RECLAMATION

Managing Water in the West

Karuk Tribe Sociocultural/Socioeconomics Effects Analysis Technical Report

For the Secretarial Determination on Whether to Remove Four Dams on the Klamath River in California and Oregon

U.S. Department of the Interior
Bureau of Reclamation
Technical Service Center
Denver, Colorado

July 2012

Mission Statements

The U.S. Department of the Interior protects America's natural resources and heritage, honors our cultures and tribal communities, and supplies the energy to power our future.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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Acronyms and Abbreviations

ADA	American Diabetes Association
AHA	American Heart Association
BIA	Bureau of Indian Affairs
CDC	Center for Disease Control
CEQA	California Environmental Quality Act
DHA	docosahexaenoic acid
DOI	U.S. Department of the Interior
EIS/EIR	environmental impact statement/environmental impact report
EPA	eicosapentaenoic acid
ESA	Endangered Species Act
HHS	Health and Human Services
IGD	Iron Gate Dam
IHS	Indian Health Service
KBRA	Klamath Basin Restoration Agreement
KHSA	Klamath Hydroelectric Settlement Agreement
MSAE	Microcystis aeruginosa
NEPA	National Environmental Policy Act
UB	Upper Basin
UKB	Upper Klamath Basin
UKL	Upper Klamath Lake
UKR	Upper Klamath River
USDA	United States Department of Agriculture
USFS	United States Forest Service

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1.1 INTRODUCTION

After years of negotiations, on February 18, 2010, Klamath Basin stakeholders agreed that removing four hydroelectric dams on the Klamath River, restoring habitat, and reintroducing salmon in the Upper Klamath Basin would be the best method for managing Basin water, fish, and other resources to resolve ongoing water supply and quality problems, drought issues, fish kills, and other multiple-use challenges. Two agreements were drafted; the Klamath Hydroelectric Settlement Agreement (KHSA) and Klamath Basin Restoration Agreement (KBRA).[1]

Implementation of the KHSA would remove Iron Gate, J.C. Boyle, Copco 1 and Copco 2 hydroelectric dams that prevent coho salmon, Chinook salmon, steelhead, and Pacific lamprey anadromous species from migrating through the middle Klamath River and above Iron Gate Dam (IGD) to Upper Klamath Basin habitat. The KBRA specifies salmon, steelhead, and lamprey reintroduction and habitat improvement programs in the Upper Klamath Basin that are expected to benefit all native fisheries in the entire Klamath River and some ocean fisheries. The KBRA benefits would occur in large part through water management agreements that would provide more reliable water supplies for irrigation in agricultural communities and fish habitat in the National Wildlife Refuges. Although the KHSA and KBRA are separate agreements, the success of each agreement depends on mutual implementation which is the assumption throughout this technical report. The agreements specify that actions would occur during the next 50 years, with dam removal beginning in 2020, and most KBRA actions beginning in 2012, provided approval is granted to proceed from the Secretary of the Interior since implementation must be determined to in the public interest.

This technical report is supporting socioeconomic documentation focused on the Karuk Tribe that will be used to assist the Secretary of the Interior in making a determination whether to proceed with implementing the KHSA and KBRA. There are similar individual socioeconomic technical reports for other Basin Tribes, including the Klamath Tribes, Yurok Tribe, Hoopa Valley Tribe, and Resighini Rancheria Tribe. The tribal technical reports are supporting documentation for the *Draft Klamath Dam Removal Overview Report for the Secretary of the Interior: An Assessment of Science and Technical Information*, (SDOR) (DOI, et al., January 23, 2012) (final forthcoming), and the *Klamath Facilities Removal Public Draft Environmental Impact Statement/Environmental Impact Report* (Klamath EIS/EIR), (DOI, et al., September 2011) (final forthcoming), that evaluated impacts of the KHSA and KBRA.

[1] Signatories in the KHSA and KBRA included the States of California and Oregon, the Klamath Tribes, Karuk Tribe, Yurok Tribe, and representatives of more than 50 organizations, including counties, irrigators, conservation and fishing groups, and others.

Methodology primarily included issue identification from meetings with the Resighini Rancheria Tribe, materials provided by the Tribe, information from the FERC record, and other sources listed in the bibliography.[2] Members of the Economics Subteam attended meetings with the Karuk Tribe concerning potential trust resource, socioeconomic, and contemporary cultural impacts on April 23, 2010 (conference call), September 1, 2010 (socioeconomics only), and January 27, 2011(trust resources government to government). Several reports were central resources, including: *The Effects of Altered Diet on the Health of the Karuk People*, by Kari Marie Norgaard, PhD. The Norgaard report primarily used archival material, interviews with Karuk Tribal members, Karuk medical records, and the 2005 Karuk Health and Fish Consumption Survey. Another important report used included: *White paper on behalf of the Karuk Tribe of California: A context statement concerning the effect of the Klamath Hydroelectric Project on traditional resource uses and cultural patterns of the Karuk People within the Klamath River Corridor*, by John F. Salter, PhD, November 2003 which, in addition to an historical analysis, included interviews with Tribal members. Year 2000 (and 2010 when available or appropriate) Bureau of the Census data was analyzed for most of the economic and demographic conclusions.

This document is divided into two main sections; affected environment and environmental consequences.

2.1 AFFECTED ENVIRONMENT

The first part of this section discusses Karuk Tribal history, followed by the present conditions portion organized by the following indicators: Fisheries, economic conditions (primarily income and employment), and health. Tribal trust resources were analyzed in two reports: *Current Effects of PacifiCorp Dams on Indian Trust Resources and Cultural Values: Background Technical Report Informing the Secretarial Overview Report*, (DOI, June 2011a), and *Current Effects of PacifiCorp Dams on Indian Trust Resources and Cultural Values;* and *Potential Effects of Implementing the KHSA and KBRA on Indian Trust Resources and Cultural Values.*[3] (DOI, June 2011b). Trust resource aspects are mentioned in this report when applicable.

The Karuk Tribe gained Federal recognition in 1979, and has about 3,474 enrolled Tribal members. The Tribe does not have federally protected fishing rights; however, the Tribe has California State recognized fishing rights. The Karuk

[2] The FERC record here refers to all public documents relating to the (FERC) relicensing process for PacifiCorp's Klamath Hydroelectric Project 2082, inclusive of the J.C. Boyle, Copco 1, Copco 2 and Iron Gate dams, and particularly documents that described tribal impacts.

[3] Prepared for DOI by North State Resources, Inc.

Tribe is located along the middle Klamath River that cuts into the surrounding mountains to create steep inclines throughout most of the middle Klamath River Karuk areas.

The Karuk Reservation consists of small non-contiguous parcels that total about 851 acres distributed along many miles of river, and there are a number of off-Reservation trust lands and allotments as well.[4] Tribal administration is dispersed over many miles with offices in Happy Camp, a central location with other offices and services in Yreka (east about 75 miles), and Orleans (south about 45 miles) (figure 2.1-1). Tribal housing is primarily located in Yreka.

High unemployment and poverty rates have made a subsistence lifestyle vital. According to the 2005 BIA Labor Force Report, unemployment for the Karuk area Indian population was 63 percent. Census 2000 data for the Karuk Reservation showed an unemployment rate that was about two to three times that of the general population in Siskiyou County with greater disparities for Indian area populations. The Karuk Reservation had the lowest per capita income of all surrounding areas, at half or less than that of other areas, particularly for the Indian population. More than half the population was in poverty in 2000, and the 2009 estimate has increased to about 60 percent, and previous Tribal surveys have placed it as high as 80 percent. The Census 2009 estimates for Reservation unemployment indicate rates that could have increased to about three to five times higher than the surrounding area general population rates. Concerning subsistence fishing, acquiring salmon has been difficult due to declining anadromous fish stocks since construction of Copco 1—problems exacerbated by construction of Iron Gate Dam in 1962 when populations declined further, particularly spring-run Chinook, and water quality became noticeably worse.

The Karuk Tribe has continued its presence in aboriginal lands and maintained its traditions to the present:

> Karuk aboriginal territory encompassed over one million acres of land where Karuk People have been recognized as fishers, hunters, and gatherers who wove baskets, made redwood dugout canoes and homes, and dance regalia. Karuk people continue to be fishermen, hunters, singers, dancers, and traditional healers whose ceremonies celebrate the return of the salmon in "fix the earth" or also known as "fix the world" ceremonies that restore balance and renew the world for harmonious living. For the Karuk People…the center of the universe is at Katimiin, near the confluence of the Salmon and Klamath Rivers." (Karuk Tribe, 2011).

[4] For the purposes of this report, the term Karuk Reservation includes Karuk Reservation lands and off-reservation trust lands.

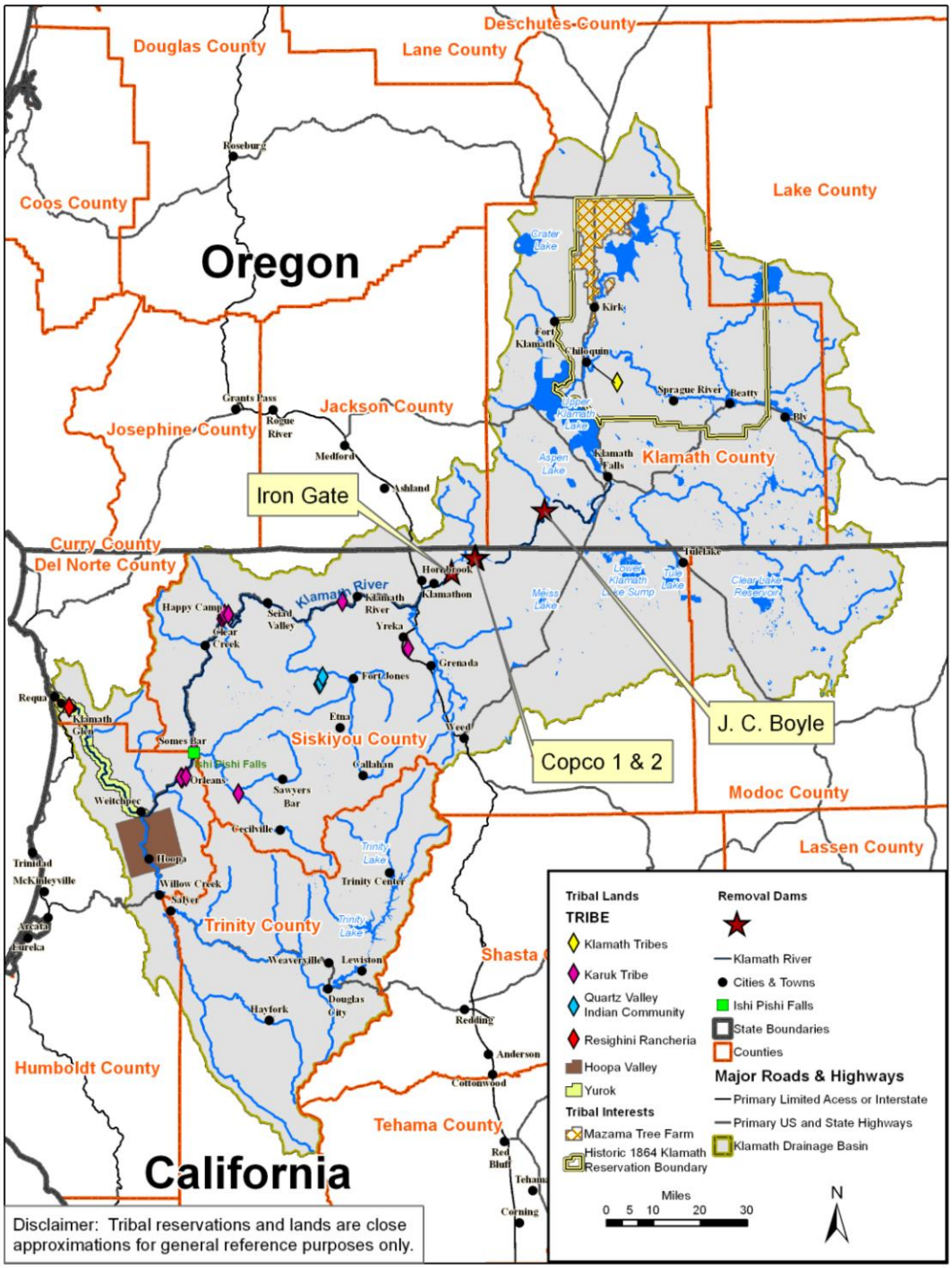

Figure 2.1-1.—Tribal lands.

2.1.1 Karuk Tribal History

History explains current socioeconomic, sociocultural, and related conditions for any population, as is the case for the Karuk Tribe. Federal and California State Indian policies, development, and settlement drastically reduced about 1.4 million acres of aboriginal territory Karuk once had to about 851 acres today, and numerous fishing stations and abundant year-round fish runs have narrowed to one fishing station with use limited to about two to four weeks annually due to reduced fish runs.[5]

The Klamath Basin Tribes are located in the southernmost area of the northwestern 'salmon culture' that stretches north to Alaska, along with its trade network. The Karuk-arara, or 'Upriver People,' describe their past as extending thousands of years prior to non-indigenous contact with homes in more than one hundred villages along the mainstem of the Klamath River in the heavily forested, mountainous region of northwestern California in the western half of Siskiyou County and northeastern corner of Humboldt County (Hill, 2010).

The Karuk Tribe thrived as a salmon culture with supplemental hunting and gathering in their aboriginal territory until Euro-American contact. A general timeline of major events and milestones are broadly summarized in attachment 1. Gold-seekers and miners around the 1850s had an immediate negative effect on the Karuk Tribe, as did the associated Federal military actions and State Indian policies, followed shortly by settlers and ranchers. After decades of hostilities with non-Indians, the Federal Government and State of California attempted to place the Karuk on the Hoopa Valley Reservation, but the Karuk people returned to their nearby homelands where they remain today. As a result of corruption, confusion, and neglect when treaties were written, the Karuk Tribe has been limited in modern times to small non-contiguous parcels, and the Tribe has no federally recognized rights to fish, hunt, or gather which has placed it at a significant disadvantage as Karuk people have tried to maintain a traditional lifestyle and a salmon culture. The Karuk Tribe gained Federal recognition in 1979—relatively recent compared with many tribes (Bright, et.al., 1978) (DOI, June 2011a) (Sturtevant, et. al., 1978). Although the trust analysis concluded that the Karuk Tribe has no Federally recognized trust resources or rights connected to KHP impacts, Karuk tribal representatives highlighted the fact that the fisheries as a trust resource has never been adjudicated.(DOI, June 2011b, pp. 2-11).

This section discusses the most relevant aspects of Karuk Tribal history up to the present, including over-arching socioeconomic and sociocultural changes in

[5] Acreage data from DOI (June 2011b). The Tribe is required by California State law to use traditional fishing methods only.

salmon cultural practices and traditional food uses that were central through Karuk aboriginal times, reservation era, Copco Dam construction, pre-Federal recognition/Iron Gate Dam, and Tribal Federal recognition period.

2.1.1.1 Aboriginal Period (Pre-1850 Conditions)

Karuk Tribal members and others have described Karuk lifestyle, the importance of salmon as a food source, and the vital cultural, social, and economic roles it played:

> "Our life on the river long predates the arrival of non-Indian people in Northern California. In ancient times, our villages occupied a long stretch of the canyon along the Klamath River from the upstream vicinity of Seiad and Hamburg down to below Bluff Creek at sites located within what today is the Hoopa Valley Reservation - an existence which has been reported and documented by every historian who has visited our area and worked with our people. Throughout this area from time immemorial, our people have harvested fish and other water-related creatures for ceremonial uses gifted by the Creator, as well as wood and clothing. The earliest anthropological studies of our tribe record our traditional catch as including chinook (or king) salmon, coho (or silver) salmon, steelhead, trout, suckers, bullheads and sturgeon, as well as Pacific lampreys. We have always made use of every part of what is harvested, a practice which underscores the importance of the river and its production to our culture." (Hillman, May 4, 2000).

2.1.1.1.1 Aboriginal Territory

Karuk aboriginal territory encompassed about 1.4 million acres that included the Klamath and Salmon Rivers with many streams and tributaries, and where the "…salmon, steelhead, elk, deer, ducks, geese, grouse, quail, tanoak acorns, and a variety of seasonal berries, mushrooms, and roots once provided sustenance in a lush natural environment." (Hill, 2010; DOI, June 2011a).

The Karuk territory provided opportunities for a "…wealth of ceremony, regalia and material goods without equal in California." (Salter, 2003, p. 5). Karuk villages were primarily situated alongside the Klamath River, surrounded by the steep river canyon mountain sides, as Salter described: "Karuk society was a long winding sequence of [about 100] villages placed upon favorable beaches, bends, benches and fishing sites..." centered on the Klamath River. (Salter, 2003, p. 5; DOI, June 2011a). Some Karuk villages were located along the Salmon River, the largest Klamath tributary within their aboriginal territory, which ran about 15 miles upstream near the traditional village of Katamin to Forks of Salmon (Salter, 2003, pp. 5-7).

The steep mountain hillsides on both sides of the River were used for seasonal hunting and gathering, including basketry materials, firewood, and for religious purposes. Seasonal hunting and gathering areas were temporary for varying periods each year and permanent residences were the villages along the river that "…provided the thread joining villages and Indian peoples from the upper Klamath Basin to the Coast." (Salter, 2003).

2.1.1.1.2 Socioeconomic Aspects

Socioeconomically, the River provided the Karuk with many runs of fish, particularly salmon, and riparian vegetation for basketry and other cultural uses and as traditional food sources. The Karuk had an economy with currencies and were part of a regional trade network.

As with other Tribes in the Northwest Culture, the Karuk Tribe placed a high value on wealth and had a complex, stratified social structure, as well as an economy replete with several forms of currency, primarily dentalia, and with prices and fees for most activities and goods in its society. (Karuk Tribe, 2011; Sturtevant, et. al., 1978). For example, there were family rights to fishing spots and if the 'laws' were not honored payment would be required as governed by rules or laws:

> "The best fishing places along the rivers were privately owned, sometimes by single individuals, sometimes jointly by several. In the latter case, a fishing place could be used by each owner in rotation, according to the proportionate share of his ownership. An owner might give someone else permission to fish there on the day or days when his turn would normally come. But no one was permitted to fish or to establish a new fishing pact immediately downstream from a recognized fishing place…most inferior fishing places, and a few excellent ones were not privately owned but were open or public…' (Kroeber and Barrett 1960, p. 3)…The concept of ownership applied strictly to the right to fish and not to ownership of land along the river." (Karuk Tribe, 2011, p. 5).

Some Tribal members described conditions of abundance before EuroAmerican contact and how it compares with limited abundance today:

> "When you ask people what that fishery used to be like, it wasn't that people would be showing up looking for fish around the middle of August and plan on being done typically by the end of September. So what has affected it is the availability of resources…That was a year round fishery." (Leaf Hillman, Vice Chairman, Karuk Tribe, age 42 at the time of the interview) (Salter, 2003).

> "'We had over 100 villages up and down the Klamath River, with fishing sites associated with each village. Now we are trying to feed our people off one fishery. It's not possible.'" (Norgaard, November 2005, p. 11).

2.1.1.1.2.1 Fishery Species, Runs, and Fishing Methods

Many riverine species provided for Karuk people, as an early observer, Gifford recorded as he cited a Karuk Tribal member who listed the principal Klamath River species used by the Karuk and basic information about each (these are the same species listed by Leaf Hillman in his quote at the beginning of this section, and by numerous other observers and historians):

- Chinook, King, spring, or black salmon was recognized as a large, dark-skinned fish with pale pink ("white") flesh and was the most esteemed species. It appeared in spring and continued through fall. Before the spring run, these fish were referred to honorifically as inenyara, which naming helped induce them to come in numbers. The first arrivals were called ixyats, but might not be eaten until after the ceremony made for them at Amekiarum. This was the species for which lifting-net scaffolds were set up, though in creeks it was harpooned.

- Coho or silver salmon, was described as red-fleshed, rather dry, not fat, and ran beginning in October.

- Steelhead were available in winter, at high water, and they continued to be taken with platform lifting nets after the salmon completed their runs.

- Trout were in the river and creeks the year round.

- Two species of sucker: Klamath coarse-scale sucker and the Klamath fine-scale sucker, both bony and not considered too desirable, but available year round.

- Sturgeon [white and green] occurred upstream only to Ike's Fall[s], and were caught in a strong-meshed lifting net. The flesh was considered less palatable than the salmon.

- Pacific Lamprey (eels) continue to be valued as a rich source of fat and are taken by a variety of techniques including small-meshed nets, gaffs and by hand, now utilizing a glove for a better grip, as the eel work their way over rocks at night in their upriver migration." (Salter, 2003; DOI, June 2011a; Karuk Tribe, 2011, pp. 6-9).

The Karuk employed various fishing methods depending on the section of river or stream, the river flows, and the species of fish, including; single and

double-pronged toggle harpoon, gorge hook, double-pointed angle hooks, V-frame dip net (large), multipronged spear, gaffs, basketry traps, fish dams, and hoop nets. The Karuk built weirs which generally coincided with ceremonies (Salter, 2003, p. 17).

According to the Karuk, weirs were sacred and construction was timed with and around ceremonies and allowed for a larger catch to feed more families:

> "Mythologically, weirs were created by one of the immortals (Ikhareya) as an aspect of creating salmon and preparing the structures and techniques that the humans…would use in their capture…Weirs offered the advantage of allowing a winter's supply of salmon to be caught for many families." (Salter, 2003, p. 18; Karuk Tribe, 2011, p. 10).

Historically, many of the family fishing holes had platforms where fishers used trigger nets and dip nets for salmon and lampreys:

> "'If you're getting everything off of your platform then you're good. All of these traditional platform fisheries, trigger net, dip net, the lamprey fishery was right off of that same platform in the same area so you didn't have to move it…there are probably different reasons why they don't fish there now, but a lot of it is because there's no fish' (Karuk eeler)." (Lewis, 2009, p. 19).

Concerning fish runs, Snyder observed that there was no discernable break between salmon and steelhead, and some fish were available as late as November and beyond:

> "'The summer migration of king salmon up the Klamath River begins about the first of July, mounts rapidly by the last of the month, reaches its maximum in August, declines gradually in September, and falls away almost entirely before the beginning of winter. There is no definite break between the spring and summer migrations, and it seems also that the fish in small numbers continue to appear through November and even later. A spawning migration of steelheads comes with that of the king salmon. And a run of silver salmon Starts early in September and continues through October and November.'" (Salter, 2003; Karuk Tribe, 2011, p. 8).

Lamprey, or eel, was an important food source in the winter and early Spring before the First Salmon Ceremony when other foods were less available, and it remains particularly important nutritionally for elders. A traditional Karuk fisherman described the role of lamprey:

> "They are a pretty important food source for us in the spring…In between when you can start catchin[g] salmon and when you quit catchin[g] steelhead. And then there's a period there when you have to wait until the ceremony's completed to…catch the salmon. So…then

> you have that food source from the River during that gap….it's very important. Bill Tripp, traditional Karuk fisherman. (Norgaard, November 2005, p. 36).

Spring Chinook was the most important run of fish, as early anthropologists observed:

> "The particular importance of Spring Chinook salmon for tribes in the region is noted by early anthropologists (e.g., Gunther 1926; Rostland, 1959). Swezey and Heizer note that, 'Those native populations to whom anadromous fish were either the most important or a major stable in the food economy almost exclusively inhabited river drainages in which the spring salmon run occurred…With the exception of the coastal streams south of the Klamath, it appears that the most important and productive fishing areas in native California were those which could rely upon an assured and abundant early spring run of king salmon (1993, 304-305).' (Norgaard, November 2003, p. 32).

Resource management has been of great importance to the Karuk people as it ensured continuance of everything they relied upon. The Karuk used a wide range of resource management techniques, many of which are used today, including such fishing-specific management methods as weirs, scaffolds, platforms, and ceremonies:

> "Over thousands of years, the Karuk people honed land management to the level of a fine science….These culturally basic natural resource management practices are still used by the Karuk…" (DOI, June 2011a, pp. 3-34).

2.1.1.1.2.2 Redistribution and Trade

Despite social stratification and the emphasis on wealth, Karuk culture placed a high value on sharing as a social responsibility: "As the fishers in their village, it was important for the eelers to give away most of their harvest to other community members, especially elders." (Lewis, 2009, p. 20).

The extensive trade network in the Northwest culture was well established prior to EuroAmerican contact, and allowed for alliances among tribes and supported socioeconomic societal structures as well as an exchange of goods:

> "The natural diversity of the Klamath basin offered a particularly wide range of potential resources which could be considered appropriate for trading with other tribes…" (Karuk Tribe, 2011, p. 17).

Although most people today consider aboriginal plant use, including basketry, to be primarily cultural, it was (and remains to some extent) as much economic in nature because they were necessities for daily life and were among goods, like

salmon, that could be traded. It is known that after a flood, willow-root basket materials are best gathered in a straight narrow section of the river where a flood's raging waters have scoured the roots. Basketry was (and remains) another important activity related to the Klamath River:

> "Baskets and the complex technology involved in the gathering and preparation of a range of materials [was of] great cultural importance, playing a significant part in the role of Karuk women and remains an important cultural activity [today]." (Salter, 2003).

2.1.1.1.3 Sociocultural Aspects

The Karuk Tribe are known as the 'Fix the World People' due to their traditional, central role in the regional annual Piky'avish (also spelled Pikiavish) or World Renewal Ceremonies. Pikiavish traditionally began with the First Salmon Ceremony in the spring followed by additional ceremonies in the summer and fall. The First Salmon Ceremony, which marked the arrival of spring Chinook, was conducted below the mouth of the Salmon River. The ceremony signaled the end of the winter steelhead season and the beginning of the salmon season. Key fishing locations and villages along the River were also the places where important ceremonies were held.

The center of the Karuk world is located just above the confluence of the Salmon and Klamath Rivers, and it is the primary place for the Word Renewal Ceremonies:

> "Just above the Salmon Rivers intersection with the much larger Klamath River and on the east side of the Klamath stands A'uich, or Sugarloaf, a pyramidal peak…[which] stands as the center of the Karuk world together with the associated flat Katamin…the principal site of the Pikiavish or World Renewal Ceremonies, including the White Deer Skin Dance for which the Karuk are renowned. Across the river from Katamin, at this most sacred of village clusters and ceremonial areas, is Ishi Pishi [Falls] (The End of the Trail), so named as it marks the point at the river that is the end of the Medicine Man's (Fatawaanun's) trail [concluding the ceremony]." (Salter, 2003; Bright, et.al., 1978, figure 1, p. 180).

