches from the northern edge of the Yurok ancestral territory (southern tip of Del Norte State Park) to the reservation boundary at Hunter Creek road. The Highway 169 South TSB runs from the intersection of Highway 96 and 169 to the Martins Ferry Bridge and the Bald Hills TSB runs from the Martins Ferry Bridge, down Tulley Creek road, and along Bald Hills road to the edge of the reservation boundary. Once the TSBs are approved, the YTFD will work with the Transportation Program to find a mutually agreeable solution should any of the scenic byways be visually impacted.

## **Socio-economic Setting**

Under the Hoopa-Yurok Settlement Act (PL 100-580, 10/1988), a Plan for Economic Self-sufficiency shall be developed for the YIR and presented to the Congress. This plan is will be authored by the Yurok Economic Development Corporation. When this report becomes available, the FMP should be reviewed for consistency, and amended where necessary. Some current figures and are presented here:

Current Tribal Enrollment in 2012:	5,742
Tribal members living in the YIR Service Area 2012:	2,766
Tribal members living on the reservation in 2012:	667

Living conditions within the Reservations vary some by the community in which one resides. A large segment of the Upper Yurok Reservation is without electrical and telephone services. Additionally, there are only community/public water systems in certain communities, all other households are on private wells, springs, or surface water sources.

According to the 2000 U.S. Census, there are 441 total households on the Yurok Reservation and the average household size is 2.46, compared to the average family size, which is 3. Of those total households, 32% have individuals under 18 and 28% have individuals 65 years and over. Thirty-five percent of residents have a high school degree and 68% have a high school degree or higher. Of the civilian population 18 years and over, 20.4% are veterans.

The Yurok Reservation is an area with little development and sparse economic opportunities. The largest employer in the immediate area is the Yurok Tribe with over 200 employees. In 2000, the rate of unemployment for all people 16 years and over residing within the Yurok Reservation (836) was 48%. This high rate of unemployment is compounded by the fact that 31% of households on the Reservation (413) were making less than \$10,000 a year in 1999. The next highest percentage of people (17.9%) make between \$15,000 and \$24,999. Moreover, median household income that same year was \$20,592. Conditions on the Hoopa Reservation and in the surrounding area are similar.

### **Timber Resources**

The timber resources are described in the FMP and Forest Inventory Analysis (FIA). The 2007 Forest Inventory Analysis (FIA) identified 3,380 acres of tribal timber lands, and 2,220 acres of allotted timber lands. These acres were divided into seven timber type strata as follows:

**Timber Type I (Hardwoods/Suppressed Conifers):** These lands include the following CWHR types: annual grasslands, barren, coastal oak woodlands, coastal scrub, mixed chaparral, montane chaparral, montane hardwood, montane hardwood-conifer, montane riparian, and pasture. Stocking density and diameter at breast height (DBH) were not determined for this timber type. These stands need stand exams in order to identify any areas that might contain suppressed conifer understories. Otherwise they should be managed for habitat, commercial firewood harvest, Tribal fuelwood areas, culturally significant species/areas, diversity, aesthetics and recreational values.

**Timber Type II (Plantations):** These timber types are classified as areas that were clear cutting sites. The density and DBH range for these areas were not determined. These stands need prompt stocking control and conifer release (pre-commercial thinning, manual removal of competing vegetation). These stands are critical to the future stand structure of the YIR, and early management expenses are highly recommended.

**Timber Type III (Small Partially Stocked Sawtimber):** The stocking density of these stands ranges between 10% and 39% canopy closure and the DBH ranges between 11 to 24 inches. These stands contain reasonable conifer stocking and growth, but more information is needed to determine appropriate silviculture.

**Timber Type IV (Small Moderately Stocked Sawtimber):** The stocking density of these stands ranges between 40% and 59% canopy closure and the DBH ranges between 11 to 24 inches. These stands could be commercially thinned or left alone, depending on other

constraints. Growth in these stands does not appear suppressed (growth rates considered reasonable at 4%). These stands represent the next medium sawtimber size class, and are very important to achieving a future sustainable flow of timber.

Timber Type V (Small Densely Stocked Sawtimber): The stocking density of these stands ranges between 60% and 100% canopy closure and the DBH ranges between 11 to 24 inches. These stands need thinning in order to promote forest health and habitat values. Co-dominants need to be released and dead/suppressed trees need to be removed to reduce fire risk and increase understory diversity.