World Renewal or Pikiavish Ceremonies were also concerned with (but not traditionally initiated by) the fall-run Chinook salmon and the approaching acorn harvest, and marks the Karuk New Year.

Karuk life revolved around fishing, particularly for salmon, and although there were numerous fishing locations, Ishi Pishi Falls was, and is today, one of the most important as it is the location of the World Renewal Ceremony as described by countless observers, and below by a Tribal member:

> "It cannot be overstated that it is impossible to separate fishing at…[Ishi Pishi] Falls from the World Renewal Ceremonies. Published studies of the [supporting ceremonies for the] World Renewal Ceremony at the four most important historic and cultural Karuk sites are tied to the salmon runs in the Klamath River and the First Salmon Ceremony, one of the most important and ancient religious practices of our people. Our 'renewing of the world' [also referred to as pikiavish] was to assure its stability between the seasonal observances. In spring, when the salmon start running, the Jump Dance is held at amekiarram, where salmon were mythically created. In the fall, at the time of the acorn harvest and second run of salmon, White Deerskin Dances were held at katimin, inaam, and tishawnik. These ceremonies involved activity by medicine men and women, as well as community display of wealth (through regalia and plentiful foods such as acorns and salmon), ceremonial dancing, and prayer." (Hillman, May 4, 2000).

All Klamath Basin tribes have held ceremonies for centuries around the timing of two runs of Chinook Salmon; spring- and fall-run. For the Karuk, the First Salmon Ceremony celebrated the return of Spring Chinook salmon around April when the fish first appeared at the mouth of the Klamath, performed in coordination with the downriver Yurok Tribe. The First Salmon Ceremony played a critical role in fisheries management for the Basin, and for the Karuk section of the River by ensuring that sufficient numbers of spawning spring-run Chinook salmon made it up the River to spawn (Salter, 2003; DOI, June 2011a). The Karuk celebrated Spring Chinook arrival at Amekiarum, below the mouth of the Salmon River, and the run was followed by summer Chinook salmon which were larger (Salter, 2003).

Powers, an early observer, gave an account of the First Salmon Ceremony and its role in traditional regulation of the salmon fishery:

> '"…They celebrate it to insure a good catch of salmon. The Kareya Indian [priest] retires into the mountains and fasts the same length of time as in autumn. On his return the people flee, while he repairs to the river, takes the first salmon of the catch, eats a portion of the same, and with the residue kindles the sacred smoke in the sudatory. No Indian may take a salmon before this dance [used in the sense of a ceremony] is held, nor for ten days after it, even if his family is starving (Powers, p. 31)."' (Salter, 2003).

Ike's Falls, located just below the traditional village of Yutamin, was a famous fishing station approximately one mile downstream of the mouth of the Salmon River with intense rapids and holding places for migrating fish. Ike's Falls was at about the same location as Amekiarum, the village where the First Salmon Ceremony was held. Just downriver from the mouth of the Salmon River was a small flat, Ashapipmam, the site of the Jump Dance (Salter, 2003). About 20 miles upriver from Katamin at the mouth of Clear Creek was the village of

Inam, site of the first enactment of the annual Deerskin Dances. Another ceremonial village, Panaminik, was about eight miles from the Salmon-Klamath confluence that later became the location of modern-day Orleans (Salter, 2003).

Kroeber and Gifford (1952), explained the Deerskin, Medicine, and War Dances as they related to the Pikiavish Ceremony:

> "Although the Pikiavish is an annual ceremony whose conclusion marks the Karuk New Year and is celebrated with great joy and feasting, the Deerskin Dance is held on years alternating with the Medicine Dance during which other decorated skins including martin and otter are displayed rather than the famous white deerskins. The Karuk ceremony has three major aspects: The first is a period of usually not more than ten days during which the priest remains much in the sweathouse, fasts, and prays for abundance of food, the elimination of sickness and the stability of the world. He also visits sacred spots; and young men engage in archery contests. The second part is the climax of the ceremony, when the priest keeps an all-night vigil by a sand pile called yuxpit. This vigil is accompanied and followed the next day, by the Deerskin Dance, or its surrogate, an imitation affair employing branches instead of deerskins; at Inam and Katamin the War Dance is part of the dance ritual. The third part is the anticlimactic retreat of the priest and other officials."
> (Kroeber and Gifford, p.6; Salter, 2003, pp. 23-24).

2.1.1.1.4 Aboriginal Diet

The Karuk diet consisted primarily of game animals, acorns, most Klamath River species, particularly salmon, and included edible riverine plants. Norgaard's research found that salmon consumption was estimated to be about 1.2 pounds per day per person and comprised about half of the Karuk diet:

> "Salmon is estimated to have made up to close to 50% of the energy and total protein in the pre-contact diet of the Karuk (Hewes, 1973)." (p. 2).
> "It has been estimated that the Karuk people historically consumed about 450 pounds of salmon per person per year or 1.2 pounds per day."
> (Norgaard, November 2005, p. 13).

Prior to mining, KHP, and other development, salmon and steelhead appeared in the Karuk area in consistent, predictable species-distinguishable pulses throughout the year, and quotes below show that this occurred, but the spring-run was affected—about 13 years after construction of Copco Dam:

> "The major run was that of the spring salmon. Snyder quotes from G.R. Field: 'As the run of winter steelheads ceases, about March 30, spring Salmon begin to come. A few enter the Klamath in the later part of February, but the run really starts in March and slackens or almost entirely passes by the last of May. These fish average about 11 pounds in

> weight and are indistinguishable from those which come later, except that the eggs are always immature. These spring salmon may be caught in the smaller streams fed by melting snow at the headwaters of Salmon River during the month of May (Snyder, p. 19). Spring salmon are said to have lingered in the vicinity of spawning beds until they mature and then spawn with the fish of later runs. They were also known as "silvers" due to their bright colors that gradually become indistinguishable from the coloration of other migrations in the period prior to spawning, having matured in the vicinity of the spawning beds.' By the time of Snyder's writing in 1931, the spring run had declined from being the major run to the point that he characterizes it as being of "relatively little economic importance" (Ibid.). (Salter, 2003, pp. 13-14; Karuk Tribe, 2011, p. 8).

Initial lamprey runs for the season occurred just before and during salmon season, about February, and were an abundant, important nutritional food, particularly for the elderly and essential for food security.

> "The elders tell stories of how Pacific lampreys used to be so thick, you could hear them. When eelers went out to harvest them at the mouth, at the falls, or up the tributaries, they could easily pull out one lamprey after another because there were so many; anyone could harvest as much as they needed. 'I remember seeing the rocks where we got the eels were just a solid mass, hundreds and hundreds' (Karuk tribal community member)." (Lewis, 2009, p. 19)

Another traditional food and culturally important species was the mussel:

> "Freshwater mussels have cultural significance for the Karuk, and mussel shells are found throughout Karuk tradition. A woman's spoon made of mussel shell is called sikihnuuk, and a mussel tool used in traditional basket weaving is an ishuvar. Shells have also been used as fishhooks and children's toys. The axthahaiish, or meat of the mussel, was a part of the traditional Karuk diet. As an indication of the importance of the mussels to the Tribe, there are eight surviving Karuk words for mussel (there are 80 for salmon)." (DOI, June 2011a, pp. 3-36).

2.1.1.2 Reservation Period (about 1850-1910)

Although Karuk people were linked by marriage, ceremony and culture with other tribes of the area, they remained largely isolated from EuroAmerican contact prior to the arrival of miners in 1850 with the discovery of Klamath goldfields. (Salter, 2003). Between about 1850 and 1910, the Karuk people were recovering as best they could from war with Euroamericans, disease, and outside pressures to assimilate into mainstream society and join other tribes on what was essentially the Hoopa reservation. By the end of this period, mining became less profitable, miners declined in numbers, and Karuk people returned to their ancestral or

aboriginal territory even if it meant resettling in villages that had been burned and otherwise destroyed. Some of the traditional Karuk villages became Orleans, Somes Bar, and Happy Camp (Karuk Tribe, 2011). Around 1908, an observer noted that between Happy Camp and Orleans:

> …"'social life of the Indian – what he believed and the way he felt about things – was very little affected by white influence...' Ceremonial law was in effect on the Rivers at the appropriate times of the year. No one was permitted to fish in either the Klamath or Salmon Rivers before the First Salmon ceremony, which was called the 'salmon smoke.'" (Most, 2006, pp. 156-157).

The aboriginal Karuk population (1848) was estimated at 2,700. Their numbers rapidly declined with "…military operations, 'social homicide,' and disease (especially syphilis, introduced by the Whites)…" (Bright, et.al., 1978, p. 189). A description of events were echoed by a Tribal member:

> "As miners moved into northern California to stake their claims--and as the U.S. cavalry followed to ensure their safety—Karuk People were murdered, massacred, and enslaved. Whole villages were burned, and the life-giving Klamath River watershed was damaged…by hydraulic mining and mercury contamination. Many of the Kaurk People who survived the immediate impacts of the gold rush moved away in search of alternate means of survival. During the late 1800s and early 1900s, children of the Karuks who remained in the aboriginal territory were forcibly removed from their families and sent to government boarding schools in Oregon, Nevada, southern California, and even more distant places, where they were expected to…[assimilate]. For 140 years, the economy of the mid-Klamath River region continued to be natural resource driven; gold and copper mining soon were followed by the timber industry…" (Hill, 2010).

The Karuk endured invasion from miners and the military first with casualties and then retreating into their aboriginal upland territory which began decades of relative isolation:

> "In 1852, after clashes between Whites and Indians around [the Karuk village of] panamnik, the Whites burned most of the Indian towns as far north as the Salmon River, and the Indians fled to the hills; the White town of Orleans was then founded. When the Indians returned, they found Whites' houses and farms on their village sites. Military operations in that year claimed 15 Karok lives, and 75 more in 1855. But subsequently, 'some of the refugees were given permission to build houses in unoccupied places near the farms, and thus began their unattached existence, which in most cases has continued to the present day' (Curtis 1907-1930, 13:58)…" (Bright, et. al., 1978, p. 188; FERC, Exhibit E, February 2004).

In all, the aboriginal Karuk population dropped from an 1848 estimate of 2,700 (Cook, 1956, p. 98) to 1,050 in 1851; a decline of about two thirds largely from "… military operations, 'social homicide'… and disease…."

2.1.1.2.1 Treaties

It was between 1851 and 1852 that 18 treaties were negotiated with various California tribes, including the Karuk, Hoopa, and Yurok, for the purpose of avoiding further conflicts and that promised over 7 million acres of land which were never ratified:

> "The treaty-making venture of 1851-1852 carried out by McKee, Wozencraft, and Barbour was intended to reduce the Indian-White confrontation on the California frontier, [primarily]..either in the gold-mining regions…or along the main lines of communication. The treaty commissioners were unable to do more than promise the Indians they made treaties with that the government would soon establish a reservation where they would be fed [and] protected….promises that were never honored….Much of this wantonly destroyed humanity and a great deal more of native culture would have survived if the California Indians had been protected on the reserves stipulated in the 18 treaties. But with the failure of the U.S. Senate to ratify the very treaties that they had authorized, the California Indians…were helpless (Heizer and Almquist 1971:23-64, 120-137). In the history of California Indians no other single event (that is 'nonevent') had a more rapid destructive effect on their population and culture than the about-face that the Senate made between authorizing President Fillmore on September 30, 1850, to make treaties and its failure on July 8, 1852, to ratify those treaties." (Heizer, et al., 1978, p. 704).

Although there has been a great deal of confusion about which tribe was party to which treaty pertaining to various geographic areas, of the 18 treaties, the Karuk were parties to California Treaty Q, dated October 6, 1851 (including its supplement dated October 12, 1851) and California Treaty R, dated November 4, 1851 (attachments 2a and 2b). The reservations were intended to hold Indians of the main course of the Klamath, Scott, and Shasta, about fifty villages in all. It should be noted that in its negative land determination of October 8, 2004, the National Indian Gaming Commission conceded that Treaty R was a treaty with the Karuk Tribe. (DOI, June 2011a).

2.1.1.2.2 Executive Orders (E.O.)

Although the 18 treaties were not ratified, issues concerning non-Indian and Indian conflicts and welfare remained, so in 1853 and 1855, Congress authorized

the President to set aside seven 'military reservations' for all California Indians with the intention of providing them houses and a means of livelihood through farming and raising cattle (Heizer, et al., 1978).

One of the seven 'military reservations' was the Klamath River Reservation (not to be confused with the Klamath Reservation in Oregon) created in 1855 (attachment 2c). It was a strip of territory that began at the Pacific Ocean and extended one mile in width on each side of the Klamath River for a distance of about 20 miles. The Klamath River Reservation was created entirely within the aboriginal territory of the Yurok Tribe; nevertheless, it was the intent of the Federal Government to move all regional Indians to it. However, only some Yurok and Tolowa were actually moved (Heizer, et. al., 1978 p. 704; DOI, June 2011a; USFWS, et al., October 1999).

In 1864, the Hoopa Valley Reservation was established for the Hoopa Valley Tribe, the Karuk Tribe, and some others. It was a 12 mile square bisected by 15 miles of the Klamath River. A June 23, 1876, E.O. formally defined the Hoopa Valley Reservation borders (attachments 2d and 2e).

In 1885, a special agent for the DOI proposed that the Klamath River Reservation and Hoopa Valley Reservation be joined, and through an October 16, 1891, E.O., the Hoopa Valley Reservation was "extended." As a result of the 1864 Act, the 1876 E.O. and the 1891 E.O. laws, the Karuk Tribe maintains that it lived as though it had rights to the lands and resources of the Hoopa Valley Reservation until 1988 when the Hoopa-Yurok Settlement Act was enacted (attachments 2d, 2e, and 2f).

The General Allotment Act of 1887 declared all unallotted land to be public land available for homesteading, and only a handful of Karuks were able to file the necessary paperwork, and most of them were denied (Tiller, 2005).

2.1.1.3 Copco Dams Period (About 1911 – 1934)

As natural resources became less available, a subsistence lifestyle gradually became more difficult. National Forests were created throughout essentially all of their aboriginal territory and surrounding areas. The Trinity National Forest (origin of the Six Rivers' Mad River and Lower Trinity districts), was established between 1900 and 1905; the Klamath National Forest was established on May 6, 1905; Siskiyou National Forest was created October 5, 1906; and the Klamath's Gasquet/Smith Fork Ranger District was transferred to Siskiyou in 1911. Diminishment of the spring-run Chinook and subsequently other species began affecting the Karuk people's ability to live off the land. Many Karuk children

had been taken to boarding schools so that the Karuk language began to fade which meant that ceremonial leaders had to begin conducting them in English (Karuk Tribe, 2011, p. 20).

Prior to mining, hydroelectric dams, and other development, salmon and steelhead appeared in the Karuk area in species-distinguishable pulses at predictable times throughout the year. By the time of Snyder's writing in 1931, the spring run had declined from being a major run to the point that he characterized it as being of "relatively little economic importance," and timing of runs appears to have shifted:

> "'The spring migration has now lost its economic importance and seems to have almost entirely disappeared. It was formerly connected at its waning period with the summer run. The fish of the spring run enter the river during its flood height of very cold water, and pass up stream under the same conditions, while the summer migration starts as the winter and spring floods subside, most of its fishes passing upstream during a minimum flow of water… (Snyder, p. 23). (p. 13).'" (Salter, 2003).

Although it is difficult to point precisely to the time when the spring-run Chinook stock was sufficiently low that the First Salmon Ceremony was no longer feasible at the time of year it would have normally been conducted, the conflict was developing.[6] The First Salmon Ceremony was important for social, resource management, cultural, and subsistence reasons:

> "[There was] continuity between the culture of the Yurok and coming up here to the First Salmon Ceremonies and communication between the tribes to assure that the fish would be healthy." (Salter, 2003).

2.1.1.4 Pre-Federal Recognition and Effects of Iron Gate Dam (About 1935 – 1978)

World War II started around 1940 and many Karuk men volunteered to serve and upon returning, some assimilated into the dominant society. There were times when not enough male participants were in the area to carry on ceremonies, but the World Renewal, or Pikiavish Ceremony continued, and at times 'underground,' with a relatively small group. The ceremonies did continue, however, and were documented between 1938 and 1942 by numerous observers described in Kroeber and Gifford (1952, pp 10-54). As the USFS helped industry meet postwar demand for wood, forestry jobs became available to Karuk people.

[6] Norgaard's research showed that virtual disappearance of the spring-run Chinook had occurred by the 1970s.

It was during this time that there developed a group that managed to continue practicing a traditional lifestyle and another part of the Tribal membership that became more assimilated (Most, pp. 161-164).

For the Karuk people maintaining a traditional lifestyle, the 1970s meant an opportunity to revitalize traditions. Most described why many tribes, including the Karuk, experienced a cultural revival:

> "Relocation legislation brought Indians from reservations across the country into cities, including Oakland and Los Angeles…living in poverty and relying on each other…[and] exposed to mass media as never before and inspired by the Civil Rights movement, many Indians rejected pressures to assimilate…such events as the fish-ins in Puget Sound and the occupation of Alcatraz…." [and] In Karuk country, Lew Wilder worked on cultural revival. He rediscovered his elders' techniques for carving elkhorn pipes, making square drums, shaping arrowheads…and many other things. … (Most, p. 162).

Concerning the treaties of the 1850s, despite the views of many that the 18 unratified treaties were not legally binding, California Indians were allowed, under H.R. 491, to sue the Federal Government for compensation promised by the 18 unratified treaties, and the suit was settled in 1944 in their favor. However, much of the compensation went towards attorney fees, was so widely distributed that individual amounts in most cases were of little consequence, and many who should have received compensation could not be located (Stewart, et. al., 1978, pp. 705-709).

2.1.1.4.1 Emerging Tribal Government

During the 1960s, Karuk activists from Orleans formed a non-profit, democratically governed organization and began acquiring land, administering social benefit programs, and preparing documentation all of which helped the Karuk Tribe gain Federal recognition.

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2.1.1.4.2 Subsistence Fisheries, Hydrograph, and Water Quality Changes

It was primarily during this time period (Iron Gate Dam was constructed in 1962) that Karuk people noticed significant changes; the numbers of fish in the River declined, water quality declined, the timing of water releases changed, and the Tribal fisheries were more formally restricted to Ishi Pishi Falls. Salter conducted a survey that included interviews of Karuk Tribal members who lived through this time period who noted changes. Higher levels of siltation from the dams and from logging roads were another change that most respondents noticed.

Similarly, Lewis found that many Tribal members that had been away from the area and returned after Iron Gate Dam was built noticed a decline in water quality:

> "Many people who left the area for a period, upon returning, noticed a dramatic change in the river, noting stagnant, slower flows, strong odors, dirtier water, more moss and algae, and higher temperatures. Those who used to swim in the main-stem river refuse to now because of the decline in water quality." (Lewis, 2009, p. 25).

The altered hydrograph affected traditional village sites (which included impacts to traditional fishing sites as well):

> "All the village sites I just named have had catastrophic effects from floods, but only since the 1960s. Prior to that '55 got it started, but you've had dams altering this river since before the Fifties. None of those things are coincidences so directly the dams have caused a tremendous impact, but indirectly they've causes a greater than tremendous impact." Quotes from Leaf Hillman, Vice Chairman of the Karuk Tribe, age 42 at the time of the interview. (Salter, 2003).

During this period, a Karuk Tribal member reported noticing rapid, daily water fluctuations while swimming as a child and that salmon and steelhead fry would get stranded when levels dropped after being higher (Salter, 2003).

The timing of salmon and steelhead runs changed as they began taking longer to get to the Karuk area of the River, especially when during hot weather. A respondent noted that in the 1960s, runs began as early as July and went through November, but in recent times the runs begin later. About the time Iron Gate Dam was constructed, looking back, Karuk people noticed that eels were abundant and gradually declined until recent times and are now almost completely absent:

> "Eels, they're disappearing too. There was a time when I was a teenager when I would go down there and get 150 of them…and have some for the year. But this year I probably got, maybe 50 or 60 of them all

> year…Its nice to be able to have that [extra], save it for the winter when you need that really good food." Bill Tripp, Traditional Karuk Fisherman (Norgaard, November 2005, p. 13).
>
> "It used to be you could go down and fill a 55-gallon drum with [lamprey] them in half a night. Now you can spend a week down there at the height of the run, if you could figure out when that is…You're lucky if you can detect when the run is anymore, let alone when the peak is. So what's responsible for their demise? It was gradual [decline in lamprey] for many years and then became precipitous for the last 15 years." Quotes from Leaf Hillman, Vice Chairman of the Karuk Tribe, age 42 at the time of the interview. (Salter, 2003).

2.1.1.4.3 Sociocultural Conditions

Socioeconomic and sociocultural information is limited in this time period, mainly since many Karuk people born in the late 1800s refused to discuss Karuk culture with anthropologists and ethnographers (Karuk Tribe, 2011, pp. 20-21). However, there is information about environmental changes Tribal members noticed and have described, including those related to hydrograph and water quality changes.

As amounts of algae increased over time, it began to get caught in dipnets. Water quality declined to the point that Karuk people could no longer drink the water and bathe in the River for ceremonies, mainly due to large amounts of algae. One respondent noted that the 1955 flood was the last time the river was "flushed out" (Salter, 2003).

The amount of water in the river also declined dramatically overall, it became warmer, and fluctuated about every three days. Another respondent stated that around 1945 and 1950 was the last time there were adequate amounts of water in the River. Tribal members reported they recall a change in the Klamath River as ponds and similar backwater areas disappeared and the River in essence became a channel. Tribal members became afraid of processing such basketry materials as willow, grape [vines], and blackberry roots in the spring using their mouths as was traditionally done. Another respondent noted that since River water does not rise to the levels it once did, there are no forces to push out old willows and bring new growth so the quality is not the same (Salter, 2003).

2.1.1.4.4 Traditional Diet

Norgaard found that the loss of Spring Chinook, the most important run of fish for the Karuk people, accounts for the drastic decline in fish consumption for people in their early 30s; they recall seeing and eating a lot of Spring Chinook as children and now essentially no one catches and eats them (Norgaard, November 2005, p. 33).

Other accounts based on research of Karuk and Yurok fishermen described the ample supplies of lamprey around the same time period compared to those of today:

> "Just over 45 years ago, the lampreys were still so thick that crews were sent in to unclog the creeks because they had no flows. Up and down the river, tales are told of a biomass so great that lampreys were poisoned in those creeks, as well as the dams where they were caught up in the turbines… The elders have no recollection of ever going eeling and not catching lampreys. ..The baskets were so heavy with lampreys that they had to position the boat and pull the basket up at an angle." (Lewis, 2009, p. 19).

2.1.1.5 Self Governance and Self Determination (1979 – Present)

Federal Indian policy shifted towards self determination beginning in 1975 with the Indian Self Determination Act, 25 U.S.C.A. 450), and the IRA of 1934 enabled the Karuk Tribe to take steps that allowed it to be Federally recognized in 1979, although it did not regain the vast majority of its aboriginal territory, fishing rights, hunting rights, or gathering rights. The Karuk Constitution was approved on April 17, 1985. Since its inception, the Karuk Tribe has become a complex governmental organization serving about 3,474 geographically dispersed members with an annual operating budget of approximately $15 million in grants and contracts. Tribal government consists of an elected nine member tribal council with a chairperson, vice-chair, secretary, and treasurer (Tiller, 2005). The timber industry began slowing in the 1980s recession and the spotted owl issue came to a peak in 1991 (Most, 2006, p. 181).

In 1984, the California Wilderness Act of 1984 designated most of a Karuk sacred area (away from the River) as wilderness, and there were other conflicts with the Forest Service about fire management and logging in old growth forests (Most, 2006, pp. 168-172).

Cultural revitalization initiated in the 1970s has continued over the past three decades and persists today, led predominantly by one Tribal member:

> "In the mid-1980s, Leaf Hillman was learning all that he could from Wilder. 'I want to learn so I can pass it on to my kids,' he told James Culp for the documentary *People of the Klamath*. Hillman also studied the Karuk language, benefiting from an Indian language program at Humboldt State University. In turn, he taught Karuk to children in the school at Orleans,' [recently] his sons Ike at fifteen and Leaf Jr. at sixteen served as priests for pikiawish ceremonies just as Hillman himself had done…" (Most, pp. 162-163).

In the same spirit, in 1979 as a newly recognized Tribal government and in cooperation with the California Department of Fish and Game, the Tribe "…began salmon fisheries enhancement projects on the Klamath River, including stream clearing and restoration, water temperature monitoring, and fish rearing [and] protection of the salmon fisheries remains one of the Tribe's highest priorities." (Hill, 2010). Another sign of cultural revitalization was the opening of a cultural interpretive center in 2002, the Karuk People's Center museum and gift shop that also has a basket weaving classroom, a library, a collections area and Karuk Language Program Office.(Karuk Tribe, April 2011). The cultural revitalization that began in the 1970s has continued, and has been important to the generation of children raised by parents who had attended boarding schools and had not been allowed to continue speaking Karuk or retain anything related to a traditional lifestyle.[7] (Karuk Tribe, 2011).

Despite Federal recognition and cultural revitalization, the Karuk continued to see fisheries declines, and in some of the species considered most resilient. Pacific Lamprey are described by Karuk eelers as an incredibly resilient species; however, various Karuk fishermen noticed reduced runs and quantities of lamprey, in part because flow fluctuations strand ammocoetes:

> "You have a run coming in February and these are runs that you have now, not runs that we used to have. There used to be a lot more lamprey runs…Now we have two identifiable runs. [Flow fluctuations] strand and dry up completely areas where lamprey spawn. The freefall collapse of the lamprey has been precipitous and obvious and coincides with Iron Gate Dam and the regulation of flows….Tribal community members remarked that the number of young lampreys they see when they go swimming now versus when they were children has declined dramatically. More than 30 years ago, they could easily pull up hundreds of different-sized ammocoetes from the sand…Most people recognize that lampreys throughout the Klamath River basin are not as big as they used to be." (Lewis, 2009, pp. 10, 17).

Lewis (2009) found that all Karuk and Yurok fishermen he interviewed noticed that Pacific lamprey populations began to decline rapidly in the 1960s:

> "One…[tribal member] recalled that the last time he had seen a full smokehouse was more than 45 years ago. Nowadays, most smokehouses are smaller and hold only about 100 lampreys, but even that size is difficult to fill in a whole season….Participants remember that in the 1980s, an eeler was lucky to catch 50 - 100 lampreys, which was considered a lot. By the 1990s, they were lucky to harvest any." (Lewis, 2009, p. 20).

[7] Indian children were often forcibly removed, punished (often severely) for speaking their languages, required to wear uniforms, and otherwise forced to assimilate.

2.1.2 Present Conditions

Politically, Federal recognition and organization of a formal Karuk Tribal Government have been steps forward for the Karuk Tribe from an economic, social, and cultural standpoint. Despite gains, the Tribe remains at a disadvantage primarily from losing ancestral territories and most of its fishing locations, the absence of Federal trust-protected fishing rights, ever-declining anadromous fish populations and runs, and worsening water quality that has contributed to declines in nearly all aquatic species used for subsistence and cultural purposes, including direct contact with River water. The remoteness of the Tribe's location is another socioeconomic challenge that compounds the Tribe's high unemployment and poverty rates, and low median incomes. Although the Karuk Tribe has experienced a cultural revival and was able to reinvigorate most ceremonies, the Tribe has not been able to reinitiate the First Salmon Ceremony at the correct time of year because there is no spring-run Chinook salmon. Furthermore, declining fisheries have contributed to high diabetes, heart disease, obesity, mortality, and disability rates.

Karuk Tribal lands and services are spread out in a remote area with very limited basic services, including telecommunications and electricity. As an example of an injustice of the KHP, a sizeable portion of the Karuk Tribal members' households do not have electric utility service and instead rely on generators. However, since it is assumed that either leaving hydroelectric dams or removing them (No Action or Action Alternative) would not affect the current lack of adequate electric service, the issue was not analyzed in this report.

Happy Camp is where the Tribal headquarters, Karuk Community Development Corporation, Community Computer Center, and Karuk People's Center are located. The Karuk Department of Natural Resources is located in Orleans. Elder, head start, health clinics, housing authorities, and social services programs are located in Orleans, Happy Camp, and Yreka (Hill, 2010). The Tribe has a Karuk language program, which is another expression of the desire of the Karuk people to retain Karuk culture to the extent possible. In fact, the importance of salmon, eels, and fishing can be seen by the number of Karuk words for these activities:

> "There are at least 152 words associated with salmon, another 162 words connected to fishing, ten more related to eels…We have a unique language and a unique grammar and a unique vocabulary to describe perfectly all the things that are here…a lot of Karuk people…feel just as badly [as reduced salmon stocks] over not having it…" Quote from Susan Gehr, Karuk Language Program Director. (Norgaard, November 2005, p. 70).

2.1.2.1 Subsistence Fishery

> "This year 2006 the tribal fishery produced less than 500 fish, last year Tribal fishermen caught less than 200…and the year before that less than 100 fish were harvested." (Karuk Tribe, December 1, 2006).

The Karuk Tribe does not operate any recreation or tourist fisheries, primarily because of poor water quality, low fish populations, small amounts of land, and a lack of capital and/or funding to initiate a business. The Tribe operates fisheries, watershed, and water quality programs. The hydroelectric dams reduce fish populations directly by blocking migration. The four dams cause poor water quality (including temperatures and hydrograph) that also contribute to low fish populations, and to human health water quality warnings (especially upstream at Iron Gate Reservoir), as well as being aesthetically unappealing (often described as 'pea soup').

The Tribal fishery is limited to one location, Ishi Pishi Falls, and fishing duration has been reduced to an average of about three to four weeks in the fall for the entire year. It should be noted that Klamath Basin conditions contributing to low fish populations and Tribal social, cultural, and economic conditions and goals are acknowledged and summarized in the KBRA (attachment 3a).

Significant impacts from the hydroelectric dams have included an over-growth of toxic algae that has contributed to higher fish disease rates and lower catch rates. The hydroelectric reservoirs contribute to an altered hydrograph that relatively rapidly raises and drops water levels that strand fry and ammocoetes, and reduce aquatic habitat along the River. The reservoirs have increased temperatures that stress fish and lamprey which makes them more prone to disease and encourages fish to run at inappropriate or otherwise inopportune times resulting in an increased likelihood of fish kills (Tucker, September 2010; Karuk Tribe, December 1, 2006; DOI, June 2011a, 2011b; DOI, September 2011; Hamilton, et al., June 13, 2011; Close, et. al., January 14, 2011; Goodman, et. al., June 13, 2011 and July 20, 2011; Dunne, et. al., April 25, 2011).

2.1.2.1.1 Socioeconomic Conditions

2.1.2.1.1.1 Fishing Methods, Locations, and Species

The dip net or plunge net is still used today in the only authorized fishing location reserved for aboriginal Karuk fishing at Ishi Pishi Falls. The net is plunged into Klamath River pools from a shelf of boulders just below the falls where salmon rest prior to making their way up the falls (Salter, 2003, p. 19). There is some danger of losing the knowledge of making the dipnets since a lot of traditional knowledge is required and less fish equates to fewer fishermen over the years:

> "There's only a few people skilled in making them…A net got lost in the river…Who's going to make the net?" Quote from Carrie Davis, Karuk Tribal member. [Another Tribal member described the problem] "In order to secure the food source, there's all other information that has to go into the materials or products or manufacturing techniques that go along with that. That's an important element with the traditional knowledge. If you're going to learn to make the dip net, you better know the right types of poles. So you have to have a certain understanding of the forest structure and forest density to give you nice Douglas fir poles. You gotta know something about the hazel that's going to be your loop. Traditionally, it'd been iris finger or doe bane for your net. You'd have to know where to get that. So just in order to be a fisherman, you have to have a sense of geography of place with where all these other materials or resources are that you can acquire to be able to do that one job at that point in time." Quote from Frank Lake, Karuk Descendant. (Norgaard, November 2005, p. 73).

Family rights continue, to some extent, to determine who has access to the Tribal fishery at Ishi Pishi Falls and few can make the steep assent to the fishing site and haul fish that can be as heavy as 20 pounds per fish. During the limited fishing season, each designated family fisherman takes an average of five to six salmon and since there is only one fishing station with a very limited season, fishermen must essentially wait in line for their turn, and a large portion of the catches are given to elders. However, there are not enough fish to distribute and trade, so the Karuk people have to ask for fish from other area tribes for their ceremonies (Tucker, September 2010). As a traditional Karuk fisherman described the change from the past to the present:

> "Traditionally,' Reed said, 'we've had over 70 miles of river, and every back eddy, every creek, every tributary was a fishery. And now we're obligated to fish out of one fishery for over 3,000 tribal members. Last year we caught approximately 850 fish, so you see that the mathematics just doesn't add up. There's a lot of people that are doing without." (Most, 2006, p. 186).

The Karuk Tribe relied, and to the extent possible, still relies primarily on the following species and would like all of them to be available in sufficient numbers for subsistence fishing in the future: Spring- and fall-run Chinook salmon, coho salmon, steelhead trout, bull trout, sturgeon, and Pacific lamprey eel. Salmon and steelhead were the most important species for sustaining the Karuk people from season to season. The Karuk also fished for candlefish and collected, and still collect to the extent possible, several species of mussels or freshwater clams and crayfish for consumption and for other cultural uses (Norgaard, November 2005, p. 14; DOI, June 2011a).

2.1.2.1.1.2 Quality of Subsistence Fisheries: Water Quality, Hydrograph, and Channel Habitat

The Karuk Tribe directed comments, in the form of an analysis of water quality impacts from the dams, to the FERC concerning coverage of their issues the Tribe considered to be inadequate in the FERC draft environmental impact statement for hydropower relicensing (FERC Project No. 2082-027). In the Karuk Tribal comments, the Tribe described cause and effects for water quality impacts to fisheries and human health (attachment 4a). Effects to fisheries from the dams included the reservoirs' effects of increasing toxic blue green algae (cyanobacteria) that created microcystis aeruginosa toxins that continue to be a substantial threat to fish health that have social, economic, and health impacts described in various sections of the remainder of this document. The effects of the dams described by the Tribe and Tribal members in survey interviews and comments to FERC are supported by the expert panel reports and all related Klamath EIS/EIR sections and other supporting background technical documents, most of which are listed in the bibliography.

Tribal members have described current conditions as they relate to historic conditions for water quality, fluctuations, and how the changes have affected River habitat--all changes that have adversely impacted fish populations:

> "Now you have stagnant water sitting there warming up with added nitrates and the algae is blooming and it is evaporating too…[Iron Gate Dam]…ramping…[caused] fishermen drowning. In two hours time you would have a raise in the river of 13 feet. And then boom, back down….Iron Gate Dam was built to regulate those wild fluctuations in flows and they…[didn't] mimic the natural system any longer. [Iron Gate]…doesn't regulate…[flows] to mimic nature. It doesn't regulate it to mimic our spring freshets; that role is lost. The [dam] regulation doesn't serve the purpose served by our big flushing flows of the wintertime; it minimizes those and…it's shallowed and broadened the river…it has served to regulate and change the river morphology to where the river is shallower and wider…[about traditional village of Katamin] when did all of a sudden about half of Katamin disappear and go down the river? The '55 flood took a chunk, '64 took a huge chunk and even little high waters now threaten to take more. All the floods in the past 4,000 years didn't have that effect on it…The effect has only come about since those dams have been in operation changing the river morphology, changing the characteristics of the river. [effects on] Red Cap Creek, Katamin, Amikiarum…All [these] village sites…have had catastrophic effects from floods, but only since the Sixties. Prior to that '55 got it started, but you've had dams altering this river since before the Fifties. None of those things are coincidences so directly the dams have caused a tremendous impact, but indirectly they've caused a greater than tremendous impact…" Quotes from Hillman, Leaf, Vice Chairman, Karuk Tribe, age 42 at the time of the interview. (Salter, 2003).

Effects of hydroelectric operations, 'ramping' cause what some Karuk people refer to as 'invisible fish kills.' Karuk Tribal Fisheries crews have found large ammocoete kills when rescuing stranded fish from pools, as they described:

> "'Current ramping practices are causing potentially irreparable damage to future lamprey [and other fish] populations by ramping water too fast from Iron Gate Dam. When the water level is dropped unnaturally fast, the ammocoetes that occupy the fine sediments along the river margins end up stranded in dry sand bars,' (Karuk Tribe, 2004)." (Lewis, 2009, p. 25).

A Karuk fisherman provided a similar explanation of adverse ramping effects on lamprey:

> "'…and when they put that Iron Gate in…boom…they'd be pumping out maybe twenty, twenty-two [hundred] cfs up, down. Overnight they'd shut it down to a thousand. And it'd leave all these, where their beds are, where they spawn, leave them high and dry. And then they couldn't get back to the river fast enough before they died. And then the [lamprey eight-year [life] cycles, it takes a long time before [the lamprey populations] can rebuild.' (Karuk eeler)." (Lewis, 2009, p. 25).

Tribal member reports in Norgaard's research showed the same conclusions about insufficient quantities for subsistence with most Tribal members reporting that they caught none of the species listed during the 2004-2005 season:

> "Despite the fact that up to 50% of tribal members report that they fish for Fall Chinook, 40% fish for eel and Spring Chinook and over 20% for Coho and Sturgeon…most of those fishing in each household are not actually catching very many fish. In the 2004-2005 season fishing for eels (Pacific Lamprey and other Lamprey species), Spring and Fall Chinook Salmon, Coho and Sturgeon all reached record lows." (Norgaard, November 2005, p. 7).

Similarly, Lewis' research found that beginning in the 1990s there were essentially no lamprey compared to conditions prior to around the 1960s, as a Tribal elders described:

> "Some years are good, while other years there are hardly any lamprey. Now anywhere from enough to eat to 30 lampreys is considered a good catch, and it can take all day or night….A good night is if you even catch a lamprey; for many, it is not even worth it anymore to spend the night. Eeling has become a form of recreation rather than a means of subsistence…" (Lewis, 2009, pp. 20-21).

Much like the declines in other subsistence fishery species, Ron Reed described a decline in the mussel population:

> "These mussels here, my mom tells me that they used to have little patches, all the families would have their own patches of these mussels. They used to harvest them and manage them just like they managed everything else -- only take a certain size and leave a certain amount to reproduce. They had these patches and through the years they just kind of disappeared." Ron Reed, Traditional Karuk Fisherman. (Norgaard, November 2005, p. 289).

2.1.2.1.2. Sociocultural Conditions

Sociocultural impacts of the KHP include direct effects of dams blocking passage as well as water quality impacts that have served to reduce or eliminate species critical for ceremonies. The Karuk Tribe, in comments on the FERC DEIS, described some species-specific, water quality-related cultural impacts (attachment 4a):

> "Water quality plays a very significant role in Karuk Tribal culture as culturally relevant aquatic species are profoundly affected by the KHP water quality impacts. For example, the giant salamander (puuf puuf) is an important figure in Karuk legend (King, 2004). The crayfish is an integral ingredient in one of Pikiavish (World Renewal) Ceremony." (Karuk Tribe, December 1, 2006, p. 4).

As discussed in the history section, there are several critical annual ceremonies surrounding salmon that are still practiced today. The First Salmon Ceremony marks the arrival of the spring-run Chinook which cannot be practiced traditionally since the spring-run Chinook Salmon has disappeared. The timing of the First Salmon Ceremony has had to be modified (Tucker, June 16, 2011). The First Salmon Ceremony includes the Jump Dance which is also affected. Declining fish stocks, particularly the Spring Chinook run, has impacted the Tribes' ability to pass fishing on as a religious and cultural value to future generations:

> "Years ago, Karuk fishermen at Ishi Pishi netted spring salmon on their way to the Upper Basin to spawn. They were the dominant run up the Klamath, and Karuks celebrated their First Salmon ceremony when they first appeared. Now these fish spawn primarily in the Salmon River and its tributaries.…Karuks no longer catch them, not even for ceremonial purposes." (Most, p. 186).

The Karuk are most well known for their annual "Fix-the-World" or Pikiavish Ceremony, commonly referred to as the World Renewal Ceremonies. Historically, and up to the present, the Karuk share ceremonies with the downriver Yurok and Hoopa Tribes that began early in the year with the spring salmon ceremonies. The timing of the Pikiavish ceremony now is determined by the fall-run salmon and at the time approaching the acorn season (Salter, 2003, p. 23).

The absence of and significant variations in fish run timing affects ceremonies. The dance cycle is determined each year by a ceremonial leader who also appoints the Fatawanun for that year--the appointment is a source of honor and a great labor, as the Fatawanun is required to undergo a lengthy ordeal including fasting, praying, and walking the Medicine Trails. Other ceremonies, including the Brush Dance and Kick Dance, have the Klamath River and fish as critical elements, often requiring one or more Tribal members to bathe in the River. For example, the Karuk World Renewal ceremony is completed when the medicine man reached the Klamath River at the end of his long journey and drinks water from the river. Currently, this does not occur very often because toxic algae blooms have led to health warnings along the river that have stated children and pets are at greatest risk. However, children are still known to jump in the river and drink the water at the end of the ceremony with the adults. Bathing in the river is an important part of most Klamath Basin Tribes' ceremonies. For example, bathing in the Klamath River and its tributaries is a requirement for participants in the Brush Dance Ceremony. Bathing is also associated with funeral services, subsistence practices, recreational swimming, courtship, and individual hygiene. Health concerns and health effects from contact with the water are discussed further in the health section of this document.

Ceremonies remain vitally important to current generations as a way of coping with the disconnect between their traditional past and the present, as described by a Tribal member:

> "As I grew up I went to the ceremonies that existed and I was trained as a world renewal priest at Katamin when I was 14 and served until I was 19 at that place. And that was such an influencing factor in m life, just changed my perspective on the entire world, the way I approached life. Prior to that, I was just like…friends and relations here in town: very angry young men with no prospects for the future." Quote from Leaf Hillman, Karuk Ceremonial Leader and Tribal Vice Chairman. (Norgaard, November 2005).

Ceremonies and ceremonial leaders are adversely affected by the unfulfilled need to have ample supplies of salmon, which are a critical, central component of the ceremonies (Tucker, September 2010). A Tribal member described traditional sociocultural roles salmon has played and how those have been affected in the present as a result of lower salmon populations:

> "Cultural practices such as feeding any visitor to one's home and the associated insult (that requires payment to fix) that results from the visitor's refusal to partake of food are still prevalent today among many Karuk families….and also permeate traditional and contemporary Karuk gatherings of all types. It is a high order obligation and responsibility of every Karuk ceremonial leader/dance owner to provide food for

> everyone in attendance, at every meal or whenever they arrive in camp, throughout the duration of the ceremony. These cultural norms are also illustrated by the contemporary practice of the Karuk Tribal Council to feed anyone who is in attendance at every Council meeting. These practices reflect the continuing important role that food plays in Karuk culture and identity. Unfortunately, denied and/or limited access to nearly all traditional Karuk foods means that other non-traditional foods are substituted. Therefore, these cultural practices…contribute to many of the health problems experienced within our population and are detrimental to the overall well being of Karuk people." Quote from Leaf Hillman, 2004. (Norgaard, November 2005, p. 74).

Low or non-existent fisheries limit the transfer of cultural, traditional knowledge from generation to generation:

> "Providing for your elders is a demonstration of respect and a primary responsibility for a Yurok or Karuk person; yet the older people say that they hardly receive lampreys anymore because no one has any to bring them. One elder only received six lampreys last year while another had not had any in the past 15 years [a Karuk elder]." (Lewis, 2009, pp. 20-21).

In terms of cultural retention, there are numerous examples. The Karuk Voices project presents oral histories filmed by youth of elders about their lives on the River (Karuk Tribe, Spring/Summer 2010, p. 10). Annual Basket weaver gatherings in spring and fall are another manifestation of traditional cultural practices.

2.1.2.1.3 Social Conditions

Low fish stocks are taking a toll on the Karuk traditional lifestyle which has social and cultural impacts, and they have occurred primarily within the lifetime of most Karuk adults:

> "I think people come down to the Falls because they know there's something to come down to, and this year was awful quiet at the Falls because they…knew there wasn't anything to come down to, because they're [the salmon] never here." Quote from Ron Reed, Traditional Karuk Fisherman. (Norgaard, November 2005, p. 78).

Another Tribal member explained that poor subsistence fishing conditions have led to less participation of families that has had social effects:

> "There's a lot less people now on the river. Before you had a whole family. You had your brothers and sisters. You had your kids. You had your grandparents and the fishermen who catch….who pack it back and clean them, pack them up the hill, and take it back to the family, and the

> wife would can them…You'd smoke them and can them…It's so few people now being able to have a job and be able to live on the river. It's really getting hard to process fish. It's a lot of work." Quote from Scott Quinn, Karuk Tribal Member. (Norgaard, November 2005, p. 77).

> "Traditional food is at the very heart of culture continuity…[and its absence] leads to further social disruption. When elders die young they are not available to pass information…on to the youngest generations. Denied access to traditional foods must be understood in the broader context of cultural genocide." (Norgaard, November 2005, p. 68).

The Tribes have experienced a diminished ability to practice a traditional lifestyle, particularly fishing for subsistence as a result of the hydroelectric dams and other development, resulting in a loss of cultural identity (but not of cultural values), social trauma, and 'cultural genocide' (a term used by Norgaard and others). The Karuk Tribe believes that the solution is restoration of the river, fisheries, and water quality that would strengthen their traditions and social fabric and social conditions.

The significance of the loss of Tribal identity associated with resources no longer available and resulting social conditions from the loss were described further in the DOI background report that also cited Norgaard:

> "When a people's identity and cultural practices are closely associated with a species that no longer thrives, a sense of connection and belonging is lost [Norgaard, Chapter 5, 2005]. Young people feel this loss of belonging especially intensely...When tribal celebrations require that the tribe and visitors feast on salmon and no salmon is to be found… it is disheartening to have to make a trip into town to purchase imported fish from a grocery chain store. The results can be depression, alienation, and withdrawal…creating a malaise that lingers among the people subject to these conditions." (DOI, June 2011a, pp. 1-7).

Grief resulting from the loss of most of their aboriginal territory and fishing rights, along with associated cultural disruption has often led to symptoms of social trauma that has left a legacy over generations that most Indians and Tribes across the nation continue to struggle with today. This syndrome has been described by social workers Brave Heart and DeBruyn as an 'Indian holocaust' and has resulted in symptoms of social dysfunction:

> "[most] American Indians and Alaska Natives are plagued by high rates of suicide, homicide, accidental deaths, domestic violence…and alcoholism as well as other social problems…We suggest that these social ills are primarily the product of a legacy of chronic trauma and unresolved grief across generations, (Brave Heart and DeBruyn 1998, p. 60)." (Norgaard, 2005, p. 65).

As Norgaard described, there has been a loss of social and cultural relationships between generations as a result of the loss of salmon, which has caused feelings of sadness and depression. A Karuk Tribal member described feelings of loss caused by the absence of salmon:

> "I think it's remarkably sad that in my teenage years I ate a tremendous amount of salmon or deer meat, and now its hardly ever eaten….there is just a TERRIBLE shortage in salmon now that when my little Indian daughters eat it they think it's a treat. Every time I hear of someone getting salmon I try to get some….either from other fishers, fishers from gatherings, [Karuk Tribal Department of Natural Resources] DNR, or Yuroks. This way I can freeze it and have it for my family or family gatherings…In the past 2 years I was only able to get 1 salmon…When I was growing up…men would pull up and unload tons of salmon…and after all the Indian families received enough for their families or ceremonies the remaining was given to families in need…Now, Indians have to go to Indians to see if they may have salmon for their ceremonies or traditions. I don't know what has happened in the last ten to fifteen years for there to be this drastic change, but it saddens me to have my children not enjoy the same simple happy memories of eating salmon with all the old Indians and hearing stories of catching them, dipping them, and packing them out." Quote from an anonymous respondent in a May 2005 survey. (Norgaard, November 2005, p. 84).

A Karuk Tribal survey found evidence of social and cultural trauma:

> "The emotional despair and social devastation of our communities is apparent in survey evidence that alcohol and substance abuse, family violence, and child neglect threaten the health and safety of Tribal communities in our region." (Hill, 2010).

Direct and indirect mortality rates caused by social and cultural disruption (and more recently also the lack of healthy foods) compound cultural challenges by taking elders (the Tribes' 'intellectual capital'), away too soon as they are the primary means through which social and cultural lifestyles and values are transmitted to following generations. A Tribal member expressed the disruption that comes from losing elders too soon:

> "We are a people who are not allowed to have fish anymore because there's not enough fish to have. It has been three generations for my people not to be living mainly on fish. And to have the different type of environment now for the children, for the elderly people. It has a profound affect on the quality of life. By tradition our elders teach our babies the ways of life while the parents are out making a living. Now we don't have that opportunity because of the mismanagement of the resources. Our people aren't living to a ripe old age and when they do

> they aren't living the high quality of life. So we need fish in our diet. That is very evident." Quote from Ron Reed, Tribal member and traditional fisherman. (Norgaard, November 2005, p. 79).

In terms of holding on to cultural traditions, the Karuk people have had to risk violations and imprisonment to fish and continue forms of a traditional lifestyle in their aboriginal territory (Stercho, October 2005). In addition, the Tribe has a Karuk language program and some area schools now offer Karuk language classes (Tucker, September 2010).

Concerning the ancient and contemporary regional barter system, salmon has remained an important socioeconomic factor for Tribal members. Often Karuk Tribal members have to try to obtain salmon from the Yurok or Hoopa Valley Tribes for ceremonies which can be difficult if there is little else of such a high value to trade. In addition, providing nearby Quartz Valley Tribal members with salmon has been an important role the Karuk Tribe has struggled to continue to play since the Quartz Valley Indian Community is comprised largely of Karuk people.

2.1.2.1.4 Subsistence Fisheries and Traditional Diet

Declines in all subsistence fisheries species (not only salmon and steelhead), including lamprey, mussels, crayfish, and others have had a negative effect on Karuk health. Water quality has had an indirect effect of limiting consumption of traditional foods as many Karuk people are afraid of consuming freshwater mussels, crayfish, and other aquatic species because of bioaccumulation concerns.

Norgaard found that in 2003, fish consumption was estimated at less than 5 pounds per person per year, down drastically from historic levels estimated at 1.5 pounds per person per day. In 2004, fish consumption dropped again to 0.5 pound per person per year:

> "By 2003 the Karuk diet contained only 1.1% the amount of salmon consumed in "pre-contact" times. In 2004 this dropped tenfold again to 0.1% of the salmon consumed traditionally." (Norgaard, November 2005, p. 15).

Another Tribal member described the inadequate supplies for modern-day subsistence fishing conditions for the number of Karuk Tribal members:

> "There are 3,000 members in our tribe. Last year we caught 1,000 fish. There's not enough to go around. We eat fish, so…we are obligated to get fish to our people, especially our elders, as many as they want. But they don't always get [as many as]…they want." Quote from Harold 'Littleman' Trip, Traditional Karuk Fisherman. (Norgaard, November 2005, p. 58).

The importance of other traditional foods, mussels as one example, should not be overlooked:

> "The anthropological literature of the early 20th century describes how mussels were gathered late in the season when the river flows were low. The time of year that they would be contributing to ceremonies is the exact time of year when they are highest in microcystin [toxic algae mainly from the reservoirs]…there are also people who are still using freshwater mussels as a food source, but again there is less and less of this food source. There has not been as much attention paid to mussels as there has been to the spring salmon." (Karuk Tribe, 2011, p. 23).

2.1.2.2 Economic Conditions

The absence of salmon in the Karuk socioeconomic structure and demographic scheme was described by a Tribal member:

> "I know that there's a lot of families…their…main food is salmon. We have a lot of families come down from Fort Jones area, Etna, there's a lot of tribal members that live out there, came down to the Falls, last year, hoping to get salmon. And it was so sad because there just wasn't any. And well, we got one salmon that my son brought home. So I told him, whatever you get now we'll have to freeze for our Tribal Reunion. So we had eleven salmon and…we had a lot of people this year, a lot of people. So, a lot of them got salmon and a lot of them didn't. But there was just nothing I could do about it. We did the best that we could." Quote from Blanche Moore, Karuk Tribal member. (Norgaard, November 2005).

With so few salmon and severe water quality problems, there are limited opportunities for Tribal recreation/tourism and bartering—all factors that have contributed to high unemployment and poverty rates, and low incomes. The Tribe plans to develop a replica of a Karuk fishing village, with planned commercial and recreational uses about 70 miles southwest of Yreka (Tiller, 2005, p. 429). Stercho (and Norgaard) found that local fishing-related recreation employment opportunities have declined for Tribal members as a result of declining fish stocks and fish kills (Stercho, October 2005, pp 89-93). Similarly, the recreation section 3.20 in the Klamath EIS/EIR (DOI, September 2011), p. 3.20-25 discussed how angling in the lower Klamath River has declined due to lower fish populations which has prompted stricter limits and adversely affected guide, resort, and sport fishery businesses, and health warnings related to toxic algae in the River has been found to have reduced recreation visitation (DOI, September 2011).