Timber Type VI (Large Partially Stocked Sawtimber): The stocking density of these stands ranges between 10% and 39% canopy closure and the DBH ranges are greater than 24 inches, however, more data is needed in these stands to prescribe silviculture. Depending on regeneration amounts, some thinning from below may be indicated or intermediate treatments like sanitation salvage. It is most likely that these stands would be best treated with seed tree cuts, followed by site preparation and planting.

Timber Type VII (Large Moderately Stocked Sawtimber): The stocking density of these stands ranges between 40% and 59% canopy closure and the DBH ranges are greater than 24 inches. These stands have the highest priority for harvesting with an emphasis on establishing and controlling conifer stocking. Depending on stand conditions, group cuts, single-tree selection, or seed tree/shelterwood could be appropriate in these stands.

Timber Type VIII (Large Densely Stocked Sawtimber): The stocking density of these stands ranges between 60% and 100% canopy closure and the DBH ranges are greater than 24 inches. Management of these stands should emphasize the identification of habitat and biodiversity values and, if appropriate, early management for timber production. Depending on stand conditions, carefully planned group selection or individual tree selection cuts could be applied, with special attention given to road location. Depending on stand health, sanitation/overstory removal approaches may also be appropriate. Some stands that show a high degree of rot or other disease should be considered for clear cutting at the time of harvest.

Timber Type IX (Small Redwood Sawtimber) and Timber Type X (Large Redwood Sawtimber): The stocking density of these stands ranges between 60% and 100% canopy closure and the DBH ranges are between 11 and 24 inches and greater than 24 inches, respectively. Depending on stand conditions and habitat issues, these stands could have the larger overstory trees selectively harvested (thinned from above) and, depending on access, managed fairly intensively.

This amounts to approximately 5,580 acres of commercial trust and allotment lands. There are approximately 2,200 acres of allotted lands and 3380 trust acres. The estimated net conifer volume on tribal lands in 2007 was 110 million board feet (MMBF), and the estimated net conifer volume on allotments in 2007 was 71.5 MMBF. Overall growth on these lands was estimated at approximately 4.1 MMBF per year. The annual growth is divided between trust land with 2.5 MMBF on trust land and approximately 1.6 MMBF found on allotment lands. This is gross timber volume for these lands.

### **Public Scoping of Issues and Concerns**

As determined from a survey questionnaire distributed by the Tribal Council during the month May, 2012 and as reported in the FMP, the following goals describe the Tribe's desires for the long-term management of their timber resources:

- Establish a regular, periodic, long term sustained yield (LTSY) of timber products.
- Generate Tribal income and employment from timber sales.
- Limit the use of clear cutting and disallow herbicides.
- Protect and enhance areas considered culturally significant.
- Acquire lands (including cutover lands) to increase the Tribal land base.
- Protect and enhance fisheries.
- Use prescribed burning when possible.
- Generate Tribal income from the sale of carbon credits.
- Provide oversight and professional expertise on the best way to utilize Tribal forestland for non-timber use.

### **Goals and Objectives**

The primary objective of the FMP is to provide a framework to generate timber revenues for the Tribe while keeping harvesting at or below the allowable cut as prescribed by the chosen management alternative. Secondary goals include increased employment opportunities for Tribal members, and enhanced access for collection of traditional materials and hunting. Although not a specific goal of the FMP, land acquisition is an important related issue.

The Tribe has indicated a strong desire to limit clear cutting and prohibit the use of herbicides. Depending on the management alternative chosen, (when appropriate) clear cuts should not exceed 30 acres in size. This indicates the application of both even-, and uneven-aged management practices. The Tribe also wishes to acquire land in order to both "block up" and increase reservation acreage. Revenues from harvesting Tribal timber could be used for this purpose. For this reason a Land Acquisition Program should be developed for the YIR.

A potential conflict could develop in terms of what the Tribe considers appropriate forestry practices, and what some allottees feel is their right to harvest as they wish - including larger clearcuts. Alternatives are proposed in the FMP and are restated below to address this issue. The ESSP Statement appears in the Appendix, and describes general desires with regard to the YIR forest resource.