Although the Karuk Tribe has worked towards greater autonomy, devastating historical events have kept the Tribe in extreme poverty, essentially landless, and with extremely limited access to traditional fisheries. About 42 percent of the

3,474 enrolled Tribal members live on or near the roughly 600 acres of trust land recognized by the BIA as the Karuk Tribal service area (Hill, 2000). Despite challenging socioeconomic conditions, the Karuk Tribe employs about 170 people and is the second largest employer in Siskiyou County after the U.S. Forest Service. (Tucker, September 2010 meeting). "The Karuk Tribe's mission is to establish a stable economy that will enhance its ability to exercise its rights as a self-governing nation." (Tiller, 2005).

Following the gold rush, the economy of the mid-Klamath River region continued to be dominated by mining, and soon also by the timber industry that peaked in the mid-1900s, declined in the 1970s and 1980s and essentially ceased in the early 1990s. Since the closure of Happy Camp's last remaining sawmill in 1994, the Karuk Tribe continued trying to retrain displaced timber workers and has conducted a survey about socioeconomic conditions:

> "…The Karuk Tribe has worked tirelessly to retrain displaced timber workers…Findings from a recent community survey indicate there is a pervasive belief that our children have to leave this area to find employment because there is no future here. Respondents also identified financial, geographic [remote area], and class scheduling as the principal barriers to further education." (Hillman, May 4, 2000).

Once the Karuk Tribe lost most of its aboriginal territory, many members relied on employment in the timber industry, particularly since the Tribe was not federally recognized at the time, and there was no support for health care, economic development, and other social services. Under the Clinton Administrations' Pacific Northwest Economic Adjustment Initiative, Happy Camp and neighboring communities in the mid-Klamath River regions were found to be 80 percent timber-dependent. In terms of economic development, the Karuk Community Development Corporation directs such projects as a building-materials business, hardware employment through U.S. Forest Service contracts, and some other various development projects.

The Karuk Tribe is a self governance Tribe.[8] As a result of Federal funding mainly under the initiative, the Karuk Tribe received grants to establish the Karuk Community Development Corporation which, along with other funding, launched what was essentially a Karuk Tribal civil works effort that improved basic community infrastructure and provided some employment opportunities. One of the work programs included a Department of Natural Resources multi-year road decommissioning project to reduce soil erosion and stream sedimentation caused by degradation of logging roads no longer in use. Another activity included a salmon rearing project. The Happy Camp Community Computer Center was

[8] Pursuant to the mandates of self-governance legislation, the Karuk Tribe is currently developing its housing stock, medical facilities, economic base and protection of its natural resources (Karuk Tribe, accessed April 2011).

established for residents to acquire basic computer skills to improve educational achievement and employability. The Karuk Community Development Corporation improved on other workforce and small business programs focused on mitigating impacts of the loss of the timber industry. However, there was a 5-year timeframe on most of the Federal funding for programs operated by the Karuk Community Development Corporation, and as result, "unemployment and poverty rates remain extremely high; and symptoms of the community's growing despair include depression, anxiety, alcohol/substance abuse, family violence, and child neglect." (Hill, 2010).

In terms of other economic activity, the Tribe hires members for home-improvement and housing construction. The Tribe opened a furniture production company (using native designs), with assistance of a grant awarded in 1996 and another one in 1998 to continue the business. The rustic furniture is constructed from timber harvested from tribal forests in a sustainable manner. In the services and retail sector, Tribal members run a building materials business. Social services administered by the Tribe for Tribal members include, among others, a childcare program, two headstart programs, youth education services, higher education and adult vocational training programs, and housing programs (Tiller, 2005).

Over the past decade, the Karuk Tribe has been limited in what it can do to improve socioeconomic conditions since its relatively minimal income is obligated for meeting non-Federal matching requirements for grants and to support governance activities. Over the past decade the Tribe has worked futilely towards resolving legal and political obstacles to building a casino on its lands in the only viable area, the town of Yreka.

2.1.2.2.1 Unemployment, Income, and Poverty Rates

The Karuk Tribal Government employs about 170 people and is the second largest employer after the U.S. Forest Service. Hill found that about 47 percent of Karuk area Indians were employed and between 77 and 89 percent were in poverty based on U.S. Health and Human Services poverty guidelines (Hill, 2010).

A 2001 BIA Labor Force Report showed 3,165 enrolled Karuk Tribal members. The Karuk Reservation area (BIA service area) had 14 percent unemployed with 29 percent employed, but below poverty guidelines in 2001. The 2005 BIA Labor Force Report showed 3,427 enrolled Karuk Tribal members and an unemployment rate of 63 percent; about 75 percent of employed Karuk Reservation area Indian people were below the poverty level.

A Karuk Tribal Demographic Summary (2004) found that about 80 to 85 percent of Karuk households were below the poverty line, and the percentages were from 88 to 92 for Tribal members throughout Siskiyou County.[9] Median household incomes were low at $13,000 compared with Siskiyou County's $28,178.

Norgaard's demographic analysis of Census 2000 data showed percentages of Indian population by community with corresponding poverty rates and per capita incomes, shown in table 2.1-1 (table adapted from Norgaard, November 2005, p. 62, table 9).

Table 2.1-1.—Indian population, poverty, and income by community

Community	% Indian	% in poverty	Per capita income (1999 dollars)
Happy Camp	24	22.9	9,683
Orleans	29	20	11,113
Somes Bar	25.9	32.9	6,215
Hoopa	81.7	36	9,221
Yreka	6.0	21.2	6,405
Siskiyou County	3.9	18.6	8,305
Humboldt County	5.7	19.5	11,532
California	1.0	14.2	15,226

Source: Norgaard, 2005, p. 62, table 9.

Census 2000 data for the Karuk Reservation showed a high (relative to other Census area percentages) unemployment rate of 12.6 percent, a low median household income and per capita income, especially for the Indian population, with over half the population in poverty, shown in tables 2.1-1 and 2.1-2. Some of the Census geographic areas are depicted in attachment 5a. All families with a female householder, no husband present with children were below the poverty level on the Reservation, which was also that case for Indian families in the Yreka area, and Indian families throughout Siskiyou County also had high levels at 80 percent (table 2.1-2).[10]

On the Karuk Reservation, unemployment was about three times higher for the Indian population than for the total population in Siskiyou and Humboldt Counties, and the State of California. More than half the population was in poverty in 2000, and the 2009 estimate has increased to about 60 percent. The

[9] The poverty line for the Karuk Tribal Demographic Summary was $18,850 for a family of four in 2004.

[10] "One race alone" Census category; not "combination of one or more races" category. An explanation of what is included in the poverty thresholds and the dollar amounts according to family size for the 2000 Census is included in attachment 5c.

Table 2.1-2.—Census 2000 unemployment, income, and poverty

Geographic areas	Census unemploy-ment (%)	BIA unemploy-ment (%)	Median household income (1999 dollars)	Per capita income (1999 dollars)	Poverty status (%)	Poverty – families, female householder, no husband, children under 5 (%)	Poverty – families, female householder, no husband, children under 18 (%)
Karuk Reservation & Off-Res. Trust Lands	12.6	—	18,000	8,744	51.4	100	97.3
Indian	8.9	63	18,125	4,938	53.9	100	96.7
Siskiyou County	5.2	—	29,530	17,570	18.6	66.2	47.7
Indian	11.6		20,641	8,305	31.7	84.1	76.9
Happy Camp CCD	8.5	—	22,679	14,731	23.7	58.1	62.3
Indian	7.0	—	19,667	8,976	26.6	61.5	55.6
Etna CCD	4.8	—	31,971	20,696	13.6	43.8	37.8
Indian	11.4	—	35,833	9,025	25.1	—	77.8
Yreka CCD	4.3	—	30,994	18,674	19.7	69.0	52.7
Indian	11.6	—	18,068	6,865	49	100	100
Yreka City	4.4		27,398	16,664	21.1	77.2	57.5
Indian	14.9	—	14,875	4,967	52.2	100	100
Humboldt County	5.26	—	31,226	17,203	19.5	61.0	44.6
Indian	12.0	—	25,281	11,532	31.0	64.0	54.5
Trinity-Klamath CCD	9.4	—	24,297	12,979	27.8	59.4	59.1
Indian	14.8	—	21,360	9,407	36.9	64.8	60.1
California	4.3	—	47,493	22,711	14.2	44.0	32.5
Indian	6.8	—	36,547	15,226	21.9	52.6	42.9

Sources: Census Bureau DP-3 Profile of Selected Economic Characteristics and 2005 BIA Labor Force Report.
Notes: American Indian and Alaska Native Census data is "Indian alone" as opposed to Indians alone or in combination with other races since that is the only option for Census sample data. BIA figure is for 2005, and for further information, including definitions, see attachment 5d.

Census 2009 estimates for Reservation unemployment indicated rates that may have increased to about three to five times higher than surrounding area general population rates (attachment 5b). Taken together with results of the Karuk Tribal Demographic Summary, poverty rates for Tribal members in the area range from about 51 to 80 percent. The 2010 economic data sampling appears to have increased this propensity for missing data for areas with low population, which is one of the reasons numbers were not updated to 2010. Another reason 2010

Table 2.1-3.—Census 2000 percentages of workforce by occupation

Geographic areas	Management	Services	Sales and office…	Farming, fishing, and forestry	Construction, extraction…	Production, transportation…
Karuk Reservation and off reservation	12.4	33.7	14.6	13.5	16.9	9.0
Indian	11.6	65.1	4.7	7.0	11.6	0.0
Siskiyou County	30.8	19.5	24.3	4.6	9.1	11.7
Indian	24.2	26.7	19.1	11.8	9.9	8.3
Happy Camp CCD	28.0	24.3	24.6	3.6	11.2	8.2
Indian	25.0	19.4	23.1	2.8	22.2	7.4
Etna CCD	35.8	13.1	22.6	7.7	9.5	11.3
Indian	25.0	23.5	29.4	14.7	2.9	4.4
Yreka CCD	31.3	20.8	26.6	2.7	7.4	11.2
Indian	29.5	41.8	8.2	15.6	2.5	2.5
Yreka City	32.1	22.4	28.9	1.4	5.5	9.7
Indian	32.6	53.7	8.4	3.2	2.1	0.0
Humboldt County	31.5	19.6	24.9	2.6	8.8	12.6
Indian	26.1	22.6	21.8	6.4	9.0	14.1
Trinity-Klamath CCD	35.0	20.1	19.6	4.3	12.1	8.9
Indian	32.8	19.3	22.3	7.0	11.2	7.5
California	36.0	14.8	26.8	1.3	8.4	12.7
Indian	25.0	19.8	25.9	1.9	11.6	15.9

Notes: Full category titles: Management, professional, and related occupations; service occupations; sales and office occupations; farming, fishing, and forestry occupations; construction, extraction, and maintenance occupations; production, transportation, and material moving occupations. For more information, including definitions, see attachment 5c.

data were not used is that evaluations of the data are not necessarily directly comparable between censuses for the sample economic data since some methodologies during the decade have changed and Indian-only data was not available for the 2005 to 2009 timeframe.

A recent Karuk survey asked about barriers to employment, and about 86 percent believed it was because there are no employment opportunities in the area, and 66 percent believed that a lack of childcare was the biggest barrier to employment. Extremely high poverty rates translate into poor conditions related to social dysfunction and particularly for children, according to conclusions drawn from the Tribal survey and Children Now, California County Data Book (2003) (Hill, 2010).

The Karuk Tribal survey found that there had been an out-migration of displaced timber workers and other youth that has been partially offset by an in-migration of low income families attracted by inexpensive housing options.

Concerning high poverty and unemployment rates, the subsistence fishing-income connection was analyzed by Norgaard and Stercho and found to have a high value:

> "Cost replacement analysis conducted in the Spring of 2005 puts the cost of purchasing salmon at over $4,000 per tribal member per year (Stercho, 2005, p. 160). In the communities within the ancestral territory this amount would represent over half the average per capita annual income." (Norgaard, 2005, p. 59).

2.1.2.2.2 Employment by Occupation

On Karuk Reservation lands, most occupations were in services at about 34 percent, but that number was nearly double for the Indian population, in part due to Tribal government employment that included many administrative services. Tribal employment also accounts for a portion of the high service Sector percentages in the Yreka and surrounding areas. Construction, extraction, and maintenance was the next highest category at 16.9 percent for the general Reservation population, and 11.6 percent for the Indian population. Occupations in farming, fishing, and forestry was high for the Reservation at 13.5 percent when compared with other areas, except when the Indian-only population is considered; it was 11.8 percent in Siskiyou County, 14.7 percent in the Etna area, and 15.6 percent in the Yreka area. A sharp contrast exists between the Karuk Reservation's roughly 12 percent in the higher salary management category and the rest of the areas' 30 to 35 percent (25 to 30 percent for the Indian population); the largest Indian-general population disparity was in the Etna area.

2.1.2.2.3 Demographics

Around 1770, it was estimated that there were about 1,500 Karuk people and was estimated at about 2,700 in 1848, which declined to between about 500 and 800 Karuk by 1910 as a result of EuroAmerican conflicts, diseases, and related factors. (Kroeber, 1976 (1925), pp. 101, 883).

The 1990 Karuk Reservation population was 400, with only 12 identified as American Indian (table 2.1-4). Part of the reason the number of Indians was low may be that many were missed in the earlier census count since there was a concerted effort to improve Indian counts beginning with the 2000 census. Another likely reason is that roughly 125 acres were added between 1990 and 2000, and with it any residents. In 2000, the Census counted 333 people living on

the small scattered Karuk Reservation parcels. The 2010 Census counted 506 Karuk Reservation residents, and for the past 20 years the Indian population has comprised about 75 percent of the Reservation population.[11]

Although the amount of Karuk land has grown, it is still relatively limited which means that a significant proportion of the Karuk population also lives around and near the Karuk Reservation lands in the geographic areas shown in the tables in this section. For this reason, BIA Labor Force Report figures are important when considering estimates of local Karuk population. There were 3,427 enrolled Karuk Tribal members in 2005 with about 1,222 Indians eligible to receive local BIA services, according to the 2005 BIA Labor Force Report.[12] Karuk Tribal Government 2004 estimates showed about 42 percent of Karuk Tribal members resided in and around the Karuk Reservation which is assumed to have remained about the same, particularly in light of year 2010 census data shown in table 2.1-4.

2.1.2.2.3.1 Race and Ethnicity

In the year 2000 and 2010 Censuses, the Karuk Reservation Indian population, presumably mostly Karuk Tribal members and their families, comprised about 75 percent of the Reservation, shown in table 2.1-5. Most notable is the fact that all areas surrounding the small, scattered Karuk Reservation parcels are predominantly White at about 90 percent. The next largest proportion of Indian population was in the Trinity-Klamath CCD at about 55 percent; however, most of it is comprised of Hoopa Tribal members. Happy Camp CCD, a central Tribal location, had the next largest American Indian population at about 23 percent. Isolated pockets of Karuk populations, especially in Yreka where assimilation pressure is higher, (and also when Karuk members must interact with others, such as when their children attend schools with non-Indian children and similar circumstances), are socially, culturally, and racially stressful.

The loss of fish runs has been another stressor as it presents difficulties in meeting basic needs and for cultural identity:

> Difficulty in meeting basic needs can result in overwhelming physical and psychological stress. Traditionally, fishing is done by Karuk men. With the loss of the salmon comes a loss of a man's sense of pride in being able to provide food for his family and tribe. For a tribe that has called itself The People of the Fish, there is an indisputable loss of identity when there are no fish. For a people whose belief system tells them they have a specific role on earth, that they have a predefined relationship with nature that needs to be honored, there is an emptiness

[11] Based on the "American Indian Alone or in Combination with Other Races" category.

[12] The 2003 service area figure was 5,250, indicating that there may be some question concerning reporting accuracy for the "total eligible for services" figure.

Table 2.1-4.—1990, 2000, and 2010 Census population

Geographic areas	1990	2000	1990 - 2000 change (%)	2010	2000 - 2010 change (%)
Karuk Reservation & Off-Res. Trust Lands	400	333	-20.1	506	34.2
Indian	12	226	94.7	319	29.2
Percent	3.0	67.9	–	63.0	–
American Indian Alone or in Combination with Other Races	na	248	na	387	35.9
Percent	na	74.5	–	76.5	–
Siskiyou County	43,531	44,301	1.7	44,900	1.3
Indian	1,797	1,726	-4.1	1,814	4.9
Percent	4.1	3.9	–	4.0	–
Happy Camp CCD	2,876	2,182	-31.8	2,142	-1.9
Indian	488	384	-27.1	395	2.8
Percent	17.0	17.6	–	18.4	–
Happy Camp CDP	na	na	na	1,190	Na
Indian	na	na	na	277	Na
Percent	na	na	–	23.3	–
Etna CCD	3,496	3,380	-3.4	3,412	0.9
Indian	249	221	-12.7	224	1.3
Percent	7.1	6.5	–	6.6	–
Yreka CCD	10,766	11,142	3.4	11,523	3.3
Indian	439	562	21.9	611	8.0
Percent	4.1	5.0		5.3	
Yreka City	6,948	7,290	4.7	7,765	6.1
Indian	330	440	25.0	491	10.4
Percent	4.7	6.0	–	6.3	
Humboldt County	119,118	126,518	5.8	134,623	6.0
Indian	6,568	7,241	9.3	7,726	6.3
Percent	5.5	5.7	–	5.7	
Trinity-Klamath CCD	4,885	5,437	10.2	na	na
Indian	2,314	2,835	18.4	na	na
Percent	47.4	52.1	–	na	
California	29,760,021	33,871,648	12.1	37,253,956	9.1
Indian	242,164	333,346	27.4	362,801	8.1
Percent	0.8	1.0	–	1.0	

Table 2.1-5.—Census 2000 and 2010 race and ethnicity percentages

Geographic Areas		Non-Hispanic					Hispanic
	Total population	White (%)	African American (%)	American Indian (%)	Asian and Pacific Isl. (%)	Other races (%)	Hispanic or Latino (%)
Karuk Reservation & Off-Res. trust							
2010	506	29.8	4.0	76.5	2.2	3.2	12.5
2000	333	27.3	0.3	74.5	0.6	4.2	7.2
Siskiyou County							
2010	44,900	89.6	2.0	7.6	2.5	4.1	10.3
2000	44,301	90.5	1.6	6.2	1.9	3.7	7.6
Happy Camp CCD							
2010	na	na	na	na	na	na	Na
2000	2,182	80.6	0.6	24.1	1.1	1.0	4.2
Happy Camp CDP[13]							
2010	1,190	74.0	0.6	28.2	1.7	1.7	8.0
Etna CCD							
2010	na	na	na	na	na	na	na
2000	3,380	91.2	0.2	9.2	1.5	2.1	4.4
Yreka CCD							
2010	na	na	na	na	na	na	na
2000	11,142	91.2	1.0	7.3	2.1	2.1	4.9
Yreka City							
2010	7,765	89.1	1.6	10.5	2.7	2.7	9.7
2000	7,290	89.6	0.9	8.2	2.6	2.4	5.4
Trinity-Klamath CCD							
2010	na	na	na	na	na	na	na
2000	5,437	45.5	0.7	55.3	1.5	1.7	4.7
Humboldt County							
2010	134,623	86.6	2.0	8.9	3.9	4.5	9.8
2000	126,518	88.8	1.4	8.3	2.7	3.5	6.5
California							
2010	37,253,956	61.6	7.2	1.9	15.7	18.9	37.6
2000	33,871,648	63.4	7.4	1.9	13.0	19.4	32.4

Source: Census tables QT-P5 and QT-P10. Each race category includes that race alone or in combination with other races, and for more information and definitions, see attachment 5c.

[13] Data became available for Happy Camp CDP, census designated place starting with the 2010 Census.

> when they are unable to fulfill that role. For a tribe whose interactions with other tribes were based on barter and trade of fish, and for families, in which children and elders provided food to each other and outsiders, emptiness and disconnection arise. Living in a changed world where wildlife is becoming scarce and the rivers polluted, it is sometimes hard for young people to understand the ways of their parents and grandparents. They wonder why the Tribe focuses on ceremonies that revolve around periodic fish runs and ritual eating of salmon when the availability of fish is so erratic. Never having seen it themselves, they don't understand that in the past there could be eight yearly runs of salmon in the Klamath when all they see is one-half of a fall run. Without tradition as an anchor, young people are sometimes drawn to gangs to establish a feeling of belonging, and they are drawn to the cities where they find an abundance of diversion and riches.(DOI, June 2011a, pp. 3-50).

One particularly distressing example that also highlights stress and depression caused by diminishing opportunities for Tribal members to live a traditional Karuk lifestyle and the identity it potentially affords, was described by a Tribal member in one example:

> "The one that's not so easy to quantify is why does a 13 year old boy shoot himself in the head. For what? Why? Well if I had to live in the…Yreka ghetto, well I guess, that seemed like the best option. That guy never knew the river and the ceremonies. So, really how does that relate? It relates because that boy knew he [was] Karuk and he hears about these things and he knows about these things, but he doesn't understand them. He knows that he's Indian because he lives in the Tribal housing project and he's surrounded by Indians. But whenever he steps out of that project and goes down town, it's all he knows, but never-the-less he doesn't fit there, doesn't belong there, and he may not know or understand why, but he knows that he doesn't belong there. And he knows that people don't want him there. He knows there must be something wrong with him, because he knows he's Karuk, he may be proud of that, but on the other hand, he knows there is something wrong with that. That's the most difficult thing to quantify, in terms of effect." Quote from Leaf Hillman, Karuk Ceremonial Leader and Tribal Vice Chairman. (Norgaard, November 2005, p. 81).

2.1.2.2.3.2 Median Age

As shown in table 2.1-6, the Reservation median age in the 2000 Census was around 21 years of age, which was the same as or younger than the surrounding areas' Indian populations and about half that of the general population. The difference is likely due to a moderately high birth rate since it appears that in- and out-migration are about the same. The number of young and middle-aged adults

Table 2.1-6.—Census 2000 median age

Geographic areas	Total population median age			Indian population median age		
	Total	Male	Female	Total	Male	Female
Karuk Reservation and Off-Res. Trust Lands	21.6	21.1	22.4	20.0	19.1	22.1
Siskiyou County	43.0	42.2	43.8	30.3	29.3	31.1
Happy Camp CCD	44.8	45.1	44.4	33.5	34.8	30.8
Etna CCD	44.8	44.5	45.0	29.5	29.0	29.8
Yreka CCD	42.1	40.6	43.4	23.0	21.9	24.6
Yreka City	40.6	38.4	42.4	21.6	20.8	22.5
Humboldt County	36.3	35.0	37.6	26.5	25.0	28.0
Trinity-Klamath CCD	35.5	35.8	35.3	24.7	22.9	26.1
California	33.3	32.2	34.4	29.3	28.5	30.1

who may leave for education and job opportunities are expected to be mostly or partially offset by Tribal members about the same age entering or re-entering the area for affordable housing, health care, and other Tribal services as research by the Tribe seems to indicate. However, low median ages can also signify high mortality rates, and Norgaard's research indicated that Karuk mortality and disability rates were high due to high rates of diabetes and heart disease. Census 2010 data shows generally that the entire area's median age has increased during the past decade--an overall trend seen in the entire region, counties, and to a lesser extent, the State.

2.1.2.2.4 Barter System

Karuk people have bartered salmon and other goods for centuries with regional tribes, and over time, salmon has increased in value as supplies continue to decline:

> "Some [Karuk] people in the community catch the fish and others trade for them…[and]…a tribe [and tribal individuals] that has fish, particularly the desirable salmon, to trade is well positioned to acquire a wide range of goods from outside their own territory." (DOI, June 2011a, pp. 3-39).

Norgaard described how the barter system and subsistence fishing elevated the Karuk people economically:

> "Although salmon was not bought and sold as part of a cash economy, the presence of this food meant that people didn't need to spend money buying other foods at the grocery store or be forced to rely on government commodities, as is now the case." (Norgaard, November 2005, p. 60).

2.1.2.2.5 Redistribution

Redistribution of wealth, in this case, of fish to Tribal members and families, particularly dependent portions of the population remains an important socioeconomic activity that is an expression of cultural values; however, low fish populations and access problems limit the ability of Tribal members to continue this practice. As several Tribal members reflected and commented:

> "I had an uncle that fished all the time…And he'd give 'em away. He always caught more than we could ever eat." Quote from Harold 'Littleman' Tripp, Traditional Karuk Fisherman. (Norgaard, November 2005, p. 76). "I send eels up to folks up the Salmon River. And to different people who want eels, like most of the time I end up givin' to people but I always try to end up getting enough to can too." Quote from Bill Tripp, Traditional Karuk Fisherman. (Norgaard, November 2005, p. 76).

2.1.2.2.6 Land Base and Uses

The Karuk traditional boundary was the middle Klamath River watershed. In 1851, the Tribe signed treaties that were never ratified. Around 1864, the Federal Government attempted to move Karuk people to the Hoopa Valley Reservation, but most Karuk people soon returned to their nearby aboriginal area. Around 1887, the General Allottment Act made all unallotted lands public for homesteading and most Karuk people could not file necessary paperwork and those that did mostly were denied. Essentially all of their land was declared public at that time, forcing the Karuk people away from the River. Around 1900, much of their aboriginal territory was converted to National Forest. Two years after Federal recognition in 1979, a small group of elders purchased a 6.6-acre parcel and placed it into trust. Currently, the Yreka area has the best infrastructure for development and the Tribe has attempted, unsuccessfully to date, to place land in trust there in order to potentially build a casino or a business that would help with high unemployment and poverty rates (Tiller, 2005; Tucker, 2010).

The Tribe's service area includes all of Siskiyou County and eastern Humboldt County. Today, three primary Karuk Tribal communities lie along 120 miles of

the Klamath River from Orleans in the south, through Happy Camp, and on to Yreka. An estimated 42 percent of the roughly 3,474 enrolled Tribal members live on or around the 851 acres of widely dispersed Reservation lands. The relatively small Karuk land base has been a limiting factor for economic growth and development.

The primary land use in the region is national forest administered by the USFS, and in 1994 the Tribe entered into a partnership, (and received funding) for the protection and restoration of forest lands within the Tribe's ancestral lands. The Tribe developed a comprehensive watershed restoration training and improvement program and Tribal restoration division. Although agricultural lands are minimal in the tribal territory, it raises about 40 acres of alfalfa and some individual Tribal members raise livestock. The Karuk Tribal Design Works produced furniture from timber harvested sustainably from Tribal forests. Some individual allottees own RV parks and mobile home parks (Tiller, 2005).

2.1.2.3 Health

Health effects include impacts of the dams on water quality, which in turn causes potential direct and indirect human health effects, and has caused a drop in consumption of traditional aquatic foods that has contributed to higher diabetes, heart disease, obesity, and mortality rates. The Karuk Tribal Health Program, governed by the Tribe's health board, operates three clinics under a compact with Indian Health Services.[14]

The Karuk Tribe has experienced an increase in obesity, diabetes and heart disease rates that coincided with the declining availability of traditional foods, particularly salmon, and that has contributed to a higher mortality rate, as documented in a November 2005 report by Norgaard in *Effects of Altered Diet on the Health of the Karuk People.* The Tribe is also presently concerned with trying to curb childhood obesity by stressing the benefits of a traditional lifestyle and diet. The Tribe recently submitted a grant proposal to conduct four seasonal eco-cultural camps with an emphasis on reducing childhood obesity (Karuk Tribe, Spring/Summer, p. 7).

The extreme poverty and remoteness of Karuk lands are conditions that have created the need for Tribal members to rely heavily on USDA commodity goods. These diseases raise health care-related costs of the Karuk Tribal government; for example, 40 percent of the Happy Camp population included disabled persons—twice that of Siskiyou County, California, and the nation.

[14] (An example of implementation of the Self Determination Act); One of the medical clinics is located in Orleans, a medical and dental clinic is located in Happy Camp, and a medical and dental clinic is located in Yreka (Tiller, 2005).

Health concerns and impacts have resulted from poor Klamath River water quality, and include basketry-material gathering and use or processing of materials that occur in or near the Klamath River that may include: pine roots, willow, Bear Grass, blue willow, and Woodwardia, and other ferns. Some of the materials require processing by mouth which raises health concerns (Salter, 2003, p. 23). A critical part of Karuk Tribal ceremonies require bathing in the Klamath River which poses important health concerns as some have had rashes after being in contact with the water. There have been health advisory warnings upstream at Iron Gate Dam and Copco Reservoirs concerning contact with the water and consuming aquatic life from the River (attachment 4b), discussed at the end of this 2.1.2.3 Health section.

2.1.2.3.1 Traditional Diet and Health

Norgaard and the Northwest Portland Area Indian Health Board documented and described a tremendous shift in the Indian diet for the Karuk Tribe and in the Portland area from one of traditional foods (hunting, fishing, and gathering) to an increased reliance on purchased food and Federal food program commodities which have been notorious for providing limited choices of foods with a large amount of bad fats and long shelf-lives (i.e., white flour, cheese, canned high fat meats, etc.) (Northwest Portland Area Indian Health Board, accessed August 2010).

The decline in the availability of Karuk traditional foods, primarily salmon, other fish, eels, other traditional foods, and extreme poverty shifted the Karuk diet beginning as early as the 1940s and 1950s, and accelerated in the 1970s with construction of IGD, contributing to higher obesity, diabetes, and heart disease rates. Norgaard also found that as traditional food consumption has declined, the time and energy spent finding, securing, processing, and physically transporting traditional foods has resulted in a more sedentary lifestyle that contributes to diabetes, heart disease, and obesity (Norgaard, November 2005).

2.1.2.3.2 Trust Responsibility and Health Care

In terms of trust responsibility, the Federal Government is required to provide health services to Federally recognized Tribes by the trust doctrine (Cherokee Nation v. Georgia, 30 U.S.1, 1831) and the Indian Health Care Improvement Act, (P.L. 94-437), as reauthorized March 2010, to ensure health care parity and a standard of living for Indians comparable to non-Indian society (attachments 6a and 6b).

2.1.2.3.3 Mortality Rates

Mortality rates have increased from the diseases which permeates Karuk social structure and culture:

> "Last year, we was going to have the Brush Dance here in Happy Camp for the first time in a lot of years. And there was just too many deaths you know in our Tribe. So we just couldn't do it. I know I've had several of my relatives…passed away here. They wasn't very old. And it was diabetes. And so, that's what really scares me. Diabetes. And then another family just told me here not too long ago that he has high blood pressure. Now that's another one here too that's pretty bad. And he's only like in his thirties. He's thirty-seven." Blanche Moore, Karuk Tribal member. (Norgaard, November 2005, p. 84).

American Indians are twice as likely as Caucasian adults to have diabetes. If current trends continue, one in three Americans will develop diabetes in their lifetime and will lose, on average, 10 to 15 years of life. Diabetes was the sixth leading cause of death nationally in 2006 and overall, the risk of death among people with diabetes is about twice that of non-diabetics (CDC, accessed September 2010).

In terms of prevention and treatment, recent studies show that lifestyle changes can prevent or delay the onset of type II diabetes among people at high risk. For example, prediabetics can reduce the rate of onset type II diabetes by 58 percent by losing 5-7 percent of their weight and exercising at least about 2 hours per week (CDC, accessed September 2010).

Several Tribal members described their perceptions of the high mortality rate:

> "I've been to way too many funerals the last couple of years…seems to me that they're just getting younger and younger." Quote from Ron Reed, Traditional Karuk Fisherman. Another member stated: "I think people are dying younger too. I think it's the food. Because my husband's father was 91 when he died. Diabetes is what killed him and that's …when we were doing research on the family a lot of the death certificates are from the diabetes. Most of them, almost all of them." Quote from Selma George, wife of Karuk Tribal member. (Norgaard, November 2005, pp. 42-43).

2.1.2.3.4 Heart Disease

Heart disease is the leading cause of death and morbidity for American Indians, as well as the general population. Several medical conditions and lifestyle choices put people at a higher risk for heart disease, including: high cholesterol (high 'bad' fats and low 'good' fats, like omega 3 fatty acids found in salmon), high blood pressure, diabetes, overweight/obesity, poor diet, and three other factors. Five of the eight factors either are diet-related or are closely tied to diet. According to an analysis of Karuk Tribal medical records, heart disease rates are about 40 percent (about three times the national average) for the Karuk Tribe (Norgaard, 2005, p. 40).

The American Heart Association (AHA) recommends eating fish at least twice a week (every day for those with heart disease), particularly fatty fish like salmon which are high in two kinds of omega-3 fatty acids: eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which have demonstrated benefits for reducing heart disease. Omega 3 fatty acids have been found to help with other such diseases as diabetes (Norgaard, 2005) (American Heart Association, accessed September 2010). Spring Chinook salmon were particularly important:

> "Of the many fish species…the Spring Chinook salmon have historically been the most important…Spring Chinook had the highest volume of fish, a reliable run, higher fat content, was in the best physical condition, tasted better, and came in the Spring, a critical time for food…The particular importance of Spring Chinook salmon for tribes in the region is noted by early anthropologists (e.g., Gunther 1926; Rostland 1959)." (Norgaard, November 2005, p. 32).

2.1.2.3.5 Diabetes

Diabetes is a major contributor to morbidity and is the fourth leading cause of death among all American Indians. According to an analysis of Karuk Tribal medical records, diabetes rates are about 21 percent (nearly four times the national average) for the Karuk Tribe, and 70 percent of Tribal members over age 60 reported having diabetes (Norgaard, 2005, pp. 39-40).

In terms of prevention and treatment, recent studies show that lifestyle changes can prevent or delay the onset of type II diabetes among people at high risk. For example, prediabetics can reduce the rate of onset type II diabetes by 58 percent by losing 5-7 percent of their weight and exercising at least about 2 hours per week, (CDC, accessed September 2010). The Karuk Tribal focus on diabetes awareness, management, and prevention occurs in part through 'diabetic luncheons,' and articles in the Tribal newspaper (Karuk Tribe, Winter, 2010).

From a socioeconomic standpoint, Norgaard found that diabetes is costly in several respects:

> "Diabetes is a costly disease not only in terms of medical care costs but also in terms of human costs. Of patients with Type II diabetes, 20 percent develop kidney disease, 45 percent develop cardiovascular related diseases and 50 percent suffer from hypertension. And the rates for these conditions are even higher for American Indian people (Joe and Young, 1993, p. 3)." (Norgaard, 2005, p. 39).

The Norgaard report also noted that nerve damage resulting from high blood glucose levels often leads to amputations and/or infections, and that the CDC

reported additional such complications as blindness, disability, decreased quality of life and premature death that affect Indians disproportionately (Norgaard, 2005, pp. 39, 47).

2.1.2.3.6 Obesity

Obesity is strongly related to altered diet and is frequently a cause of the increase in the incidence of diabetes (Norgaard, November 2005, p. 44). Nutrition is an important factor in obesity, and being overweight is a leading contributor to heart disease and the most prevalent form of diabetes, type II. Relatively small weight losses are associated with large decreases in risks associated with developing and managing heart disease and diabetes (American Heart Association, September 2010).

A study of California childhood obesity found that some racial groups had declining rates of obesity, but for American Indian girls, obesity rates increased while rates for their male counterparts saw no change to a modest decline. Because of the serious health consequences and increasing rates of obesity, childhood weight data will be collected by IHS for 2010 reports on Indian Country health. Traditional foods require physical activity and are low calorie and more specifically, a daily portion of fish is recommended by the American Heart Association for people with heart disease, and at least two to three times per week as a preventative measure.

Obesity is the leading contributor to the onset of type II diabetes, and rates for children have been increasing. In "Disparities in Peaks, Plateaus, and Declines in Prevalence of High BMI Among Adolescents," it was found that there was a decline in obesity prevalence for California's Caucasian and Asian youth since 2005, but a continuation of increases for American Indian girls and remained about the same for American Indian boys (only the top percentile group had a decline). Data was analyzed from 2001 to 2008 (Madsen, K.A., et. al., August 16, 2010). The trends may indicate greater disparities over time, particularly for the severely obese.

2.1.2.3.7 Diet and Nutrition

The Subsistence Fishery part of the Present Conditions section of this document discussed the estimated quantities of salmon historically consumed (about 1.5 pounds per person per day) by Tribal members and the almost non-existent amounts of today. This section discusses details of the nutritional value of fish, especially salmon, the link with diseases, and the USDA Commodity Food Program.

2.1.2.3.7.1 Omega-3 Fatty Acids and Fish

A daily portion of fish is recommended by the American Heart Association (AHA) for people with heart disease, and at least two to three times per week as a preventative measure, primarily for the omega 3 fatty acids which are highest in wild salmon, (AHA Web site accessed November 2010). Norgaard researched and described some of the omega 3 benefits:

> "Omega-3 fatty acids have been linked with a number of significant health benefits including reduced risk of heart attacks, strokes and Alzheimer, prevention of osteoporosis, a diabetic treatment, improved mental health and improved brain development in infants…A number of studies indicate beneficial effects of omega-3 fatty acids on various forms of depression…(Bruinsma, 2000; Hibbeln, 1998)." (Norgaard, 2005, pp. 50-51).

2.1.2.3.7.2 Shift from Traditional to Western Diet and Disease

Norgaard's report included an analysis of Karuk Tribal survey results in which members stated that overweight, diabetes, and heart disease were relatively new and coincided with the shift from a traditional to a Western diet. For example, 66 percent of Karuk members surveyed reported that diabetes appeared in their families for the first time around the 1970s, which is when salmon runs declined significantly in the middle Klamath River reach. More specifically, Norgaard found that the correlation was strongest with the disappearance of Spring Chinook salmon:

> "Spring Chinook was the most important source of salmon in the Karuk diet in terms of both volume and nutritional quality…self-reported information about when consumption of Spring Chinook salmon stopped or became an insignificant food sources and when diabetes first appeared in Karuk families shows almost a perfect match, with the rise in diabetes following the loss of Spring Chinook in the diet." (Norgaard, 2005, pp. 39-53).

Norgaard listed numerous studies in which a Western diet was introduced to American Indian Tribes and other native groups and within a month or so, they began to experience diabetes, and in some cases, heart disease as well (Norgaard, 2005, pp. 51-53), and a primary example has been the USDA commodity food program.

2.1.2.3.7.3 USDA Commodity Food Program

The commodity food program distributes food to Indian reservations, and has been comprised mainly of high sugar/simple carbohydrates, low fiber, highly processed foods that are often high in 'bad' fats. Commodity food programs appear to be linked to obesity among Indians:

> "Significant concern has been expressed about commodity foods distributed to Indian people as a cause of obesity (USDA Food and Nutrition Service 1991) since the use of this program is high among Indian populations. Other studies have discussed the poor availability of high fiber, low fat foods in commodity food programs and called for change in these programs (Burhansstipanov and Dresser, 1994)." (Norgaard, 2005, p. 46).

2.1.2.3.8 Social Conditions: Food Insecurity, Poverty, Stress, and Health Implications

In addition to the high degree of trauma and stress from losing much of their culture, land, fish, barter economy, in addition to experiencing high disease and mortality rates, and many important associated factors, Karuk Tribal members have the added stress of meeting basic needs. Previous sections of this document discussed high poverty rates that indicate many families are food insecure and/or have difficulty in meeting other basic needs. Norgaard's research and observations for the Karuk Tribe revealed social and psychological stress when she stated that: "Difficulty in meeting basic needs results in overwhelming physical and psychological stress," which can directly and indirectly compound existing health conditions (Norgaard, 2005, p. 57).

2.1.2.3.9 Health Care Costs

This section discusses higher health care costs nationwide resulting from heart disease, diabetes, and obesity.

2.1.2.3.9.1 Heart Disease Costs

In 2010, heart disease will cost the United States $316.4 billion, and includes the cost of health care services, medications, and lost productivity. Since 1998, the CDC has funded state health departments' efforts to reduce the number of people with heart disease and stroke. Health departments in 41 states and the District of Columbia currently receive funding. The program stresses policy and education to promote heart-healthy and stroke-free living and working conditions (CDC, accessed September 2010).

Large amounts of Federal funding are allocated for direct services to Tribes for diabetes and heart disease, and for research and education programs specific to American Indians designed to reduce the high rates of heart disease and diabetes. Direct costs of the top diseases and causes of death have been monetized for the general population and are included in this section. In terms of indirect costs, there are numerous Federal programs that are researching these problems and educational programs that stress the benefits of eating foods that happen to be part of a traditional diet such as that of the Karuk Tribe. For example, the CDC's

Native Diabetes Wellness Program (NDWP) has recognized the need and importance of trying to influence diet choices to curb the diabetes epidemic by using culturally sensitive information and education of Indian children.

2.1.2.3.9.2 Diabetes Costs

The prevalence of diabetes has continued to grow with the total reaching 17.5 million by 2007. Medical costs for people diagnosed with diabetes are about 2.3 times higher than the rest of the population. Total costs (direct and indirect) of diabetes was estimated to be $174 billion, with direct medical costs at about $116 billion and indirect costs (disability, work loss, premature death) at $58 billion nationwide (2007 dollars). Hospital inpatient care was the largest percentage of costs at about half, medication and supplies were about 12 percent, prescriptions 11 percent, and physician office visits about 9 percent. In terms of direct medical costs, annual excess expenditures for the diabetic population was found to be $3,808 for people under 45 years old, $5,094 for people ages 45-64, and $9,713 for people over age 65. The report noted that "the actual national burden of diabetes is likely to exceed the $174 billion estimate because it omits the social cost of intangibles such as pain and suffering, care provided by nonpaid caregivers, excess medical costs for health care expenditure categories such as health care system administrative costs, over-the-counter medications, clinician training programs, and research and infrastructure development." (ADA and CDC, accessed October 2010).

2.1.2.3.9.3 Obesity Costs

Recent national estimates of the cost of obesity totaled about $147 billion (2008 dollars) (Finkelstein, E.A., et al., 2009). Researchers investigated the average annual increase in medical spending associated with obesity, and found it to be 37.4 percent, or about $732 more per patient (2002 dollars) (Finkelstein, Fiebelkorn, and Wang, 2003). Research results were similar in a 2002 study that found obese adults annually incur about $395, or 36 percent higher medical expenditures than normal-weight adults under age 65 (Sturm, March/April 2002).

2.1.2.3.10 Water Quality Concerns

There have been health warnings about water quality problems in Iron Gate and Copco reservoirs which concern and affect Tribal members for fishing, ceremonies, swimming, gathering basketry materials, and other uses of the Klamath River by tribal members. Often after contact with the water, members have described rash symptoms (attachment 4a) (Tucker, 2010).

Water quality concerns affect or potentially affect Karuk health in several ways:

- Direct contact with the River water for ceremonies, fishing, swimming, or similar activities.

- Concerns about consumption of potentially contaminated fish species.

- Avoidance or reduced reliance on traditional foods as a result of concerns about contaminated fisheries. Impacts of not having access to (or in this case, avoiding) sufficient amounts of fish, lamprey, and shellfish were discussed in the first part of this Health section.

2.1.2.3.10.1 Direct Klamath River Water Contact/Consumption

Ceremonies and ceremonial leaders are adversely affected by the need to commune directly with the Klamath River water, a problem described by the Karuk Tribe in comments on the FERC DEIS in the FERC record:

> "Water quality also affects the ability of Fatawana, or World Renewal Priests, to conduct ceremonies. Pikiavish starts with the Spring Salmon Ceremony [which used to be in early spring] and continues throughout late summer into early fall. Key ceremonial participants bath multiple times a day in the Klamath River for ten days straight. This is the time that the KHP has its most egregious impacts on water quality and KHP induced algae blooms are at their zenith." (Karuk Tribe, December 1, 2006, p. 4).

The Karuk World Renewal ceremony is completed when the medicine man reaches the Klamath River at the end of his long journey and drinks water from the river. Currently, this does not occur very often because toxic algae blooms have led to health warnings along the river that have stated children and pets are at greatest risk (attachment 4b). However, children are still known to jump in the river and drink the water at the end of the ceremony with the adults. Bathing in the Klamath River and its tributaries is a requirement for participants in the Brush Dance Ceremony and may be associated with funeral services, subsistence practices, recreational swimming, courtship, and individual hygiene.

The Karuk Tribe specified the criteria necessary, in its view and for its uses, for safe contact with the water: "Water conditions must be safe for what is usually termed 'recreational contact' as well as human consumption (Salter, 2006)," (Ibid. p. 5).

Historically, Tribal members described swimming as a common activity until the toxic algae began to flourish in more recent times: "Swimming in the Klamath

will infect any open sores you might have," Scott Quinn, Tribal member (Salter, 2003). Similarly, the Karuk Tribe expressed concern about possible effects to fishermen by the presence of toxic algae:

> "To date, no study has evaluated the impact of algal toxins on these fishermen who come into contact with water as well as breath water vapors from the river. Both contact and inhalation of vapors are considered microcystin exposure pathways by the World Health Organization [WHO]." (Karuk Tribe, December 1, 2006, p. 7).

In addition, concerning River water quality, the Tribe had requested that FERC evaluate and consider: "…modest human consumption during ceremonies." (Karuk Tribe, December 1, 2006, p. 7).

The Karuk Tribe described water quality impacts of the hydroelectric dams in its comments on the FERC DEIS. The Tribe's analysis found that Iron Gate and Copco Reservoirs are "directly responsible for the high levels of cyanobacteria, which produce microcystin toxins (blue-green algae, or *Microcystis Aeruginosa*), leading to "massive blooms" (Kann, 2006)." The Tribal analysis showed that the blue green algae and toxins supplied by the reservoirs "…persisted and occasionally re-grew down river, and was detected in the Klamath River estuary (Kann 2006)." Furthermore, the Tribe stated that the hydroelectric dams and reservoirs create "…taste and odor compounds in the Klamath River [that] impact both recreational and subsistence fisheries." In addition, the reservoirs flooded formerly free-flowing river reaches that "…removed taste and odor compounds through aeration," and that organic matter produced by algal blooms "…creates taste and odor compounds as it decays." Taste and odor issues have impacted recreation/tourism, aesthetics, health advisories, and ceremonial uses for the Karuk reaches of the River (DOI, September 2011, including Appendix C, p. C-59).

Recreation analyses for the Klamath EIS/EIR and SDOR described present conditions as they relate to recreation and human health, and additional information includes a copy of the health advisory notice that was posted at the reservoirs (attachment 4b):

> "In response to the [PacifiCorp recreation visitor] survey question 'Has water quality ever affected your visit to the Klamath River area?' approximately two-thirds of recreational users of the subject reservoirs had negative perceptions of water quality, commenting on its color, turbidity, and odor. The source of visitor concerns was primarily the brown, foamy water in free-flowing reaches and regular, extensive algae blooms that occur throughout the reservoirs. Visitors reported that the algae produces bad odors, fouls fishing lines, and reduces the area available for fishing, swimming, and wading (FERC 2007)." (DOI, September 2011 p. 3.20-21).

In another section of the analysis, public health effects were described that extend to the lower Klamath River:

> "As discussed in Section 3.2, Water Quality, concentrations of chlorophyll-a and *Microcystis aeruginosa* have exceeded World Health Organization guidelines for protection from adverse effects in recent years, in both Copco 2 and Iron Gate reservoirs, as well as reaches of the Klamath River downstream of Iron Gate Dam. In 2005 and 2008, the NCRWQCB, Karuk Tribe, USEPA and other local, state, and federal agencies issued a warning to residents and recreational users of the river to use caution when near these algal blooms due to possible health effects of exposure to *Microcystis aeruginosa* and its microcystin toxin. Effects range from mild, non-life threatening skin conditions to permanent organ impairment and death, depending upon exposure time and intensity (FERC 2007). As identified in comments received during the scoping period for this EIS/EIR, these water quality issues and public health warnings have resulted in reduced recreational activity in affected river segments in recent years." (Ibid p. 3.20-24).

The River below Iron Gate Dam is a popular whitewater boating area and the analysis showed that health warnings have reduced the amount of white water boating in the middle Klamath River reach where Karuk Tribal areas are interspersed with USFS and BLM lands:

> "Data collected by the USFS and BLM indicate that substantially more whitewater boating occurs on the Klamath River below Iron Gate Dam than in the Klamath River upstream of J.C. Boyle Dam. From 2001 through 2009, the average annual person-trip-days were 10,722 per year. However, whitewater boating in this portion of the Klamath River has decreased somewhat in recent years." (DOI, September 2011, p. 3.20-24 to 3.20-25).

2.1.2.3.10.2 Aquatic Plant, Fish/Shellfish Species, and Water Consumption

The Karuk Tribe has concerns about the safety of consuming fish and other species from and along the Klamath River:

> "KHP impacts on traditional food sources other than fish, such as watercress, Indian rubarb, fresh water mussels, and crayfish, should be evaluated and considered." (Karuk Tribe, December 1, 2006, p. 7).

Water quality problems, in the view of Tribal members, have reduced the consumption of traditional foods which compound existing high diabetes, heart, obesity, and related disease rates discussed in the first part of this section of this document:

> "We used to eat kaaf (Indian Rhubarb), and watercress. Now I'd be scared to eat watercress because you don't know where the water is coming from…There were lots of crayfish. Now you don't see them any more. We used to eat freshwater clams too." Vera Davis (Salter, 2003, pp. 32-33).

Basketry materials, such as willow, has been a concern in terms of water quality for processing, and in terms of river channel effects and quantities.

Norgaard found concern about water quality and freshwater mussel consumption:

> "Freshwater clams are relatively abundant (although less so than in the past), but no longer consumed in quantity due to concerns over bioaccumulation of materials in body tissues." (Norgaard, November 2005).

Fish tissue advisories and shellfish consumption health advisories for toxins in aquatic life due to high blue-green algae blooms toxin levels emanating from the reservoirs were issued for areas in the hydroelectric reach and downstream, including Iron Gate Dam, each summer from 2007 to 2010:

> "In 2007, a *M. aeruginosa* bloom prompted a Yurok Tribe health advisory along multiple affected reaches in the Klamath River (Kann 2007a 2007d); 85 percent of fish and mussel tissue samples collected during July through September 2007 in the Klamath River, including Iron Gate and Copco 1 Reservoirs, exhibited microcystin bioaccumulation (Kann 2008). Results indicated that all of the WHO total daily intake guideline values were exceeded, including several observations of values exceeding acute total daily intake thresholds (Kann 2008). In a retrospective letter to PacifiCorp (August 6, 2008), the California OEHHA stated that they "would have recommended against consuming mussels from the affected section of the Klamath River, and yellow perch from Iron Gate and Copco Reservoirs, because their average concentrations exceeded 26 nanograms per gram (ng/g)," which is the OEHHA upper bound of advisory tissue levels fish or shellfish consumption (for a single serving per week based on 8 ounces uncooked fish). Data from 2007 also indicate microcystin bioaccumulation in juvenile salmonids reared in Iron Gate hatchery (Kann 2008; see Section 3.3.3.3 Habitat Attributes Expected to be Affected by the Project - Water Quality - Algal Toxins for a discussion of algal toxins as related to fish health). Additional public health advisories were issued in 2009 and 2010 in Copco 1 and Iron Gate Reservoirs, as well as downstream locations in the Klamath River (including locations on the Yurok Reservation), for

microcystin levels in ambient and/or freshwater mussel tissue (Kann et al. 2010a, Kann et al. 2010b, Fetcho 2010)."(Klamath EIS/EIR Appendix C, p. 58).

[And]

"Although concentrations of both M. aeruginosa and microcystin toxin in the Klamath River downstream of the Hydroelectric Reach are lower relative to the reservoirs (Figure C-32), WHO guidelines for exposure to microcystin (i.e., < 4 μg/L) have been exceeded downstream of Iron Gate Dam on numerous occasions (Kann 2004, Kann and Corum 2009, Kann et al. 2010a, Fetcho 2010), including late-summer/early-fall M. aeruginosa blooms in September 2007, 2009, and 2010 from Iron Gate Dam (RM 190.1) to the mouth of the Klamath River (RM 0.0). Health Advisories were posted along this reach of the Klamath River (Iron Gate Dam to Shasta River in 2009 and 2010, due to elevated microcystis cell counts and/or microcystin concentrations in river water. Available data indicate that algal blooms in Iron Gate and Copco Reservoirs have been responsible for the public health exceedances in the lower river (Kann and Corum 2009). Additionally, data from 2007 indicate microcystin bioaccumulation in juvenile salmonids reared in Iron Gate hatchery (Kann 2008) and, in 2010, algal toxins were found in salmonid tissues collected near Happy Camp (Kann et al. 2011) (see Section 3.3.3.3 Habitat Attributes Expected to be Affected by the Project - Water Quality - Algal Toxins for a discussion of algal toxins as related to fish health)." (Ibid, p. C-60 to C-61).

3.1 ENVIRONMENTAL CONSEQUENCES

This section compares the No Action Alternative, or existing conditions projected into the future (dams in) and Action Alternative that includes implementation of the KHSA and KBRA.[15] A comparison of impacts between the two alternatives is summarized in table 3-1.1.

[15] The two agreements have language specifying their interdependence as a condition of execution.