All timber harvesting on both Tribal and allotted lands should comply with the standards and practices described in 53 BIAM Supp. 3 and the PRO Logging Practices (Appendix). Along with these practices, the Tribe is required to follow the practices outlined in the Yurok Habitat Conservation Plan (YHCP) (Appendix) with regards to the management of the 22,500 acres of recently acquired fee lands. The choice of optimum timber management policy is highly dependent on the objectives of the Tribe. A desire for both short and long-term economic benefits must be weighed against desires for multiple use and protection of other resources such as cultural sites and lands, aesthetic values, watershed protection and habitat conservation. For this reason, a rapid liquidation of the timber resource would not be an appropriate path to follow. In addition, the BIA is required by law to manage Tribal forests on a long-term sustainable basis. The calculated allowable cuts for each alternative can be reached in the first year or the tenth year of the 10-year management plan horizon. This distribution of harvesting over time -- the harvest schedule -- is left to the discretion of the Tribe, and allow for the capture of strong timber markets, and avoidance of weak ones. Discussions with the Tribal Council and a review of the questionnaire survey data indicate that the Tribe would like to emphasize uneven aged harvesting methods, but will allow limited clearcutting in units less than 20 acres on all trust lands. Some allottees do not want their "hands tied" in terms of harvest methods and timber volume removed. The harvest policy should therefore provide for an equitable mixture of allotment and Tribal land

harvest projects, while not precluding projects between ownerships. The distribution of timber volume between Tribal and allotments is estimated at approximately 70:30. This means that 70% of the standing timber is on the Tribal portion of the trust ownership. As a result of this distribution of timber, separate calculated allowable cuts on allotments are proportionately lower (60-80% lower depending the alternative chosen). It is recommended that the Tribe consider limiting allotment projects and emphasizing Tribal projects with these proportions in mind, and not to allow uncut timber on Tribal lands to balance overcutting on allotments. Although separated here for the purpose of discussion, it is important to note that the allowable cut is based on all trust lands combined, and as long as it is not exceeded, the Tribe will determine where that cut will come from.

In order to allow utilization of smaller amounts of forest products without going through the formal timber sale process, a Permit Cutting Program, as described in 53 BIAM Supp. 4, has been implemented. This free use permit program allows up to 100 cords per year be made available for Tribal members for personal use.

### **Alternatives, Environmental Consequences and Mitigations** **Management Alternatives**

The timber resource on the YIR, if managed properly, could provide a steady flow of timber, timber revenues, and Tribal employment over time, while still providing many "non-timber" values. As stated earlier, the BIA is required by law to manage Tribal forests on a long-term sustainable basis. The timber inventory data indicate that under an aggressive policy, an average annual harvest of up to 3,320 thousand board feet (MBF) (41,000 MBF over a ten year period) could be achieved at a sustainable level into perpetuity. However, the impact of this level of harvesting to other resources is probably inconsistent with expressed Tribal values. In order to meet these tribal concerns and maintain some flexibility for allottees, four management alternatives are proposed (Table 2).

**Alternative #1 Limited Action:** Timber harvest would be limited to salvage logging, hazard tree removal and limited operations on Allotments. Less than 500 MBF per year would be harvested. Firewood harvest would be limited to cutting by permit only. No clear cutting will occur. Less than 100 cords of firewood harvested on an annual basis. No timber harvests will occur within the Carbon Credit areas. No prescribed fire would be utilized for land management purposes.

**Alternative #2 Conservative:** This alternative limits all harvesting on tribal lands to uneven-aged management (single-tree and group selection methods), yielding an average annual harvest of approximately 1.5 MMBF per year, over the ten year planning period. No clear cutting will occur. Firewood harvest would be limited to cutting by permit only. Less than 100 cords of firewood harvested on an annual basis. No timber harvests will occur within the Carbon Credit areas. Prescribed fire would be utilized for land management purposes on a limited basis.

**Alternative #3 Moderate (Preferred Option):** This option mainly provides for uneven-age management. Total timber harvests on all lands would be approximately 6.0 MMBF per year including the carbon areas. In general, clear cut units would be limited to less than 20 acres in size, but could exceed this size if justified in the project specific Timber Sale EA. Clear cut silviculture would only be utilized on a very limited basis. The primary reason would be for the

replacement of a timber stand that has been degraded by disease or insects. The primary silvicultural system to be employed will be a selection or small group selection harvest. Firewood harvest by free use permit can occur, up to 100 cords per year. Commercial firewood cutting, up to 200 cords per year, would also occur. Timber harvests will occur within the Carbon Credit areas up the amounts allowed in the Carbon Credit Program, approximately 2.5 MMBF per year. Timber harvest will be limited to selection, group selection or intermediate treatments. Rotation age will be from 80 to 100 years. Prescribed fire would be utilized for land management purposes on a project by project basis up to 100 acres per year.

**Alternative #4 Industrial:** This option allows for nearly all harvests to be even-aged with 50 year rotations. Total timber harvests on all lands would be approximately 9 MMBF per year including the carbon areas. Firewood harvest by free use permit can occur, up to 100 cords per year. Commercial firewood cutting, up to 600 cords per year, would also occur. Timber harvests will occur within the Carbon Credit areas up the amounts allowed in the Carbon Credit Program, approximately 3.5 MMBF per year. Timber harvest silviculture will include clear cuts, selection, group selection or intermediate treatments. Clear cut may be as needed on a routine basis. Clear cuts will be limited to 30 acres or less. Rotation age will be from 50 years. Prescribed fire would be utilized for land management purposes on a project by project basis up to 500 acres per year.