Table 3.1-1.—The Karuk Tribe impacts summary table

Indicators	No Action	Dam removal
KHSA 1. Introduction, 1.2, Purpose of the Settlement, Dam ("Facilities") Removal and Section 3, Affirmative Determination **Note: It is assumed that the KHSA and KBRA would both be implemented; however, for analysis purposes only, the most significant and relevant portions of the KBRA were examined individually.**		
Fisheries	Continuation of declining anadromous fish populations available for subsistence. Increasingly limited opportunities to continue practicing a traditional lifestyle and ceremonies that center on a salmon culture and require a healthy river. Continuation of insufficient numbers of salmon for barter. Continued weakening of tribal identity and other social and cultural conditions. Continuation of unnatural hydrograph and reservoir retention that contributes to algae toxins, higher summer water temperatures, and other water quality conditions that adversely affect fisheries, health of the river, and traditional uses.	Additional quantities of anadromous fish available for subsistence beginning around 2020 to 2060. Greater opportunities to continue practicing a traditional lifestyle and ceremonies that center on a salmon culture and require a healthy river. Possibility of sufficient salmon numbers for barter. Strengthened tribal identity and other social and cultural conditions. More natural hydrograph would improve algae toxins, improve summer water temperatures and other water quality conditions that adversely affect fisheries, health of the river, and traditional uses.
Employment and income	Limited opportunities to improve high poverty rates and low income conditions with subsistence fishing and barter. Continuation of high unemployment and low income levels, and limited potential for improved social conditions related to poverty. Water quality problems would likely continue to be preclude any potential recreation or tourism opportunities.	Opportunity for tribal members to improve high poverty and low income conditions with additional subsistence fishing, and possibly barter beginning around 2020 to 2060. Potential to improve high unemployment levels directly or indirectly from dam deconstruction around 2020. Potential for improved social conditions related to poverty. Water quality improvements would likely provide the potential to develop recreation or tourism opportunities.

Table 3.1-1.—The Karuk Tribe impacts summary table

Indicators	No Action	Dam removal
Health	Limited opportunity to alleviate high diabetes, heart disease, and obesity rate trends and associated high costs, disability, and mortality rates through increased fish consumption. Continued relative heavy reliance on commodity and processed foods. Some degree of poor water quality conditions are expected to continue, and are likely to include possible quality-related health concerns or effects from fishing, ceremonial bathing, drinking and other uses, gathering and processing basketry plants, and gathering and ingesting plants for medicinal and traditional food purposes.	From about 2020 to 2060, opportunity for improvement in diabetes, heart disease, and obesity rate trends and associated high costs, disability rates, and mortality rates with greater fish availability, especially for elders. Reduced reliance on commodity and other processed foods. Improved Klamath River water quality could reduce or eliminate adverse health effects from fishing, ceremonial bathing, drinking and other uses, gathering and processing basketry plants, and gathering and ingesting plants for medicinal and traditional food purposes.
KBRA Part VII. Tribal Program, 32. Tribal Participation in Fisheries and Other Programs		
Fisheries	Limited opportunities for participation in cooperative resource management.	Program funds for fishery management and conservation roles would occur between about 2012 and 2021, enhancing tribal participation, fisheries, identity, social conditions, and self determination.
Employment and income	Limited opportunities for additional tribal income and employment and economic development support that could improve unemployment, poverty rates, and income levels.	Program funds for fishery management and conservation roles would occur between about 2012 and 2021, which could improve high unemployment and poverty rates, including funds for an economic development study that could strengthen the Tribal economy.
Health	Limited opportunity to change high diabetes, heart disease, and obesity rate trends and associated high costs, disability, and mortality rates. Continued heavy reliance on commodity/processed foods.	Fishery management and conservation support would enhance tribal participation, State-recognized fisheries, cultural identity, and social conditions, encouraging more fish consumption and less reliance on commodity food.

In terms of the action alternative, execution of the KHSA would remove Iron Gate, J.C. Boyle, Copco 1 and Copco 2 hydroelectric dams that prevent coho salmon, Chinook salmon, steelhead, and Pacific lamprey anadromous species from migrating above Iron Gate Dam to Upper Klamath Basin habitat.

The goals of the KBRA are to restore and maintain ecological functionality and connectivity of historic fish habitats and re-establish and maintain naturally sustainable fish populations, including harvest opportunities. The KBRA Fisheries Program will, among other actions, provide for reintroduction of anadromous species above the current site of Iron Gate Dam, including tributaries to Upper Klamath Lake. It would emphasize strategies and actions to restore and maintain a properly functioning Upper Klamath Lake and River processes and conditions, while also striving to maintain or enhance economic stability of adjacent landowners. In addition, it would prioritize habitat restoration and monitoring actions to ensure the greatest return on expenditures. Both agreements include measures that would improve water quality, particularly the KHSA dam removal which would reduce toxic algae accumulation in the four reservoirs, especially Iron Gate and the Copco dams. Under implementation, an increase in the amount and availability of fish is expected to restore much of the cultural, social, economic, and health deterioration of the past and would enhance the trust responsibility for Karuk economic, social, and health support.

3.1.1 No Action: Potential Impacts without the KHSA and KBRA

Expert panel, biological subgroup draft Synthesis report, draft EIS/EIR, and DOI report information (June 2011a and b) were used for drawing conclusions about potential impacts to species.[16]

3.1.1.1 Subsistence Fishery

> "Since time immemorial Karuk people have relied directly on the land and rivers for food. Salmon, eel, sturgeon, steelhead trout….and game were plentiful and healthy sources of food for generations. The dramatic decline in eel and salmonid populations that once supplied over half the Karuk diet has occurred within the lifetime of most adults alive today. With the loss of the most important food source, Spring Chinook salmon in the 1970s, the Karuk people hold the dubious honor of experiencing one of the most recent and dramatic diet shifts of any Native tribe in the United States. A high percentage of Karuk people continue to fish and

[16] Hamilton, et al., November 23, 2010, Synthesis of the effects to fish species of two management scenarios for the Secretarial Determination on removal of the lower four dams on the Klamath River, Final Draft

> hunt traditional foods, however over 80 % report that they are unable to harvest enough to meet their family needs." (Norgaard, November 2005, pp. 1-2).
>
> "Last year we caught an all-time low, less than a hundred fish at Ishi Pishi Falls with extended effort…What about lamprey? What about sturgeon? What about the spring salmon? What about the fall run? We're talking about a total collapse in our fishery." Ron Reed, Traditional Karuk Fisherman. (Norgaard, November 2005, p. 13).

According to the biological subgroup report the Klamath Basin was once the third-largest producer of salmon in the United States (Institute for Fisheries Resources 2006) that produced large runs of steelhead, Chinook salmon, coho salmon, green sturgeon, euchelon, coastal cutthroat trout, and Pacific lamprey (Hamilton, et al., June 13, 2011).

Historically, most species were used for subsistence, as early observers and elder Tribal members have recounted, and the Tribe depends on these species presently if they are available, and if not available, the Tribe would like them to become available again: Spring- and fall-run Chinook Salmon, coho salmon, steelhead, Pacific lamprey, trout, and sturgeon (green and white). Spring- and fall-run Chinook are central components of the most important ceremony, Pikiavish (World Renewal) Ceremony in which the First Salmon Ceremony is a vital component. Lamprey is "…a much esteemed food source…" and has important nutrients, particularly for the elders (Karuk Tribe, 2011, p. 9). Another traditional food and culturally important species is the fresh water clam or mussel (DOI, June 2011a, pp. 3-31). Crayfish are another subsistence food and an integral element in the Pikiavish (World Renewal) Ceremony. Some riparian vegetation is also used for medicinal purposes and as subsistence foods, such as watercress and rhubarb (Karuk Tribe, December 1, 2006, p. 4).

Table 3.1-2 summarizes projected current conditions (no action) without KHSA and KBRA actions. The variety and plentitude of fish species in the middle Klamath River was a large part of the Tribe's seasonal round, food security, and culture that has gradually declined over passing decades beginning with Copco I Dam, but especially since IGD was constructed around 1962. Karuk Tribal members described the changes they have experienced in subsistence fishing with the dams, particularly Iron Gate Dam, over several generations:

> [pre IGD] Harold (age 54)[father]: "I started when I was 16, first time I dipped I caught 87 fish. But there was a lot of fish then….that would have been in '66. The river was a lot bigger and there was a lot more fish."

Table 3.1-2.—Summary of No Action Alternative conditions by species

Coho salmon (threatened)	Significant impact on essential fish habitat and continuation of downward trend.
Spring Chinook salmon	Significant impact on essential fish habitat and continuation of low levels, possibly become extinct.
Fall Chinook salmon	Significant impact on essential fish habitat and continuation of downward trend.
Pacific lamprey	Trends range from little change in current low levels to a decline.
Steelhead trout	Some uncertainty.
Green Sturgeon (threatened)	Some uncertainty.
Trout - Redband/Rainbow	Redband/rainbow below IGD would likely decline.
Crayfish	No change.
Mussels or Freshwater Clams	No change.
Riparian vegetation used for food, ceremonial, and subsistence purposes	No change—poor hydrograph (affecting quantity and quality of plants) and water quality/bioaccumulation concerns would persist.

Sources: See attachment 7.

> [post IGD] Bill (age 31)[son]: "First time I dipped…It was the first day of Pikiavish, I asked Dad if I could fish before him. There wasn't any fish yet that year, they usually come in two months earlier, but they just weren't there. I threw it in there and I got one. I got the first fish of the year, the only one caught that day." (Norgaard, November 2005, p. 23).

Under No Action, or conditions without the KHSA and KBRA, one the most important species to the Tribe, spring run Chinook would continue to be unavailable and others are in danger of going below harvest levels or would continue to be unavailable or potentially unsafe due to water quality problems—all of which have significant economic, social, cultural, and trust responsibility impacts.[17]

Spring run Chinook salmon would continue to be essentially absent and could become extinct, and fall-run Chinook salmon populations would continue to decline. Spring Chinook are particularly important because they come relatively

[17] The Federal Government has a trust responsibility to support the health, economic, and social welfare of federally recognized tribes. For additional trust information, see the trust section of the Klamath Facilities Removal EIS/EIR and DOI, June 2011a, June 2011b.

early in the seasonal round and are highest in fat content, similar to Pacific Lamprey, and salmon traditionally comprised up to about half of the Karuk diet. (Norgaard, 2003).

Fall run Chinook, and possibly Pacific Lamprey and steelhead, would continue a downward trend and Tribal members have documented the fact that these primary remaining sources of high quality subsistence foods do not meet the needs of the current population and level of demand.

In addition to adverse Chinook salmon impacts, coho salmon is expected to remain threatened and continue declining. Various species of lamprey are important to Karuk Tribal members, as discussed in the Historic and Present Conditions Sections, and projected trends range from essentially no change from current low levels to declines. Steelhead trout were, and remain another important fishery that is likely to decline under No Action. Green sturgeon, another traditional subsistence species, is expected to remain at low levels. Trout below IGD is at reduced levels, but stable which would continue through the project period. The Karuk Tribe did not prefer suckers, but relied on them when necessary for subsistence, and the Klamath Smallscale Sucker is fairly abundant and conditions are expected to remain unchanged. Klamath Largescale Sucker projections range from no change to possible ESA listing. Karuk Tribal members have been particularly concerned about impacts to crayfish and mussels in terms of water quality impacts, health, and consumption (discussed in more detail in the Health section and attachment 4a). The Klamath EIS/EIR stated that there would be a less than significant impact on species such as crayfish and mussels.

Overall economic, social, cultural, and health resource impacts of having insufficient fish runs and stocks available for traditional uses would continue past trends. The Karuk Tribe had a subsistence lifestyle that was sharply affected beginning in the late 1960s and 1970s when IGD exacerbated hydrograph and water quality problems along the River. The hydrograph became increasingly unnatural, stranding fry and changing the River channel that compromised fish and vegetation habitat along the River banks. Water temperatures have risen, contributing to fish runs shifting later into the season that resulted in more fish disease and mortality. Additionally, the proliferation of blue algae toxins cultured by the hydroelectric reservoirs has contributed to declining fish populations and drapes fishing nets which lowers fishing success. Existing water quality trends would be expected to continue to some extent (DOI, September and expert panel reports).

During the same time period, the Karuk Tribe experienced a cultural revitalization that has gained momentum up to the present. Declining (or potentially disappearing) spring and fall run Chinook could, at some point in the project period, make practicing the Karuk religious ceremonies related to Pikiavish

essentially impossible. The Tribe's modest social, cultural and economic gains would be expected to slow, stall, and possibly decline as remaining key fish species continue to decline or are lost forever.

As an example, a Tribal member commented on the economic, social, and cultural need to be able to practice the First Salmon Ceremony (which requires spring-run Chinook salmon) as it was historically held:

> "With every species that we lose, that we no longer have access to, that doesn't help to sustain us, is another link that's broken. So it's vitally important to us….over the years, in my lifetime all of our ceremonies that our folks once did, every last one of them [ceremonies] has returned with one exception [the First Salmon Ceremony]. And how do you perform the Spring Salmon Ceremony…when the physical act of going out and harvesting that first fish won't happen? You could be out there for a very long time to try to find that first fish and maybe you won't at all…So, will that ceremony ever come back? Well, I don't know. But, once again, it's a link that's broken. And restoring that link is vital. It is a missing component. It's a resource that is missing from our people, it is missing from our culture, our religion. Leaf Hillman, 2004." (Norgaard, November 2005, p. 35).

Although the Karuk Tribe does not currently have reserved, Federally protected trust fishing rights, the overall trust responsibility of the U.S. Government to provide for the health, social, economic, and overall welfare of the Karuk Tribe would continue to be weak under the No Action Alternative:

> "…the lack of fish in the local economy has effects on general tribal health and cultural well-being. The Karuk Tribe, when asked whether such trust resources were affected by the current dam operations, emphatically responded 'Yes.' Those [Tribal members] representing the Tribe at the [DOI government-to-government] meeting went on to relate that water quality and fish returns have diminished, and, being a tribe that lives alongside the river, their aesthetic quality of life has also diminished. They rarely bathe in the river [as was historically the case], and in an area with fewer available fish, tribal members are likely to consume less of the traditional food base and pay less attention to the culturally inherited management traditions of a 'Salmon People.' This has led to related impacts to tribal health such as higher rates of obesity, diabetes, heart disease, and stroke and mental diseases such as depression." (DOI, June 2011a, p. 3-43).

No action would mean a continuation of an impaired sense of Tribal identity and social trauma that began about 150 years ago with loss of their traditional territory and again about 40 years ago when fish runs began a dramatic decline, particularly spring-run Chinook, and diabetes, heart disease, and associated disability and mortality rates rose dramatically. Water quality began declining

and water fluctuations were often frequent and dramatic which served to diminish other River-based traditional uses. With only one fishing location, reduced fish populations, an unnatural hydrograph, and related factors that threaten tribal cultures, Norgaard and others describe the consequence as 'cultural genocide.'

Social values and methods for achieving economic well-being have been transmitted to successive generations by teaching and practicing concepts of redistribution of wealth (fish) to extended family and dependent populations within the community, which would continue to be adversely impacted, particularly for the children, because what is largely unavailable cannot be used or distributed (and an unnatural hydrograph interferes with ceremonies as well):

> "When a people's identity and cultural practices are closely associated with a species that no longer thrives, a sense of connection and belonging is lost [Norgaard, Chapter 5, 2005]. Young people feel this loss of belonging especially intensely…When tribal celebrations require that the tribe and visitors feast on salmon and no salmon is to be found… it is disheartening to have to make a trip into town to purchase imported fish from a grocery chain store [or consider substituting other species]. The results can be depression, alienation, and withdrawal… creating a malaise that lingers among the people subject to these conditions." (DOI, June 2011a, pp. 1-7).

Adverse cultural and social impacts would include problems stemming from the continuation of impaired Tribal and cultural identity. The Karuk have many ceremonies in common with the Yurok and Hoopa, such as the Jump Ceremony, White Deerskin or World Renewal Ceremony (which includes the Boat Dance Ceremony); ritual bathing in the River is a necessary component for them all. The critically important Pikiavish ('fix the world') Ceremony, with the First Salmon Ceremony as a crucial initial component, would not have the potential of being reinstated in the Spring with the first salmon run as had traditionally been done for centuries. In addition to its cultural and religious significance, the First Salmon Ceremony served an important resource management role.

The Karuk Vice Chairman explained cultural impacts of drastically reduced salmon availability:

> There is no part of our culture that is not adversely touched [by impacts of the dams] clear down to religion and the practice of religion. The practice of ceremonial, ritualistic practices like the boat dance. Where are we going to do a boat dance because we can't do it any longer at the original site because the river channel has been so drastically altered that it is impossible to do it there any longer. Probably no mitigation short of removing the dams will make a difference. I say that based on experience and practicality." Leaf Hillman, Vice Chairman of the Karuk Tribe. (Salter, 2003).

The regional barter system that was a thriving economy prior to European contact would continue to be adversely affected as Karuk Tribal members would continue to have insufficient salmon supplies to trade.

3.1.1.2 Employment and Income

The trend of declining varieties and populations of fish for subsistence fishing to supplement low incomes, improve poverty conditions, and for barter would remain unchanged for a growing Tribal population. Fishing has been considered an essential component of a family's security which would continue to be threatened under no action and has considerable social and health implications:

> "There is a loss of a sense of pride in being able to be a food provider as salmon fishermen, and this pertains to other species as well. There is a sense of pride in having an identity and a role and doing what you were put here to do by the Creator, versus what happens to people's [psychological] and emotional and mental health when they are unable to fulfill that role. There is a huge mental health component to being able to provide, versus when you are not able to provide. There is a shame of not having a space to fit into, especially for young people. This relates to the dams, because the dams are responsible for a lack of spawning habitat and are changing the river systems in many ways. They are changing water quality, water temperature, flow regimes-all the traditional pieces in the system are having an impact on what is happening in the river below." (Karuk Tribe, 2011, pp. 23-24).

The Karuk Reservation and surrounding areas where many Tribal members live are projected to continue to have high unemployment and poverty rates and low incomes compared with surrounding non-Indian populations and the counties and the State. Karuk Reservation unemployment was about two to three times that of most surrounding areas, the counties, and the State. The Census 2009 estimates for Reservation unemployment indicate rates that could have increased to about three to five times higher than surrounding area general population rates. Based on BIA data, the unemployment rate was 63% in 2005. The Karuk Reservation had the lowest per capita income of all surrounding areas at half or less than for other areas, particularly for the Indian population. More than half the population was in poverty in the 2000 Census, and the 2009 Census estimate showed an increased to about 60 percent, and previous Tribal surveys have placed it as high as 80 percent. All families with a female head of household, no husband present, with children under 18 years of age were in poverty. The Tribe has noted that the social, cultural, and economic disparities created by the KHP are disproportionate impacts, and therefore are also considered environmental justice issues.

Potential opportunities are limited for improving high unemployment and low income levels since the area is quite remote, the main industry in the region has

been timber-based which remains weak, recreation in the area has declined, and Tribal members tend to be at a disadvantage in terms of education, training, and discrimination for other relatively few area jobs. The potential for improved social conditions related to poverty is limited. For these reasons, the development and growth of Tribal education, job training, and employment programs has been important. However, Tribal economic development would continue to be constrained by the lack of abundant resources (i.e., timber, fish, clean water, etc.), and limited amounts of land owned by the Tribe, including a lack of sufficient funds for business development. Poor water quality conditions would likely continue to make investments in local recreation/tourism highly unlikely since River-based recreation has been declining in large part because of health advisories (one example includes attachment 4b, but there have been newspaper articles and other advisories, and other sources cited in Section 2.1.2.3.10).

3.1.1.3 Health

A no action scenario would be continuing high rates of diabetes, heart disease, and related diseases with high mortality rates. Reliance on commodity foods would likely continue. Higher disease rates are correlated with higher costs to the Tribe and Federal Government and are inconsistent with the intent of the Federal trust responsibility to Federally recognized tribes in providing social, economic, and health well being. Poor water quality creates health concerns and problems, and contributes to traditional food-avoidance.

Trends, documented by Norgaard, began with a shift from a traditional diet resulting largely from declining salmon populations that accelerated during the during the 1970s when the spring run Chinook essentially disappeared. Changes were described as dramatic and correlated with the appearance of diabetes and other diseases (Norgaard, 2005). The decline in traditional food available in the Tribal diet has had adverse health effects as it was largely replaced by USDA commodity foods which are highly processed, high sugar and fat foods that many tribes have had to rely on to help feed their people given high unemployment and poverty rates. Norgaard found that omega-3 fatty acids, abundant in salmon (especially spring Chinook), have been linked with a number of significant health benefits, including: [18]

> "…reduced risk of heart attacks, strokes and Alzheimer, prevention of osteoporosis, a diabetic treatment, improved mental health and improved brain development in infants…[and] beneficial effects …on various forms of depression…(Bruinsma 2000; Hibbeln 1998)." (Norgaard, 2005, pp. 50-51).

[18] The American Heart Association recommends consuming fish, especially salmon, at least two to three times a week as a preventative measure for heart disease and obesity.

The diet shift resulted in high heart disease, diabetes, and obesity rates with associated high direct and indirect social and monetary costs and higher mortality rates. Tribal health problems are compounded by food insecurity and other poverty-related stress. Diabetes in particular tends to have a higher rate of complications that result in disability. High disease rates and associated social and cultural costs would include a continuation of high rates of premature disabilities and death in older age groups that limit 'intellectual capital;' the ability of elders to pass along Tribal culture and social structure to younger generations. Economic costs estimated for the national population are about $316 billion annually in 2010 dollars for heart disease, $174 billion annually in 2007 dollars for diabetes, and about 36 percent more health care expenses for obese people. Health costs associated with diabetes and obesity would likely continue with a no action scenario.

A lack of sufficient fish supplies has profound health effects. All Karuk religious and world-views, including ceremonies, are adversely affected by non-existent and diminishing fish runs, poor water quality, and an unnatural hydrograph. Over the past 50 years various Tribal members have attested to the fact (including the Karuk Tribal Department of Natural Resources) that the large, rapid fluctuations in water flows often strand large numbers of fry and ammocoetes.

Although existing efforts are expected to improve water quality (full implementation of Oregon and California TMDLs) eventually (decades), the extent is not clear, and algal blooms would likely still be present, especially Iron Gate Dam:

> "Continued impoundment of water at the Four Facilities would continue to support growth conditions for toxin-producing nuisance algal species such as MSAE, resulting in high seasonal concentrations of cyanotoxins (e.g., microcystin) and chlorophyll-a transported into the lower Klamath River downstream of Iron Gate Dam…." (DOI, August 2011 [April 11, 2011, pp. 3.2-109]).

Recreation water contact health advisories are likely to continue during mid to late summer months for microcystis aeruginosa, or blue-green algae toxins. Water quality would continue to be a health concern in the River for Tribal members' contact with the water for ceremonial bathing, traditional fishing, medicinal, edible, and other plant gathering/processing uses as well as direct and indirect ingestion. Karuk Tribal members (including children) would likely continue to risk adverse health consequences from direct River contact for such ceremonial uses as bathing in the River for 10 days (traditionally included drinking the water), fishing, and gathering plants as traditional foods, other ceremonial and regalia purposes, and basketry materials.[19]

[19] The Brush Dance is a community gathering to support an ailing child, and is still held in many of the traditional village sites along the River, and requires a pristine River for the setting and resources. Often people still arrive/depart by boat on the River. (DOI, June 2011a, p. 3-6).

> "Bathing in the river is an important part of most ceremonies and cultural activities throughout the year, including the Spring Salmon Ceremony, the Brush Dance Ceremony, funeral services, subsistence practices, recreational swimming, courtship, and individual hygiene. The Karuks historically bathed in the Klamath River; however, in more recent years degraded water quality conditions during the summer have forced them to take precautionary steps and avoid contract with the water." (DOI, June 2011a, p. 3-45).

Additionally, water quality concerns could continue to affect gathering and consumption of such edible plants as watercress and Indian rhubarb, shellfish (mussels and crayfish), and fish. Processing basketry, fish, and other traditional foods and cultural materials would continue to be a human health concern. Algae would continue to interfere with fishing success as it accumulates quickly on fishing nets. Fear of water quality-related warnings and poor aesthetics of the River water has compounded diminishment of a traditional diet that contributes heavily to high disease rates (DOI, June, 2011a; June 2011b).

3.1.2 Action Alternative: Potential Impacts of the KHSA and KBRA

In order to more thoroughly evaluate impacts related to each of the most significant and relevant components of the KHSA and KBRA to the Karuk Tribe, this section is divided into the most significant components even though the KHSA and all KBRA parts would be implemented as a comprehensive action:

- KHSA, 1.2 Purpose of the settlement, dam (facilities) removal
- KBRA Part VII. Tribal Program 32. Tribal participation in fisheries and other programs

Although other sections of the KBRA are not specifically analyzed, it is assumed that all KBRA actions would contribute to improved fish habitat, water quality, and fish populations.[20]

Overall, if the KHSA and KBRA were implemented, conditions measured by the indicators; subsistence fisheries, employment and income, and health are projected to improve, as described in the following sections and summarized in table 3.1-1.

[20] One of the most significant is described in section 18.2 Restore Upper Klamath Lake Water Storage and reconnect historic lake bed, 18.2.1 Williamson River Delta, 18.2.2 Agency Lake Ranch and Barnes Ranch, 18.2.3, Wood River Wetland Restoration Project.

Impacts would be positive for all species in the long run (after 2021 and possibly not fully for all species until about 2025), which is a significant improvement since the Tribe places a high value on the return of conditions closer to the historic, healthy, diverse ecosystem the middle Klamath River once was. For this reason, any resurgence in the spring run Chinook in the middle Klamath River reach that has not occurred since the 1930s is perceived as a significant benefit regardless of whether all fisheries would be at harvestable levels. Clearly the Karuk Tribe still views its people as a fishing culture, as described by a Tribal member:

> "'…it's the responsibility of the Karuk people to fish. We have fish, we do fish medicine and it's our responsibility if we want to make it to the other side to take care of fish. They are a spiritual food for our people….according to our old stories the spirit people that we come from made that river….taking the dams out will make the river healthy again….'"(Karuk Tribe, 2011, pp. 13-14).

Therefore, it is assumed that more fishing opportunities would lead to the practice of a traditional lifestyle on a greater scale than is currently taking place which would strengthen social ties and economic stability. Many Karuk people expressed their need and desire to live in a more traditional manner (see Karuk quotes throughout the Existing Conditions section of this document. Additionally, it is important to note that although this analysis focuses mainly on subsistence fisheries, the fact that the Action Alternative would mean preservation of some species that are projected to possibly become extinct under No Action is critical.

The variety and plentitude of fish species in the Basin was a large part of the Tribes' seasonal round and food security that has gradually declined over passing decades, beginning with construction of Copco 1and 2, and particularly IGD in 1962. Historically, most native middle Klamath River species were used for subsistence, however the Karuk Tribe depended heavily on spring and fall run Chinook, steelhead, and lamprey. Table 3.1-3 summarizes impacts by species and additional detail is in attachment 7.

3.1.2.1 KHSA, 1.2 Purpose of the Settlement, Dam (Facilities) Removal

Dam removal would benefit Karuk Tribal subsistence fisheries, ceremonies, socioeconomic conditions, and health status.

Table 3.1-3.—Summary of Action Alternative conditions by species

Coho salmon (threatened)	Below IGD, significant negative short term impacts and long term effect range from marginal to beneficial. UB, uncertain whether they would reoccupy the area.
Spring Chinook salmon	Below IGD, negative short run impacts (about 2020) due to dam removal sediment, positive long run effects (roughly 2021-2060). UB, Spring Chinook could reoccupy, but not to historic levels.
Fall Chinook salmon	Negative short run impacts (around 2020) due to dam removal sediment, especially in the lower Klamath. Positive long run effects (about 2021-2060). Fall Chinook would reoccupy the UB, possibly substantial increase, particularly helpful in years when production is low.
Pacific lamprey	Below IGD, around 2020-2025/30 decline due to dam removal sediment. Long run (about 2025/30 -2060), population would increase up to 10%. Potential to occupy UB, but uncertain.
Steelhead trout	Below IGD, short term, adverse sediment impacts (approximately 2020-2026), long term increased numbers, possibly substantial. UB, re-establish and increase, possibly substantial.
Green Sturgeon (ESA-listed)	Negative short term effects, beneficial in the long term.
Trout	May experience some short term adverse dam removal sediment impacts, long term major benefits.
Crayfish	Short term minimal adverse effects and long term benefits.
Mussels or freshwater clams	Short- to mid-term significant adverse impacts with long term benefits.
Riparian vegetation used for food, ceremonial, and subsistence purposes	Expected to increase in the long run.

Sources: See attachment 7.

3.1.2.1.1 Subsistence Fisheries

> "It's been told to me by elders that there used to be eight runs of fish, eight specific runs of fish that used to go up at Ishi Pishi Falls. That was before the dams. We would be done fishing by Labor Day….Now the fish don't even get there until Labor Day…What are the social and mental impacts of that? We used to have four months of optimal fishing….Now two weeks." Ron Reed at DOI September 30, 2010, government-to-government meeting. (DOI, June 2011a, p. 3-33).
> "Everything about our ceremonies here on the river is about fish," V. Grant Hillman, age 74 at the time of the interview. (Salter, 2003).

Ron Reed stated that the sacred Ishi Pishi Falls fishery is in close proximity to the Pikiavish Ceremony location because fish are crucial to the ceremonies:

> "'a sacred fishery…the center of the world for us...the center of our spiritual universe.' The proximity of the falls to the world renewal site is significant, he noted, since 'all of our ceremonies evolved around the fish run.' Fish caught at Ishi Pishi are carried up the trail to serve the dancers and others attending the ceremonies." (Most, 2006, p. 185).

Dam removal would begin in 2020, and there would be adverse short term impacts to Klamath River species below Iron Gate Dam resulting from the release of sediment that has accumulated for decades in the four reservoirs that would impair water quality downstream. However, within about five years or less of dam removal, populations of spring- and fall-run Chinook, steelhead, lamprey, sturgeon, trout, and two species of suckers are expected to improve, in large part because of additional habitat and improved water quality.

Spring- and fall-run Chinook and steelhead would increase, possibly substantially, in the long run which would provide more subsistence opportunities. Spring Chinook was one of the most important species for the Karuk Tribe, sustaining the people from season to season and was an important element in the traditional diet. The prospect of the Tribe to be able to reinstate the First Salmon Ceremony at the proper time of the year with the actual spring-run would be a significant positive consequence that would enhance such related ceremonies and cultural practices, including the Pikiavish or World Renewal Ceremony overall.

Positive subsistence fishing impacts of dam removal would include:

- Culturally, the First Salmon Ceremony (and dam construction) would have the potential of being reinstated at the proper time of year with the first run of salmon, spring Chinook, would again become available in sufficient numbers to hold the Ceremony, and possibly eventual harvest. The Jump Dance, Boat Dance, White Deerskin Dance and Brush Dance Ceremonies and associated cultural values and social interactions (i.e., community celebrations) that revolve around salmon and community gatherings would be possible, or continue to be possible.

- Potential social and economic gains and cultural revitalization would be supported through potentially harvestable levels of spring-run Chinook and improved harvest levels of fall-run Chinook, steelhead, lamprey, and most other fish species traditionally used.

- The regional barter system could be revitalized for the Karuk Tribe since Tribal members would likely have sufficient salmon supplies for trade/barter for game or other food and goods with other tribes.

- A traditional lifestyle, social values, and methods for achieving economic well-being could continue to be transmitted to successive generations by teaching and practicing concepts of survival through fishing.

- Additional opportunities for elders to teach youth how to catch salmon, lamprey, steelhead, sturgeon, and other species, and be socially responsible by giving away a portion of their catch, usually to elders.

- Youth could continue to learn to catch salmon, steelhead, lamprey, and other species for elders and others. Tribal identity would improve and there would likely be a greater sense of what it means to be Karuk for youth and other Tribal members that would lead to some degree of improvement in social trauma and overall social conditions (depression, substance abuse, and others).

- Water quality would improve more rapidly than under no action which would benefit aquatic species.

Water quality would improve, particularly toxic algae levels, MSAE, which would minimize the incidence of fish disease and mortality, contributing to an increased harvestable stock, easing concerns related to human health fish consumption and contact with water, and no longer interfering with fishing success when algae accumulates on dip nets.

A more natural hydrograph would decrease or eliminate the stranding of fry and ammocoetes, improve the timing of runs so that they align more closely to traditional seasons and natural timing for Tribal ceremonies, and fish runs would be expected to last longer, resulting in greater subsistence fishing opportunities.

3.1.2.1.2 Employment and Income

Beginning around 2021, dam deconstruction could directly and/or indirectly improve employment and incomes. Increases in fishery populations, particularly salmon and steelhead have the potential to:

- Improve income, poverty, and food insecurity problems since there would be salmon for subsistence and barter.

- Enhance the functioning of the existing Tribal redistribution of wealth (fish) to extended family and dependent populations, primarily elders, within the community to better support dependent Tribal members.

- Water quality improvements, together with improved fish populations, have the potential to increase recreation and tourism opportunities (i.e., tribal fishing guides, rafting guides, indirect effects, etc.) and related individual and/or tribal endeavors which could increase employment and income.

3.1.2.1.3 Health

There would be an increase in salmon, particularly spring-run Chinook, which is considered one of the best foods for preventing heart disease (spring-run is higher in healthy fat), and ranks high in the same regard for obesity and likely diabetes as well. Pacific Lamprey populations are expected to increase, and is considered to be particularly nutritious for elders (DOI, June 2011a; Lewis, 2009). In sum, all species are projected to remain stable or increase in the long run.

In Norgaard's report (2005), Karuk Tribal members stated that diabetes and heart disease were relatively new and coincided with the shift from a traditional to a Western diet. For example, 66 percent of Karuk members surveyed reported that diabetes appeared in their families for the first time around 1970, which is about the time when salmon runs declined significantly in the middle Klamath River reach. More specifically, Norgaard found that the correlation was strongest with the disappearance of Spring Chinook salmon:

> "Spring Chinook was the most important source of salmon in the Karuk diet in terms of both volume and nutritional quality…self-reported information about when consumption of Spring Chinook salmon stopped or became an insignificant food source and when diabetes first appeared in Karuk families shows almost a perfect match, with the rise in diabetes following the loss of Spring Chinook in the diet." (Norgaard, 2005, pp. 39-53).

Karuk Tribal members continue to suffer disproportionately high rates of diabetes, and positive effects of increased salmon, other fish species, and lamprey populations available for consumption would be reduced rates of some of the highest incidences of disease. Potential improvements would likely be greatest for the elderly population since, proportionately, they tend to be more consistently supplied with salmon and lamprey when available and have higher rates of disease compare to the rest of the Tribal population. Anticipated health improvements would include the potential for:

- Less reliance on USDA commodity foods and other processed foods.
- Lower diabetes rates and associated costs.
- Reduced heart disease rates and associated costs.

- Lower disability rates especially associated with diabetes, but also those that arise from heart disease and all associated costs.

- Less interrelated compounding effects between these diseases and associated costs.

- Reduced mortality rates, particularly for elders and associated social and cultural costs and a lower likelihood for premature disabilities and death to limit the process of elders passing along Tribal culture and social structure to younger generations.

- Reduced occurrence of other illnesses, including depression, Alzheimer's, and osteoporosis (Norgaard, 2005, pp. 50-51).

- Improved health conditions, reinforcing "…the federal trust responsibility to uphold treaty responsibilities for health care to Indians…" (IHS Fact Sheets, accessed September, 2010).

- Fewer health problems that result from food-insecurity and associated poverty-related stress.

Reduced levels of toxic algae (microcystis aeruginosa) would minimize human health concerns about skin contact with the water, particularly for children and pets which are at a greater risk (attachment 4b):

> "Dam removal is expected to result in long-term improvements in water quality, notably decreased prevalence of *microcystin* (see Section 3.2, Water Quality). As discussed in Section 3.2, Water Quality and 3.20.3.2 above, *microcystin* has been associated with public health risks for recreational bathing waters and health warnings issued in 2005 and 2008 by the USEPA and other agencies warned recreation visitors to use caution due to potential health effects. In addition, about two-thirds of recreation visitors to the subject reservoirs had negative perceptions of water quality, stating concerns of bad odors and algae blooms, which restrict areas available for fishing, swimming and wading. These adverse effects related to water quality negatively influenced the quality of the recreational experience for visitors and also resulted in safety risks to the recreational visitors. Because existing conditions for water-contact-based recreational activities are considered adverse due to water quality, improved water quality conditions would result in long-term beneficial effects." (DOI, September 2011, p 3.20-40).

A recreation analysis found that riparian vegetation would benefit which, overall, would be expected to benefit Tribal use and consumption of traditional plant foods:

> "Dam removal could result in changes to riparian vegetation compared with conditions present when the California Klamath River component was designated as National WSRs. Removal of the Four Facilities would result in a more natural riparian vegetative community immediately downstream of Iron Gate Dam due to sediment deposition and scour and gravel transport. Improved riparian vegetation would increase the presence and scenic variety of the vegetation within the WSR. This would likely increase overall scenic riparian vegetation aspects of scenic quality over conditions present at the California WSR's 1981 date of designation and result in long-term beneficial effects." (DOI, September 2011,p. 3.20-50).

3.1.2.2 KBRA Part VII. Tribal Program 32. Tribal Participation in Fisheries and Other Programs

3.1.2.2.1 Subsistence Fisheries

Program funds for fishery management and conservation roles would occur between about 2012 and 2021, enhancing tribal participation, fisheries, identity, social conditions, and self determination. Through funded Tribal participation, Tribal fisheries would improve and contribute to the benefits described under the subsistence fisheries portion of the KHSA of this Action Alternative section. Tribal participation and ownership would be important. Funding and participation provided by the KBRA Tribal Program would strengthen the Tribes' existing fish management efforts and support the overall goals of Tribal self-determination.[21]

3.1.2.2.2 Employment and Income

The KBRA Program funds for fishery management and conservation roles and economic development would occur soon after 2012. Tribal funding and participation would directly and possibly indirectly improve Tribal employment and incomes, and habitat improvements would increase anadromous and non-anadromous fish (and mussel) populations; together these would:

[21] President Nixon adopted a policy of 'tribal self-determination,' followed by Congress' enactment of the Indian Self-Determination and Education Assistance Act of 1975 which enabled tribes to assume administration of Federal programs for the benefit of their members through contracts. The Tribal Self-Governance Act of 1994 extended the concept to many other Federal programs with the option of autonomous program operations, and the Karuk Tribe is a Self Governance Tribe, operating a number of programs, including its health clinics.

- Potentially improve income, poverty, and food insecurity problems since there would likely be more direct Tribal fisheries/natural resources employment that would result in more anadromous and resident fish for subsistence in the middle Klamath River for what appears to be a growing population.

- Support Karuk Tribal economic development by providing funding for an economic development study/plan that would contribute to a strengthened tribal economy that may improve employment, income, and poverty levels.

- Improve the functioning of the existing Tribal redistribution of wealth (fish) system to extended family and dependent populations within the community to better support dependent Tribal members.

- Increase the potential for recreation and tourism opportunities (i.e., tribal fishing guides) and related individual and/or tribal endeavors that may increase employment and income.

3.1.2.2.3 Health

Participation in fisheries management and conservation activities would enhance Tribal involvement for its State-recognized fisheries, fisheries production, and subsistence fishing, cultural identity, and social conditions that could encourage more fish consumption and less reliance on commodity food. Health benefits could include those described under the KHSA in this Action Alternative section.

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Attachments

1 The Karuk Tribe Historical Timeline

2 Karuk Treaties (unratified) and Executive Orders. Klamath River Reservation and Hoopa Valley Reservation Depictions

3a KBRA Part I, General Provisions, 1.2. General Recitals, Section 1.2.3. Sustainable Tribal Communities

3b KBRA Part VII. Tribal Program

3c KBRA Part III Fisheries Program, Section 9 beginning with 9.2. Program Elements, Section 10, Fisheries Restoration Plan, and Section 11 Fisheries Reintroduction and Management Plan

4a Karuk Tribe Water Quality Comments to FERC

4b Health Advisory

5a Bureau of the Census Maps

5b Bureau of the Census 5-Year Average 2005–2009 Unemployment, Income, and Poverty Estimates for the Karuk Tribe Area

5c Bureau of the Census Definitions

5d Bureau of Indian Affairs Labor Force Report Definitions

6a Indian Health Care Improvement Act Made Permanent by Health Care Reform Legislation

6b 90 Stat. 1400 1976

7 Karuk Tribe Subsistence Species Impacts

Attachment 1

The Karuk Tribe Historical Timeline

Attachment 1 The Karuk Tribe Historical Timeline

Era or Event	Year	Description
Pre-European Contact		Elaborate economies with barter and extensive trade networks among regional tribes and ceremonies that centered on the Klamath River and all that depended on it as central. The Karuk Tribe depended heavily on salmon and the eight runs of various anadromous species and resident trout year round.
Missionaries	1500s-1846	Spanish missionaries explore area on and off and later used Indian slave labor to build missions and begin claiming lands.
Reservations Established	1812-1870	Treaties between Indians and England were over when England lost the war of 1812 and treaties were made between the U.S. and tribes, increasingly used to accommodate rapid settlement.
Trust Relationship Established	1831	*Cherokee Nation* v. *Georgia* case established the guardian-ward, or trust relationship between the U.S. and Indian tribes, or "domestic dependent nations."
Gold Rush	1849	Miners and prospectors began arriving in search of gold.
Treaties	1851	California Treaties Q and R signed by some Karuk members and the treaties were never ratified which has been a contributing factor to the absence of Federal trust fishing rights.
Reservation Period	1855	Klamath River Reservation created by executive order, intended for area tribes.
	1864	Hoopa Valley Reservation created by executive order, intended for Hoopa, Karuk, and some other area tribes, but of the Karuks moved, most returned to their homelands.
Missionaries	1865	Reservation schools were established under Christian organizations in 1865.
Reservation Period	1876	Executive order makes Hoopa Valley Reservation borders official.
Assimilation Boarding Schools	1878	Off-reservation boarding schools were established to assimilate and educate Indian children away from their homelands and families.
	1883	The Code of Indian Offenses, which the courts implemented, outlawed many traditional Indian ceremonies and practices.
Allotments & Assimilation	1887-1934	Dawes Act (25 U.S.C. 31) et seq. divided reservations into parcels to encourage individual Indians to become farmers, and leftover land was given to non-Indians. All Indian-held lands declined from 138 million acres to 48 million.
Settlers and Land Loss	1889	Squatters were appearing along the Klamath River in large numbers. By this time, essentially all land from the mouth of the River inland for 20 miles had been taken by non-Indians.
Cannery	1890s	Four Klamath allotments were used for a cannery established by A. Bomhoff near Requa. In exchange for the land, Bomhoff agreed to hire only Indian fishermen and workers in the cannery.
Reservation Period	1891	Executive order connects Klamath Reservation and Hoopa Valley Reservation to create a larger Hoopa Valley Reservation.
Assimilation	1900s	Forced boarding school attendance ended and day schools on reservations begin.

Era or Event	Year	Description
Development, ***Copco 1***	**1910**	**Copco 1 construction began, blocking salmon and other anadromous species' migration to the Upper Klamath Basin.**
Disease	1912	Flu epidemic.
Development, ***Copco 2***	**1925**	Copco 2 Dam constructed without fish ladders for salmon passage up the Klamath River to Klamath Tribal areas.
Disease	1920s-30s	TB epidemic.
Self Governance Period	1934-1953	**Indian Reorganization Act (IRA)** ended allotments and encouraged tribal self government through tribal constitutions and protected/expanded some tribal land bases.
Assimilation	1940s–50s	BIA relocation programs meant a sudden loss of some tribal members to cities.
WWII	1940s	Relatively large proportion of men away at war made continuing ceremonies difficult during this time period.
Cash Settlement-Trust Responsibility	1940s-1970s	From 1946 to 1978, Congress moved to resolve remaining 102 docket cases transferred to the U.S. Claims Court: Indian claims for compensation for lands ceded under treaties. The Karuk Tribe was given funds for 1851 ceded lands in the ungratified (ineffective) treaties.
Termination and Relocation Programs	1954-1966	Congress passed statutes terminating the Federal relationship with 109 Indian tribes and over 11,400 individuals lost "recognized" Indian status. About 1.5 million acres of Indian land were taken out of trust. At about the same time, relocation programs encouraged Indians to leave reservations for cities.
Development, ***J.C. Boyle***	1958	JC Boyle hydroelectric dam constructed, blocking salmon passage up the Klamath River to Klamath Tribal areas.
Development, ***Iron Gate Dam***	**1962**	Iron Gate Dam constructed without fish ladders for salmon passage up the Klamath River to Klamath Tribal areas.
Trust Responsibility: Health Care	1976	The Indian Health Care Improvement Act, 25 U.S.C. 1601, was passed "reflecting the Federal Government's trust responsibility to provide economic and social services necessary to ensure a standard of living for Indians comparable to non-Indian society."
Indian Self Determination Act	1975	The Act enabled tribes to operate federally run tribal programs. Overall, widespread implementation was relatively slow, with most activity beginning in the 1990s.
Cultural Revitalization	**1970s**	**Karuk medicine men revitalize ceremonies and traditional lifestyle.**
Federal Recognition	**1979**	**The Karuk Tribal becomes a Federally recognized tribe.**
	1985	**Karuk Constitution approved.**
Development, Fish Kill	2002	Over 60,000 migrating adult salmon died in September on their way up the Klamath River to spawn. Diseases caused by low flows and high temperatures were responsible which cause unprecedented devastation to the Yurok fishery.
Development	2009	Tribe sought to stop suction dredge mining, *Hillman et al*. v. *California Department of Fish and Game* on February 5, 2009.
Self Governance and Self Determination	2010	Tribe signs KHSA and KBRA.
	Beyond 2010	The Karuk Tribe believes that the KHSA and KBRA would improve the health of the Klamath River, especially fish availability and water quality that would in turn help improve the social, cultural, economic, and physical health of Karuk people. Tribal emphasis has been on improving social and economic conditions, in part through the continued strengthening of Karuk cultural practices, and on managing and preventing diabetes.

Attachment 2

Karuk Treaties (unratified) and Executive Orders. Klamath River Reservation and Hoopa Valley Reservation Depictions

In testimony whereof, the parties have hereunto signed their names and affixed their seals this eighteenth day of September, in the year of our Lord one thousand eight hundred and fifty-one.

O. M. WOZENCRAFT,
United States Indian Agent.

For and in behalf of the Cu-lu:

MI-ON-QUISH, his x mark. [SEAL.]

For and in behalf of the Yas-si:

SAN-TEA-GO, his x mark. [SEAL.]

For and in behalf of the Loc-lum-ne:

POL-TUCK, his x mark. [SEAL.]

For and in behalf of the Wo-pum-nes:

HIN-COY-E, his x mark. [SEAL.]
MAT-TAS, his x mark. [SEAL.]
HOL-LOH, his x mark. [SEAL.]
BOY-ER, his x mark. [SEAL.]

Signed, sealed and delivered, after being fully explained, in presence of—
FLAVEL BELCHER.
J. B. MCKINNIE.
WILLIAM RHOAD.

TREATY WITH THE POHLIK OR LOWER KLAMATH, ETC., 1851.

TREATY MADE AND CONCLUDED AT CAMP KLAMATH, AT THE JUNCTION OF KLAMATH AND TRINITY RIVERS, STATE OF CALIFORNIA, OCTOBER 6, 1851, BETWEEN REDICK MCKEE, INDIAN AGENT ON THE PART OF THE UNITED STATES, AND THE CHIEFS, CAPTAINS AND HEAD MEN OF THE POHLIK OR LOWER KLAMATH, &C., TRIBES OF INDIANS.

October 6, 1851.
Unratified

A treaty of peace and friendship made and concluded at Camp Klamath, at the junction of the Klamath and Trinity rivers, between Redick McKee, one of the Indian agents specially appointed to make treaties with the various Indian tribes in California, on the part of the United States, and the chiefs, captains, and head men of the tribes or bands of Indians now in council at this camp, representing the Poh-lik or lower Klamath, the Peh-tsick or upper Klamath, and the Hoo-pah or Trinity river Indians; containing also stipulations preliminary to future measures to be recommended for adoption, on the part of the United States.

ARTICLE 1. The said tribes or bands acknowledge themselves, jointly and severally under the exclusive jurisdiction, authority and protection of the United States; and hereby bind themselves to refrain hereafter from the commission of all acts of hostility or aggression towards the government or citizens thereof, and to live on terms of peace and friendship among themselves, and with all other Indian tribes which are now or may hereafter come under the protection of the United States.

ART. 2. Lest the peace and friendship established between the United States and the said tribes should be interrupted by the misconduct of individuals, it is expressly agreed that, for injuries received on either side, no private revenge or retaliation shall take place or be attempted; but instead thereof, complaints shall be made by the party aggrieved to the other, through the Indian agent of the United States in their district, whose duty it shall be to investigate, and, if practicable, adjust the difficulty; or, in case of acts of violence being committed upon the person or property of a citizen of the United States by an Indian or Indians belonging to or harbored by either of said tribes or bands, the party or parties charged with the commission of the crime shall be promptly delivered up when demanded, to the civil authorities of the State of California for trial; and in case the crime has been committed by a citizen or citizens of the United States upon the person or property of an Indian or Indians of either of said tribes, the agent shall take all proper measures to bring the offender or offenders to trial in the same way.

ART. 3. The said tribes or bands hereby jointly and severally relinquish, cede, and forever quit claim to the United States, all their right, title, claim or interest of any kind which they or either of them have to lands or soil in California.

ART. 4. To promote the settlement and improvement of said tribes or bands, it is hereby stipulated and agreed, on the part of the United States, that the following tract or district of land shall be appropriated and set apart as an Indian reservation, and the use and possession thereof forever guaranteed to the said tribes, their successors, and to such other tribes as the United States may hereafter remove from other parts of the valleys of the Trinity or Klamath rivers, or the country adjacent, and settle thereupon, to wit: commencing at the mouth of a stream called John's creek, emptying into Trinity river on the north side thereof, about fourteen miles above this camp; thence running up the middle of the same with its windings, to a distance of five miles; thence north to the summit of the dividing ridge between the waters of the Trinity and Klamath rivers; thence northwestwardly in a straight line to a point on said Klamath river opposite the lower end of what is now known as "Red Cap's" bar; thence due west to the summit of the first ridge lying beyond the Klamath river; thence southwestwardly along the summit of said ridge to a point due north of the mouth of Pine creek; thence south to the mouth of Sand creek; thence up Pine creek with its windings, to a point due south of the place of beginning; and thence north to said place of beginning. The said reservation including, by estimation, a tract twenty miles in length by twelve miles in width, and containing in all six or seven square miles of farming land. It is, however, understood and agreed that the United States reserves the right of way over said lands, and of using for farming purposes any quantity thereof not exceeding one thousand acres; also the right to establish such military posts, erect such buildings, and make such improvements for the accommodation of their agent and other officers or servants as the President may direct; also that said tribes or bands shall never sell or alienate their right or claim to any part thereof, except to the United States, nor shall they ever lease to or permit white men to settle, work or trade upon any part thereof without the written permission of the United States Indian agent for the district.

ART. 5. It is further stipulated and agreed that the said tribes or bands shall, within three years from the date hereof, or sooner, if thereto required by the United States, remove to and settle upon said reservation; and that whenever said removal and settlement shall be ordered by the United States or made by said tribes, such farmers, mechanics, and school-teachers to instruct them in the language, arts, and agriculture of the whites as the President may deem expedient and proper, shall be assigned, provided for, and settled among them, so as to place the Indians on said reservation in a situation as favorable for their improvement (being in like manner supplied with facilities for farming, stock-raising, &c.,) as by the treaty of Lu-pi-yu-ma on the 20th day of August, 1851, is stipulated to be assigned to and provided for the *Clear Lake Indians*. It is understood, however, that if upon examination by the Indian agent it is found that any of the articles or supplies provided in said treaty for the Clear Lake Indians shall be unnecessary for or unsuited to the Indians on the Trinity and Klamath, the President may in his discretion withhold the same, and invest the value thereof in other and more suitable goods. And it is further expressly agreed and understood that if either of said tribes or bands, or other Indians harbored by them shall be guilty of theft, robbery or murder, either upon the persons and property of Indians or whites, the United States may exclude such tribe or band from all the benefits of this treaty.

ART. 6. As early as convenient after the ratification of this treaty by the President and Senate, the United States will deliver to the said Klamath and Trinity Indians, through their agent, during each of the years 1852 and 1853, viz: five hundred pairs two and a half point Mackinaw blankets, five hundred pairs strong cotton pantaloons, five hundred cotton (hickory) shirts, five hundred red flannel shirts, five hundred strong cotton or linsey gowns, three thousand yards of calico, three thousand yards of four-fourths brown sheetings, thirty pounds Scotch thread, five thousand needles, six dozen pairs scissors, two gross thimbles, ten pounds pins, ten dozen nine-inch flat files, thirty-five dozen large size butcher knives, ten mattocks, one hundred garden or corn hoes, two hundred chopping axes, handled, common size, two hundred chopping axes, handled, small size; one hundred sheetiron camp kettles, large size; one hundred sheet-iron camp kettles, second size.