Table 2.

Management Plan Alternatives Summary				
	Alternative #1	Alternative #2	Alternative #3	Alternative #4
<b>Annual Timber Harvest</b>	>500 mbf Salvage Only	1.5 mmbf	7.0mmbf	9.0 mmbf
<b>Clear cut size</b>	No clear cuts	No clear cuts	>20 acres (if needed)	30 acres
<b>Silviculture</b>	uneven aged	uneven aged	uneven aged	even aged
<b>Rotation age</b>	N/A	150 years	80 -100 years	50 years
<b>Carbon Program</b>	None	minimal carbon sale	max sales as needed	minimum sales
<b>Prescribed Fire</b>	None	less than 100 acres	100 acres	500 acres
<b>Road Maintenance</b>	Minimal	as needed	extensive	new construction
<b>Hardwood Harvest</b>	None	100 cords	200 acres	600 cords
<b>Fire Wood Harvest (Free Use)</b>	>100 cords	100 cords	100 cords	100 cords

### Impacts to Air Quality and Mitigation

Alternative #1 – This alternative does not prescribe burning and so will not create smoke emissions.

Alternative #2 – Prescribed burning in small openings and underburning will create smoke emissions that will not significantly impact air quality. Broadcast burning in larger openings on allotments and trust land will be the principle source of smoke. The generally remote nature of the YIR and the good ambient air quality will keep impacts below significant levels. The combined effects of wood stove smoke and forestry-related burning to air quality could be of

concern, especially during atmospheric inversions. Mitigations would not be necessary due to the low level of burning.

Alternative #3 – Increased acres of even-aged management will increase the acres burned for site preparation. Smoke emissions will not create significant impacts to air quality. The generally remote nature of the YIR, good ambient air quality, and watershed area constraints will reduce emissions locally thus keeping air quality impacts below significant levels. The combined effects of wood stove smoke and forestry-related burning to air quality could be of concern, especially during atmospheric inversions. Mitigations measures would include: following the guidelines set forth by the Yurok Smoke Management Plan, the attainment of burning permits, coordination with other land owners, not only in the area but throughout the basin, coordination with the Yurok Tribal Environmental Program, which constantly monitors particulate matter on the YIR, and coordination Air Quality Control Board as well as with the Hoopa Tribal Environmental Protection Agency, which also monitors particulate matter.

Alternative #4 – This alternative would create the most smoke emissions due to the large numbers of clearcuts requiring broadcast burning for site preparation. Due to the scattered nature of tribal lands, these smoke levels would still not constitute a significant impact to air quality unless combined with heavy burning on private and Federal forest lands, and wood stove smoke emissions. This combined effect could reach significant levels during atmospheric inversion periods. Mitigations measures would include: following the guidelines set forth by the Yurok Smoke Management Plan, the attainment of burning permits, coordination with other land owners, not only in the area but throughout the basin, coordination with the Yurok Tribal Environmental Program, which constantly monitors particulate matter on the YIR, and coordination California Regional Air Quality Control Board as well as with the Hoopa Tribal Environmental Protection Agency, which also monitors particulate matter.

### **Impacts to Geology and Soil Productivity and Mitigation**

Alternative #1 - No areas of geological instability and unsuitable slope conditions are identified. The continued level of scattered harvesting on allotments may have project specific impacts to geologically unstable areas. All harvesting on all ownerships requires identification of unstable areas and soils, and development of specific mitigation measures. Soils will be least impacted in this alternative due to the generally low levels of harvesting and roading proposed. This lack of scheduling and coordination can create unnecessary impacts due to poor road planning. Mitigations as described in the PRO Logging Practices and the State Forest Practice Rules will be adequate to protect this resource.

Alternative #2 - All harvesting on all ownerships requires identification of unstable areas and soils, and development of mitigation measures. Impacts may be less than Alternative #1 because watershed area constraints will limit road construction over time. The preferred use of selection harvesting may not actually cause more impacts to this resource than clearcutting. The extensive and repeated use of skid trails and roads over time in a selection system can cause the same level of impact to soils as clearcutting over a smaller area. A skid trail that is used only three or four times can be just as compacted as one used 100 times in a clearcut. Repeated entries in a selection system also require that roads be kept open and vulnerable to soil losses from erosion. Mitigations as described in the PRO Logging Practices and the State Forest Practice Rules will

be adequate to protect this resource.

Alternative #3 - The impacts to the resource would be the same as *Alternative #2* except additional even-aged harvesting may increase the risk of slope instability. Mitigations and prescribed logging guidelines shall be applied. Although more even-aged methods will be allowed in this alternative, impacts to the soil resource should be non-significant due to the use of watershed area controls. As described in *alternative #2*, selection harvesting can result in greater soil compaction and soil loss per area compared to clear cutting. Mitigations as described in the PRO Logging Practices and the State Forest Practice Rules will be adequate to protect this resource. Mitigations will include limiting harvesting to dry periods between May and October, winter period harvesting and other limitations in place in the FMP.

Alternative #4 - Due to the increased intensity of activity, this alternative would have the highest likelihood of impacting geologically unstable areas such as landslides. This alternative will result in the most impacts to this resource, and if harvesting is not adequately spread out over space and time, then impacts could reach significance. Mitigations as described in the PRO Logging Practices and the State Forest Practice Rules will be adequate to protect this resource. Mitigations will include limiting harvesting to dry periods between May and October, winter period harvesting and other limitations in place in the FMP.

### **Impacts to Water Quality and Mitigation**

Alternative #1 - Water qualities should not be significantly impacted by this alternative provided all crossings are built and maintained as described in the PRO Logging Practices.

Alternative #2 - Proposed watershed area controls, in combination with the application of the PRO Logging Practices and the State Forest Practice Rules should keep impacts to water qualities below significance. The emphasis on selection harvesting in this alternative could cause greater impact to this resource than if clearcutting over a smaller area were applied. Mitigations in a concentrated area of clearcuts are much easier to implement and monitor than over a larger area treated with selection methods.

Alternative #3 - Because of the increased intensity of activity in this alternative, additional monitoring of erosion control mitigation measures is recommended. Proposed watershed area controls, in combination with the application of the PRO Logging Practices and the State Forest Practice Rules should keep impacts to water qualities below significance. The emphasis on selection harvesting in this alternative could cause greater impact to this resource than if clear cutting over a smaller area were applied. Mitigations in a concentrated area of clear cuts are much easier to implement and monitor than over a larger area treated with selection methods. Timber harvesting will also be subject to the requirements of the FMP which places limitations on harvest timing, road use, monitoring, and extensive watercourse protection.

Alternative #4 - Proposed heavy cutting by clear-cuts and short rotations in this alternative would have the highest likelihood of negatively affecting water qualities such as temperature and sediment from surface erosion. However, the application of buffer widths required by the PRO and logging practices described in the State Forest Practice Rules will keep impacts below

significant levels.

### **Impacts to Wildlife and Fisheries and Mitigation**

Alternative #1 - Wildlife and fisheries will be minimally impacted due to low levels of cutting that will occur under this alternative. Wildlife surveys will be required for all harvesting projects.

Alternative #2 - Impacts would be similar to Alternative #1 due to the low level of harvesting proposed in this alternative. For the same volume removed, the heavy emphasis on selection harvesting can have a greater impact to a larger area over a longer time compared to a concentrated impact using clear cutting methods. Biological surveys will be required on all harvesting projects. Mitigations to any identified listed species will be developed by biologists at the time of project preparation, and reviewed and concurred by the USF&WS and/or NMFS, as necessary. The stream buffers required under the FMP and PRO Logging Practices combined with the watershed area controls proposed will effectively mitigate impacts to fisheries. Mitigation outlined in the Recommendations from the Yurok Tribal Fisheries Program should also be followed where applicable (created at time of project development).

Alternative #3 - Impacts under this alternative would be minimal, and openings created from the small clear cuts and group cuts would increase the edge effect for song birds and small mammals. Deer use would likely increase as forage levels increase in these openings. The emphasis on selection harvesting will result in the maintenance of significant tree cover for other species. However, as stated above for alternative #2, for the same volume removed, the emphasis on selection harvesting can have a greater impact to a larger area over a longer time compared to a concentrated impact using clear cutting methods. Biological surveys will be required on all harvesting projects. Mitigations to any identified listed species will be developed by biologists at the time of project preparation, and reviewed and concurred by the USF&WS and/or NMFS, as necessary. The stream buffers required under the PRO Logging Practices and the FMP combined with the watershed area controls proposed will effectively mitigate impacts to fisheries. Mitigation outlined in the Recommendations from the Yurok Tribal Fisheries Program should also be applied where appropriate (created at time of project development).

Alternative #4 - This alternative would have the most disruptive effect on wildlife and fisheries due to the higher level of harvesting intensity. The potential for a "take" of a threatened habitat is also highest under this alternative. Biological surveys will be required on all harvesting projects. Mitigations to any identified listed species will be developed by Tribal biologists at the time of project preparation, and reviewed and concurred by the USF&WS and/or NMFS, as necessary. The stream buffers required under the PRO Logging Practices and the FMP combined with the watershed area controls proposed will effectively mitigate impacts to fisheries. Mitigation outlined in the Recommendations from the Yurok Tribal Fisheries Program should also be applied where appropriate (created at time of project development).

### **Impacts to Cultural Resources and Mitigation**

Alternative #1 - All timber harvesting and related activities, regardless of how small the scale, must be planned to avoid and or mitigate impacts to documented or found cultural resources.

Project-specific mitigation may need to be developed. The Yurok Cultural Committee, Tribal Archaeologist and Tribal Council should review all proposed projects that have the potential for affecting these resources. BIA compliance with Section 106 and THPO review of proposed projects are required for all ground disturbing activities.

Alternative #2 - The small amount of harvesting, and lack of associated road building proposed in this alternative will make it very unlikely that any cultural resources will be affected. Project-specific mitigation may need to be developed. The Yurok Cultural Committee, Tribal Archaeologist and Tribal Council should review all proposed projects that have the potential for affecting these resources. BIA compliance with Section 106 and THPO review of proposed projects are required for all ground disturbing activities.

Alternative #3 - The increased roading and disturbance associated with the proposed harvesting levels will increase the likelihood of impacting cultural resources, but adequate pre-harvest surveys should minimize or eliminate this potential. Project-specific mitigation may need to be developed. The Yurok Culture Committee, Tribal Archaeologist and Tribal Council should review all proposed projects that have the potential for affecting these resources. BIA compliance with Section 106 and THPO review of proposed projects are required for all ground disturbing activities.

Alternative #4 - The potential for impacts to this resource (both identified and unidentified cultural features) is greatest under this alternative due to the high intensity of timber harvesting proposed. However, adherence to the Section 106 process should minimize or eliminate any such impacts. Project-specific mitigation may need to be developed. The Yurok Cultural Committee, Tribal Archaeologist and Tribal Council should review all proposed projects that have the potential for affecting these resources. BIA compliance with Section 106 and THPO review of proposed projects are required for all ground disturbing activities.

### **Impacts to Recreation and Visual Resources and Mitigation**

Alternative #1 – Recreational opportunities would be generally unchanged under this alternative. There is no recreational plan for the reservation at this time, although a lack of planning could eventually result in cumulative visual impacts. For example, if two adjacent clearcuts were applied, the visual impacts would be greater than if the harvests would have been staggered over time.

Alternative #2 – Recreational opportunities under this alternative would be increased due to an improvement in access to the reservation. Visual impacts would be similar to Alternative #1. The exclusive use of selection harvesting would keep visual impacts of harvesting to a minimum. Layout of group cuts would need to take into account potential visual impacts. Watershed area controls will also mitigate visual impacts.

Alternative #3 – Recreational opportunities under this alternative would be increased due to an improvement in access to the reservation, although some road grating will be done to minimize potential road damage and general trespass. Some clearcut and group cut units might be visible across the canyon from residential sites on ridges and from the TSBs along Hwy 169 and up Bald Hills road. There are no nationally designated scenic byways close to any of the planned

timber activity sites on the YIR (the closest being over eight straight line miles away) and most of the current and future visual impacts in the river gorge will be from timber harvesting on adjacent private ownerships. Layout of small clearcuts and group cuts would need to take into account potential visual impacts. Single tree selection, group selection, watershed area controls, and coordination with the Yurok Tribe Transportation program will mitigate visual impacts.

Alternative #4 – Recreational opportunities under this alternative would be increased due to an improvement in access to the reservation, although some road grading will be done to minimize potential road damage and general trespass. Potential negative visual impacts would be most likely to occur under this alternative due to the extensive use of clearcutting, and the high level of harvesting proposed. The lack of group and variable retention would also increase visual impacts. Clearcut units will be visible across the canyon from residential sites and TSBs. Layout of clearcut units would need to take into account visual impacts.

### **Impacts to Socio-economic Resources and Mitigation**

Alternative #1 - Minimal and sporadic timber revenue returns to the Tribe would result from this alternative. Permit cutting and occasional allotment projects could generate some income, but without a concerted forest management planning process which includes Tribal lands, sustainable and consistent flows of timber revenues are not possible. If approximately 500 MBF of conifers were cut per year, an estimated \$300,000 could be generated annually. This does not consider revenues from fuelwood sales. Without a reasonable mixture of Tribal projects, employment opportunities would not be maximized.

Alternative #2 - This alternative could generate an average annual harvest of 1,400 MBF over the ten year planning horizon. Given the assumptions stated in the Forest Inventory Analysis (FIA) and FMP, this harvest level could generate \$840,000 per year. This does not include potential income from fuelwood cutting. If a Tribal Corporation were established, Tribal employment opportunities in the harvesting and hauling of timber products could be increased significantly.

Alternative #3 - This alternative could generate an average annual harvest of 2,200 MBF over the ten year planning horizon. Given the assumptions in the FIA and FMP, this harvest level could generate \$1,300,000 per year. This does not include potential income from fuelwood cutting. If a Tribal Enterprise were established, Tribal employment opportunities in the harvesting and hauling of timber products could be increased significantly.

Alternative #4 - This alternative could generate an average annual harvest of 3,300 MBF over the ten year planning horizon. Given the assumptions in the FIA and FMP, this harvest level could generate \$2,000,000 per year. This does not include potential income from fuelwood cutting. If a Tribal Corporation were established, Tribal employment opportunities in the harvesting and hauling of timber products could be increased significantly.

### **Impacts to Timber Resources and Mitigation**

Alternative #1 - The amount of conifer and hardwood harvested in this alternative is not defined, but should be less than 500 MBF (based on past cutting levels). The Indicated Allowable Cut (IAC), depending on the mixture of even- and uneven-aged methods used, range from approximately 1,000 MBF per year to over 3,000 MBF per year, over the ten year planning

horizon. The amount of timber harvested under this alternative would be well below the lowest IAC, but a lack of planning and watershed area controls could cause negative impacts to the overall forest structure, which could result in difficulties in reaching forest regulation in the future.

Alternative #2 - Conifer harvesting under this alternative would average approximately 1,400 MBF per year over the ten year planning horizon. This amount of timber harvesting would be well below the most aggressive IAC of 3,320 MBF (maximize clearcutting, short rotation model). The proposed mixture of harvests between allotments and Tribal lands, combined with the watershed area controls would allow for reasonable progression towards a regulated forest structure in the future. Because of the restriction to selectively harvest, even-aged stands of old growth may result in stands that are understocked or stocked with poor quality trees as a result of dependence on natural regeneration. Overall stand quality could decline if "high grade" prescriptions are applied. The amount of hardwood cutting is not defined, but if kept below 100 cords per year, should not significantly affect the growing stock of this cover type.

Alternative #3 - Conifer harvesting under this alternative would average approximately 2,230 MBF per year over the ten year planning horizon. This amount of timber harvesting would be below the most aggressive IAC of 3,320 MBF (maximize clearcutting, short rotation model). The proposed mixture of cutting practices, combined with the watershed area controls would allow for a reasonable progression towards a regulated forest structure in the future. As in alternative #2, the emphasis on selection harvesting in even aged (or even sized) stands of old growth may result in stands that are understocked or stocked with poor quality trees as a result of dependence on natural regeneration. Overall stand quality could decline if "high grade" prescriptions are applied. The amount of hardwood cutting is not defined, but if kept below 100 cords per year, should not significantly affect the growing stock of this cover type.

Alternative #4 - Although the 514 acres excluded for stream buffers has reduced the IAC from 4,240 MBF to 3,320 MBF per year over the ten year planning horizon, this alternative assumes that some fairly intensive harvesting methods are to be applied. In reality, it is not likely that the Tribe will want to harvest stands on a 35 year rotation when considering the potential impacts to other resources. The Tribe could consider using even-aged methods with extended rotation ages of 80 or 100 years. This reliance on even-aged methods tends to limit future harvesting to the same methods.

### **Additional Mitigation**

All forestry projects proposed under any management alternative must comply with the standards and practices described in 53 BIAM Supp. 3, the PRO Logging Practices, and should comply with the Recommendations from the Yurok Tribal Fisheries Program, wildlife recommendations and Cultural requirements. In addition all activities and projects on the Green Diamond purchase fee lands must also comply with standards and practices requirements of the Aquatic Habitat Conservation Plan.

As timber sales are proposed under the FMP, each shall have a project-specific EA which will define site-specific mitigation measures as appropriate. These mitigation measures will ensure that the forest management actions will result in environmental impacts which will be less than significant.

## **Consultations and Information Sources**

### **Consultations:**

Thomas P. O'Rourke Sr. - Yurok Tribal Council Chairperson  
Marjorie Buckskin - Yurok Tribal Council Vice Chair  
Bonnie Green - Yurok Tribal Council Member  
Sid Nix - Yurok Tribal Council Member  
David Gensaw - Yurok Tribal Council Member  
Lyle McKinnon - Yurok Tribal Council Member  
Richard Myers - Yurok Tribal Council Member  
Larry Hendrix - Yurok Tribal Council Member  
Jack Mattz - Yurok Tribal Council Member

Dave Hillemeier - Tribal Fisheries Program Manager  
Chris West – Tribal Wildlife Biologist  
Gordon Karnes (Retired) - BIA Klamath Field Office  
Gerald Jones – BIA Regional Forester  
Joe Hostler – Tribal Air Quality Specialist  
Joe James – Tribal Transportation Manager  
John Baskette- BIA Timber Sale Officer  
Frank Galea – Galea Wildlife Consulting  
Tanya Sangrey – Yurok Economic Development Corporation Director

### **Scoping Sessions:**

02/15/2012 BIA, Tribal Forestry and Tribal Planning Departments  
02/29/2012 Tribal Forestry Department Staff  
03/13/2012 IRMP Planning staff and Forestry Department Staff  
04/04/2012 Tribal Council planning session  
04/09/2012 IRMP Planning session  
04/17 – 19/2012 BIA and Tribal Forestry, Legal and Fiscal Staff  
04/26/2013 Forestry Department Staff & IRMP Planning Staff  
05/09/2012 Tribal Council planning session  
05/06/2012 Tribal Natural Resources Division staff  
05/23/2012 SOD management workshop  
05/30/2012 Yurok Habitat Conservation Plan (YHCP) planning session  
06/12/2013 Tribal Natural Resource Committee planning session  
06/20/2012 Tribal Public Meeting and Information Session

Information Sources:

National Environmental Policy Act. 1970.

53 BIAM, Supp. 2, Release #09-02, Forest Management Planning

Six Rivers National Forest Management Plan.

Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. April 1994

Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. April 1994

California Air Quality Data Summary of 1993, Air Quality Data Gaseous and Particulate Pollutants. Vol. XXV - Annual Summary. California Environmental Protection Agency, Air Resources Board.

USF&WS data base query. 10/12

Forest Management Plan Hoopa Indian Reservation, California. 1983

Draft Environmental Assessment. Forest Management Plan for the Hoopa Valley Indian Reservation.

Yurok Forest History. Lynn Huntsinger. September, 1994.

Hoopa Valley Forest History. AITS, Inc. 1983.

The Hoopa-Yurok Settlement Act. Julian Lang, News From Native California. January/February 1989.

Handbook of North American Indians. Volume 8, California. Smithsonian Institution, 1978.

Forest Inventory Analysis of Yurok Indian Reservation. BIA Branch of Forest Resources Planning. 2010.

Yurok Aerial color photography. 2010, 2001, 1996, 1991

A Guide to Wildlife Habitats of California. Kenneth E. Mayer and William F. Laudenslayer Jr. October, 1988

California Native Plant Society. <http://www.cnps.org>

California Department of fish and Game. Natural Diversity Data Base. <http://www.dfg.ca.gov>

California Forest Soils, University of California, Davis; 1979

Natural Resources Conservation Service. <http://soils.usda.gov>

Oaks of California. Cachuma Press. 2002

United States Department of Agriculture Forest Service. Soil survey of the Six Rivers National Forest.

U.S. Census Bureau, Profile of General Demographic Characteristics, Yurok Reservation, CA, 2000, Summary File 1, <http://factfinder.census.gov>, (October 2005)

State Timber Harvest Plans:

1-05-086HUM

1-05-114HUM

1-05-171HUM

1-05-218HUM

1-06-027HUM

1-06-049HUM

1-06-112HUM

1-07-055HUM

1-07-182HUM

Appraisal Report, Yurok Phase 1 Purchase, J.E. Fleming & Associates, 2010

Yurok Tribe Sustainable Forest Project CAR 777, Project Design Document Improved Forest Management Forest Project Protocol v3.1, 2012

Final Aquatic Habitat Conservation Plan, Green Diamond Resource Company, 2006

Past Yurok Tribe Timber Sales:

Cappell Creek A 1997

Pine Creek "40"/Jane Young 1999

Two Snakes 2003

Boundary A 2003

Bear Creek A 2006

FY 2011 Particulate Matter PM<sub>2.5</sub>, Appendix A, Air Quality Monitoring Data Summary, Yurok Tribe Environmental Program, 2012