It is understood, however, that the agent shall use a sound discretion as to the time when, and the tribes or persons to whom the said goods shall be distributed, having reference to their peaceful disposition and good conduct.

ART. 7. In consideration of the premises, the United States, in addition to the numerous presents of beef, bread, sugar, blankets, shirts, &c., &c., made to said tribes at this camp, will, within sixty days from the date hereof, furnish them free of charge at the ferry of C. W. Durkee, in Klamath river, to enable them to rebuild the houses recently destroyed by the whites, with four dozen chopping axes, handled, ten sacks of hard bread, and four bullocks, sixteen pairs heavy blankets, to be distributed among them by said Durkee, according to their respective losses.

ART. 8. These articles to be binding upon the contracting parties when ratified by the President and Senate of the United States.

In testimony whereof the parties have hereunto signed their names and affixed their seals this sixth day of October, anno Domini 1851.

[SEAL.] REDICK McKEE,
United States Indian Agent for California.

For and in behalf of the Wetch-peck tribe, living at mouth of Trinity:

WUCK-UG-GRA, his x mark. [SEAL.]
WA-PE-SHAW, his x mark. [SEAL.]
SA-SA-MICH, his x mark. [SEAL.]
EN-QUA or AMOS, his x mark. [SEAL.]

For and in behalf of Wuh-si tribe, living three miles below mouth of Trinity river:

MO-RU-KUS, his x mark. [SEAL.]

For and in behalf of the Cap-pel tribe:

MAH-ON, his x mark. [SEAL.]

For and in behalf of the Mor-ri-ahs:

MAH-ON, his x mark. [SEAL.]
WUS-SUR, his x mark. [SEAL.]
UP-PER-GASH, his x mark. [SEAL.]

For and in behalf of the Ser-a-goines:

UP-LA-GO-PUS, his x mark. [SEAL.]
MOO-ROO-KUS, his x mark. [SEAL.]
SA-ET-MA-GEHL, his x mark. [SEAL.]

For and in behalf of the Pak-wan tribe:

CAP-PEL-LA-WAH, his x mark. [SEAL.]

For and in behalf of the Ut-cha-pah tribe, living near the mouth of Bluff creek:

E-NE-NUCK, his x mark. [SEAL.]
MOW-WEIGHT, his x mark. [SEAL.]

For and in behalf of the Up-pa-goines, living near "Red Cap's" bar, on Klamath river:

KEE-CHAP, his x mark. [SEAL.]
RED CAP or MIK-KU-REE his x mark. [SEAL.]

For and in behalf of the Sa-von-ra tribe:

SA-VON-RA, his x mark. [SEAL.]
UP-PA-GRAH, his x mark. [SEAL.]
EX-FIN-E-PAH, his x mark. [SEAL.]

For and in behalf of Cham-ma-ko-nee tribe:

KA-TOP-KO-RISH, his x mark. [SEAL.]

For and in behalf of the Coc-ko-man tribe:

PA-NA-MO-NEE, his x mark. [SEAL.]

For and in behalf of the Chee-nah tribe, living ten miles below mouth of Salmon river:

AK-KA-REE-TA, his x mark. [SEAL.]

For and in behalf of the Hoo-pahs or Trinity river Indians, residing in twelve rancherias or villages:

Principal chief, AH-ROOK-KOS, his x mark. [SEAL.]
TE-NAS-TE-AH or JOHN, his x mark. [SEAL.]
MET-POOKA-TA-MAH, his x mark. [SEAL.]
NIC-A-WA-EN-NA, his x mark. [SEAL.]
WASH-TEN, his x mark. [SEAL.]

Signed, sealed and delivered, after being duly explained, in presence of—

JOHN MCKEE, *Secretary.*
C. W. DURKEE, } *Interpreters.*
GEORGE GIBBS, }
H. W. WESSELLS, Brevet Major, U. S. A., commanding escort
WALTER VAN DYKE, }
GEO. W. ELLSWORTH, }
MORRIS S. THOMPSON, } *Interpreters.*
WALTER MCDONALD, }

A TREATY SUPPLEMENTARY TO THE FOREGOING TREATY

The undersigned chiefs, captains and head men of the Si-wah, Op-pe-o, He-ko-neck and In-neck tribes or bands of Indians, residing at and near to the mouth of the Cor-a-tem or Salmon river, having had the terms and stipulations of the foregoing treaty, concluded at Durkee's ferry on the 6th instant, fully explained to them by Redick McKee, Indian agent of the United States, having expressed an earnest desire to become parties to the said treaty in all its articles and stipulations, it is therefore agreed by and between the said agent and the said chiefs, &c., that the said bands be and hereby are admitted as parties to the same, and to the advantages thereof, and become bound by the stipulations therein contained as fully in all respects as if they had been parties thereto originally.

In testimony whereof the parties have hereunto signed their names and affixed their seals at Camp Cor-a-tem, near mouth of Salmon river, this twelfth day of October, anno Domini, 1851.

[SEAL.] REDICK MCKEE,
United States Indian Agent

For and in behalf of the Si-wah band:

ESSE-PISH-I-A, his x mark. [SEAL.]
RES-SOW, his x mark. [SEAL.]
CHEE-FEE-CHA, his x mark. [SEAL.]
PI-RA-TEEM, his x mark. [SEAL.]

For and in behalf of the Op-pe-o band:

CA-POR-U-PUCK, his x mark [SEAL.]
PEEK-NEETS, his x mark. [SEAL.]

For and in behalf of the He-ko-neck band:

YAH-FEE-PAH, his x mark.
HON-A-PUCK-IF-MA, his x mark [SEAL.]

For and in behalf of the In-neck band:

SISH-KAH, his x mark. [SEAL.]

Signed, sealed and delivered after the foregoing treaty of 6th instant, and this addenda had been fully explained in presence of—

JOHN MCKEE, *Secretary.*
C. W. DURKEE, *Interpreter*
GEORGE GIBBS.
H. W. WESSELLS, *Brevet Major U. S. A., commanding escort*
JOHN S. GRIFFIN, *Assistant Surgeon U. S. A.*
WALTER MCDONALD.

TREATY WITH THE UPPER KLAMATH, SHASTA AND SCOTT'S RIVER, 1851.

TREATY MADE AND CONCLUDED AT CAMP, IN SCOTT'S VALLEY, SHASTA COUNTY, STATE OF CALIFORNIA, NOVEMBER 4, 1851, BETWEEN REDICK M'KEE, ONE OF THE COMMISSIONERS ON THE PART OF THE UNITED STATES, AND THE CHIEFS, CAPTAINS AND HEAD MEN OF THE UPPER KLAMATH, SHASTA, AND SCOTT'S RIVER TRIBES OF INDIANS.

November 4, 1851.
Unratified.

A treaty of peace and friendship made and concluded at camp, in Scott's valley, Shasta county, California, between Redick McKee, one of the Indian agents specially appointed to make treaties with the various Indian tribes in California, on the part of the United States, and the undersigned chiefs, captains and head men now in council at this camp, representing the Upper Klamath, Shasta, and Scott's river Indians, residing severally in twenty-four, nineteen, and seven rancherias or villages, and known as the O-de-i-lah tribe or band, I-shack chief, from the Upper Klamath river; I-ka-ruck tribe or band, Tso-hor-git-sko chief; Ko-se-tah tribe or band, Ada-war-how-ik chief; I-da-kar-i-waka-ha tribe or band, I-da-kar-i-waka-ha chief, from Shasta valley; Wat-sa-he-wa tribe or band, Ar-rats-a-cho-i-ca chief; E-eh tribe or band, An-na-nik-a-hok chief, from Scott's valley.

ARTICLE 1. The said tribes or bands acknowledge themselves jointly and severally under the exclusive jurisdiction, authority and protection of the United States, and hereby bind themselves to refrain hereafter from the commission of all acts of hostility or aggression towards the government or citizens thereof, to live on terms of peace and friendship among themselves and with all other Indian tribes which are now or may hereafter come under the protection of the United States.

ART. 2. To preserve the peace and friendship hereby established between the United States and the said tribes or bands, it is understood and agreed that for injuries received on either side, no private revenge or retaliation shall take place or be attempted; but instead thereof complaints shall be made by the party aggrieved to the other, through the Indian agent or sub-agent of the United States for their district, who shall investigate, and, if practicable, adjust the difficulty; and in case of acts of violence being committed upon the person or property of a citizen or citizens of the United States by an Indian or Indians belonging to or harbored by either of said tribes or bands, the party or parties charged with the commission of the crime shall be promptly delivered up when demanded of the chiefs by the said agent or a duly authorized officer of the county, to be tried for the alleged offence by the civil authorities of the State of California; and in case the crime has been committed by a citizen or citizens of the United States upon the person or property of an Indian or Indians of either of said tribes or bands, the agent shall take all proper measures to bring the offender or offenders to trial in the same way.

ART. 3. The said tribes or bands for and in consideration of the premises, and of the stipulations and promises hereinafter contained, hereby jointly and severally sell, cede, relinquish, and forever quit claim to the United States, all their right, title, claim or interest of any kind which they or either of them have to the lands they now occupy, and to all other lands or soil in California.

ART. 4. To promote the permanent settlement and improvement of said tribes or bands, it is hereby stipulated and agreed that the following described tract or district of country shall be appropriated and set apart as an Indian reservation, and the use and possession thereof forever guarantied to the said tribes or bands and their successors, equally with such other Indian tribes or bands and their successors, as the United States may hereafter remove from the waters of the Klamath or Trinity rivers of elsewhere in northern California, and settle thereupon, to wit: commencing at a point on the easterly side of Scott's valley, about six miles above the cabin or improvement generally known as Watson, Gee & Company's ranch, where two cedar trees stand upon the southwest side of a bald hill, and midway between the said cedars; thence running in a southwesterly direction across the said valley to a point projecting into the same, behind which stands a conical peak called Seino's peak; thence over the same and over said peak to the summit of the dividing ridge between the waters of Scott's and Klamath rivers; thence following the same

to where a divide runs northward to a creek or large brook entering the Klamath from the northward next above the one entering at Murderer's bar, and known as Indian creek; thence along said divide and across the Klamath river to the mouth of said creek; thence up the main fork of said creek to the forty-second parallel of north latitude; thence eastward along said parallel to a point due north of a point where the ridge dividing the waters of Scott's river from the waters of Humbug creek terminates at or near the Klamath; thence due south, crossing the Klamath river, to said point; thence following said divide and the divide separating the waters of Scott's river from the waters of Shasta river to a point in a line with the place of beginning, and thence southwesterly to said place of beginning; said tract being by estimation twenty-four miles in length from northwest to southeast by fifteen miles in average width, and containing between four and five square miles of tillable land, *Provided, however*, That those citizen of the United States who are now engaged in mining, raising, or washing gold upon that part of Scott's river lying between the first creek entering the same from the north, above the town of Scott's bar and the mouth of said river, shall be permitted to hold and work the claims of which they are now in actual possession for the term of two years from the date of this instrument, unless sooner exhausted; and *Provided further*, That such other citizens of the United States as have already thrown up earth or raised ore on any other part of said reserve shall be allowed until the first day of June next to wash the same, and that those having cabins or other improvements already erected on said reservation shall be permitted to occupy and enjoy the same, free from molestation, until said first day of June, eighteen hundred and fifty-two, and no longer. *It is also further provided*, That the said tribes or bands shall never sell or alienate their right or claim to any part thereof except to the United States, nor shall they ever lease to or permit white men to settle, work, or trade upon any part thereof without the written permission of the United States Indian agent for the district. It is agreed and understood, however, that the United States reserves the right of way over said lands, and of using for farming purposes any quantity thereof not exceeding one thousand acres; also the right to establish such military post or posts, erect such buildings, and make such other improvements for the accommodation of an Indian agent and other officers or servants as the President may direct.

ART. 5. The said tribes or bands agree and hereby bind themselves to remove to and settle permanently upon said reservation, within two years from the date hereof, or sooner if thereto required by the Indian agent of the United States; and whenever said removal and settlement shall take place, the United States with a desire to encourage them in acquiring a knowledge of letters, agriculture, and the mechanic arts, will employ and settle among them upon said reservation, one principal school-teacher, with three male and female assistant teachers to instruct said tribes in the different branches of a common-school education and in the domestic arts of sewing and house-keeping, upon the manual labor system; also one practical farmer who shall assist said tribes in cultivating the soil and act as superintendent of agricultural operations, with two assistant farmers, one carpenter or worker in wood who shall direct and aid in the construction of houses, repairing wagons, &c., and one blacksmith or worker in iron also to be employed for their assistance and convenience; all of the above teachers, farmers, and mechanics to be paid and maintained upon said reservation by the United States for the period of five years, and as long thereafter as the President may deem advisable; also that the United States will erect suitable dwellings, school-houses and shops for the accommodation of an agent, and of the teachers, farmers and mechanics above specified, and store-houses for the protection of the public property.

ART. 6. The United States will also appoint and settle among said tribes upon said reservation, an agent or sub-agent of the Indian department to carry out the stipulations of this treaty and the general laws and regulations of the Indian department pertaining to the government and improvement of said tribes; and until the United States shall have established a military post on or in the neighborhood of said reservation, with a regular physician or surgeon attached thereto, the United States Indian agent for the district shall be authorized, and is hereby directed to employ at the expense of the United States, an experienced physician to reside on said reservation, attend to the sick among either whites or Indians, and especially

to vaccinate the members of each tribe; and when said military post shall be established, the services of the surgeon thereto attached may be substituted by said agent for those of the physician first employed, allowing him therefor a reasonable compensation.

ART. 7. To aid said tribes or bands in their subsistence while removing to and making their settlement upon said reservation, the United States, in addition to twelve head of beef cattle, twenty sacks (one thousand pounds) of flour, and numerous other presents of blankets, shirts, &c., given to them at this camp, will furnish them free of charge, during each of the years 1852 and 1853, with two hundred head of beef cattle, to average in weight five hundred pounds net, and two hundred sacks (equal to twenty thousand pounds) of flour, five hundred pair of two and a half point Mackinaw blankets, five hundred pairs strong pantaloons, five hundred cotton (hickory) shirts, five hundred red flannel shirts, six hundred linsey gowns for women, and girls, three thousand yards of calico, three thousand yards 4–4 brown sheetings, twenty-five pounds of Scotch thread, five thousand needles, assorted, one gross of thimbles, ten pounds of pins, twelve dozen scissors, fifty dozen common size butcher knives, five hundred pea-jackets of heavy, strong cloth, assorted, one thousand pounds of salt, one hundred hatchets, all to be distributed among them by the agent, according to their respective numbers.

ART. 8. As early as convenient after the ratification of this treaty by the President and Senate, and the settlement of said tribes or bands upon said reservation, the United States will also furnish them with twenty-four brood mares and one stallion, thirty milch cows and one bull, fifty sheep, ten hogs (both sexes,) four yoke of work cattle, with yokes, chains, &c., two breaking ploughs, ten small ploughs, two ox wagons, one mule wagon, seeds of all proper kinds for sowing and planting, eight work mules or horses with harness, one hundred heavy spades, twelve mattocks, four hundred garden or corn hoes, two hundred chopping axes, common size, with handles, two hundred chopping axes, small size, with handles, two hundred sheet-iron camp-kettles, first size, two hundred sheet-iron camp-kettles, second size, four hundred tin pans, (two hundred large size, two hundred small size,) one set of blacksmithing tools, one set of carpenter's tools, three thousand pounds of iron, five hundred pounds of steel, assorted, fifty dozen pint tin cups, fifty dozen tin plates, fifty dozen iron-lined spoons, three United States flags. The stock enumerated above, and the product thereof, together with the farming utensils and mechanical tools to be held as the joint property of said tribes or bands, the former to be marked or branded with such letters or marks as will at all times designate the same to be their property, and no part or portion thereof shall be killed, exchanged, sold, or otherwise parted with, without the assent and direction of the agent.

ART. 9. It is further agreed, that the United States will fence in with a good board or post and rail fence, preparatory to breaking up the soil for planting, one thousand acres of land; and if, by the year 1853, the said tribes or bands shall not be in a situation to provide themselves with food and clothing, and the agent for their district shall so recommend, the President, in his discretion, may order for their use, in the year 1854, a like or smaller quantity of the articles enumerated in article 7 to be provided for the years 1852 and 1853.

ART. 10. It is further understood and agreed that within the line of the reservation referred to and described in article 4, there shall be retained and set apart a belt or border of one mile in width on the eastern and southern sides or lines thereof, whereon it shall not be lawful for either Indians or white men to settle on or remain, or to pass over except by the highways or roads running through the same, but the same shall be exclusively within the jurisdiction of the United States.

ART. 11. The said tribes or bands hereby bind themselves to deliver up within sixty days from the date hereof, all horses, mules, or other property which may be in their possession, stolen from the whites, the claimants making proof of ownership before the agent or such person as he may designate to act in his absence, or before a magistrate or judge of the county of Shasta; all such property claimed but not clearly identified, to be returned to the Indians.

In testimony whereof, the parties have hereunto signed their names and affixed their seals, this fourth day of November, anno Domini eighteen hundred and fifty-one.

REDICK McKEE,
United States Indian Agent. [SEAL.

For and in behalf of the O-de-i-lah tribe or band from the Upper Klamath river:

I-SHACK, his x mark. [SEAL.]
E-EH-NE-QUA, his x mark [SEAL.]
PI-O-KUKE, his x mark. [SEAL.]
SA-NAK-A-HA, his x mark. [SEAL.]

For and in behalf of the I-ka-ruck tribe or band in Shasta valley:

TSO-HOR-GIT-SKO, his mark. [SEAL.]
CHE-LE-NA-TUK, his x mark. [SEAL.]

For and in behalf of the Ko-se-tah tribe or band in Shasta valley:

ADA-WAR-HOW-IK, his x mark. [SEAL.]
QUAP-SOW-A-HA, his x mark. [SEAL.]

For and in behalf of the Ida-kar-i-waka-ha tribe or band in Shasta valley:

A-LAT-SE-WAK-A-NA, his x mark. [SEAL.]
IDA-KAR-I-WAK-A-HA, his x mark. [SEAL.]

For and in behalf of the Wat-sa-he-wa tribe or band in Scott's valley:

AR-RATS-A-CHO-I-CA, his x mark. [SEAL.]

For and in behalf of E-eh tribe or band in Scott's valley:

AN-NA-NIK-A-HOK, his x mark [SEAL.]
SUN-RISE, his x mark. [SEAL.]

Signed, sealed and delivered, after being fully explained, in presence of—

JOHN McKEE, *Secretary.*
GEORGE GIBBS, } *Interpreters.*
LINDLEY ABEL, }
W. T. SMITH.
F. H. McKINNEY.
C. McDERMIT.
SAMUEL FLEMING.
WALTER McDONALD.
C. FULTON.
WM. H. BURGESS.
EDWARD HICKS.
WILLIAM DAIN.
LIRY SWAN.
GEO. W. TAIT.

TREATY WITH THE SAN LOUIS REY, ETC., 1852.

TREATY MADE AND CONCLUDED AT THE VILLAGE OF TEMECULA, STATE OF CALIFORNIA, JANUARY 5, 1852, BETWEEN THE UNITED STATES INDIAN AGENT, O. M. WOZENCRAFT, AND THE CHIEFS, CAPTAINS AND HEAD MEN OF THE SAN LOUIS REY, KAH-WE-AS, AND THE CO-COM-CAH-RAS TRIBES OF INDIANS.

January 5, 1852.
Unratified.

A treaty of peace and friendship made and concluded at the village of Temecula, California, between the United States Indian Agent, O. M. Wozencraft, of the one part, and the captains and head men of the following nations, viz: The nation of San Louis Rey Indians, the Kah-wé-as, and the tribe of Co-cóm-cah-ras.

ARTICLE 1. The several nations above mentioned do acknowledge the United States to be the sole and absolute sovereign of all the soil and territory ceded to them by a treaty of peace made between them and the republic of Mexico.

ART. 2. The said nations of Indians acknowledge themselves, jointly and severally, under the exclusive jurisdiction, authority and protection of the United States, and hereby bind themselves hereafter to refrain from the commission of all acts of hostility and aggression towards the government or citizens thereof, and to

Klamath River Reserve.

DEPARTMENT OF THE INTERIOR,
Office of Indian Affairs, November 10, 1855.

SIR: Referring to your communication of the 8th of August last to the Acting Commissioner of Indian Affairs, advising him of the approval by the President of the United States of the recommendation of the Department that it was expedient to expend the money appropriated on the 3rd of March last for removing the Indians in California to two additional military reservations, I have the honor now to make the following report:

On the 15th of August last the Acting Commissioner inclosed a copy of your letter of the 8th of that month to the superintendent of Indian affairs in California, with directions to select these reservations from such "tracts of land adapted as to soil, climate, water-privileges, and timber, to the comfortable and permanent accommodation of the Indians, which tracts should be unincumbered by old Spanish grants or claims of recent white settlers," limiting the dimensions of the reserves to within 25,000 acres each, and to report to this office a description of their geographical position in relation to streams, mountain ranges, and county lines, etc., and indicating the same upon a map. A copy of that letter is herewith, marked A. By the last mail from California, I have received from Superintendent Thomas I. Henley a report upon this subject, dated the 4th ultimo (a copy of which is herewith, marked B), by which it appears he recommends as one of the reservations aforesaid "a strip of territory one mile in width on each side of the (Klamath) river, for a distance of 20 miles." The superintendent remarks upon the character of the country selected, and incloses an extract from a report (also herewith, marked C) to him of the 19th of June last, by Mr. S. G. Whipple, which contains in some detail a description of the country selected, habits and usages of the Indians, etc., but no map is furnished.

It will be observed from this report of the superintendent that he has deemed it important to continue the employ of an agent and to prepare for raising a crop in order to assure the Indians of the good faith of the Government and to preserve the peace of the country. Considering the great distance of this reserve from the seat of Government and the length of time it necessarily requires to communicate with an agency at the Klamath, it is desirable that some definite action be taken, if practicable, before the sailing of the next steamer, to leave New York on the 20th instant.

I, therefore, beg leave to ask your attention to the subject, and if you shall be of the opinion from the representations made by the superintendent in California and Mr. Whipple that the selection at the mouth of the Klamath River is a judicious and proper one, that it be laid before the President of the United States for his approval, but with the provision, however, that upon a survey of the tract selected that a sufficient quantity be cut off from the upper end of the proposed reserve to bring it within the limitation of 25,000 acres, authorized by the act of 3d March last.

I also inclose herewith a copy of another letter from Superintendent Henley, of 4th ultimo (marked D), in which he states, in relation to the other reserve, that it is intended to locate it "between the headwaters of Russian River and Cape Mendocino." In reference to both of these proposed reserves, and as connected with the means to be used to maintain peacable relations with the Indians, the superintendent is of opinion that it is of great importance to provide for crops, and that to do so an agent in each instance is necessary. As this last-named selection has not been defined by any specific boundaries, and no sufficient description is given as to soil, climate, and suitableness for Indian purposes, to enable the Department to determine the matter under-

standingly, of course nothing definite can now be done. But it may not be improper to consider the subject in connection with the general intent as to the particular locality in which it is proposed to make the location.

The reserve proposed on the Klamath River and Pacific coast does not appear from the map of the State of California to be very far removed from Cape Mendocino, or a point between that and Russian River; and as provision is made only for two reserves in the State other than those already in operation, the question arises whether it should not be situated farther in the interior, or perhaps eastern part of the State, than the point referred to. The Noome Lacke Reserve is situated in one of the Sacramento valleys, at about the latitude of 40 degrees north and 122 degrees of longitude west, about the center of that portion of the State north of the port of San Francisco. As, therefore, the proposed Klamath Reserve, being northwest from the Noome Lacke Reservation, would appear to be adapted to the convenient use of the Indians in that direction, the question is suggested whether the other reserve should not be located farther east and north, say on the tributaries of either Pitt or Feather Rivers. As in the case of the proposed reserve of the Klamath, I am desirous of obtaining your opinion and that of the President of the United States, with such decision as may be arrived at under the circumstances, in season to communicate the same by the next California mail, for the government of the action of superintendent Henley.

Very respectfully, your obedient servant,

GEO. W. MANYPENNY,
Commissioner.

Hon. R. MCCLELLAND,
Secretary of the Interior.

DEPARTMENT OF THE INTERIOR,
Washington, D. C., November 12, 1855.

SIR: I have the honor to submit herewith the report from the Commissioner of Indian Affairs of the 10th instant, and its accompanying papers, having relation to two of the reservations in California for Indian purposes, authorized by the act of 3d March last.

The precise limits of but one of the reservations, viz, a strip of territory commencing at the Pacific Ocean and extending 1 mile in width on each side of the Klamath River, are given, no sufficient data being furnished to justify any definite action on the other.

I recommend your approval of the proposed Klamath Reservation, with the provision, however, that upon a survey of the tract a sufficient quantity be cut off from the upper end thereof to bring it within the limit of 25,000 acres authorized by law.

Respectfully, your obedient servant,

R. MCCLELLAND,
Secretary.

The PRESIDENT.

Let the reservation be made, as proposed.

FRANKLIN PIERCE.

NOVEMBER 16, 1855.

Mendocino Reserve.

DEPARTMENT OF THE INTERIOR,
Office of Indian Affairs, April 16, 1856.

SIR: Referring to the report I had the honor to submit for your consideration on the 10th of November last, relative to the establishment

Yuma Reserve.

(For order relating to Yuma Reserve in Arizona, see California, post page 831.)

CALIFORNIA.

Hoopa Valley Reserve.

[Occupied by Hunsatung, Hupa, Klamath River, Miskeet, Redwood, Saiaz, Sermolton, and Tishlanaton tribes; area, 155 square miles; established by act of April 8, 1864 (13 Stat., 39), and Executive orders.]

By virtue of power vested in me by an act of Congress approved April 8, 1864, and acting under instructions from the Interior Department, dated at Washington City, D. C., April 26, 1864, concerning the location of four tracts of land for Indian reservations in the State of California, I do hereby proclaim and make known to all concerned that I have this day located an Indian reservation, to be known and called by the name and title of the Hoopa Valley Reservation, said reservation being situated on the Trinity River, in Klamath County, California, to be described by such metes and bounds as may hereafter be established by order of the Interior Department, subject to the approval of the President of the United States. Settlers in Hoopa Valley are hereby notified not to make any further improvements upon their places, as they will be appraised and purchased as soon as the Interior Department may direct.

AUSTIN WILEY,
Superintendent Indian Affairs for the State of California.

FORT GASTON, CAL., *August 21, 1864.*

EXECUTIVE MANSION, *June 23, 1876.*

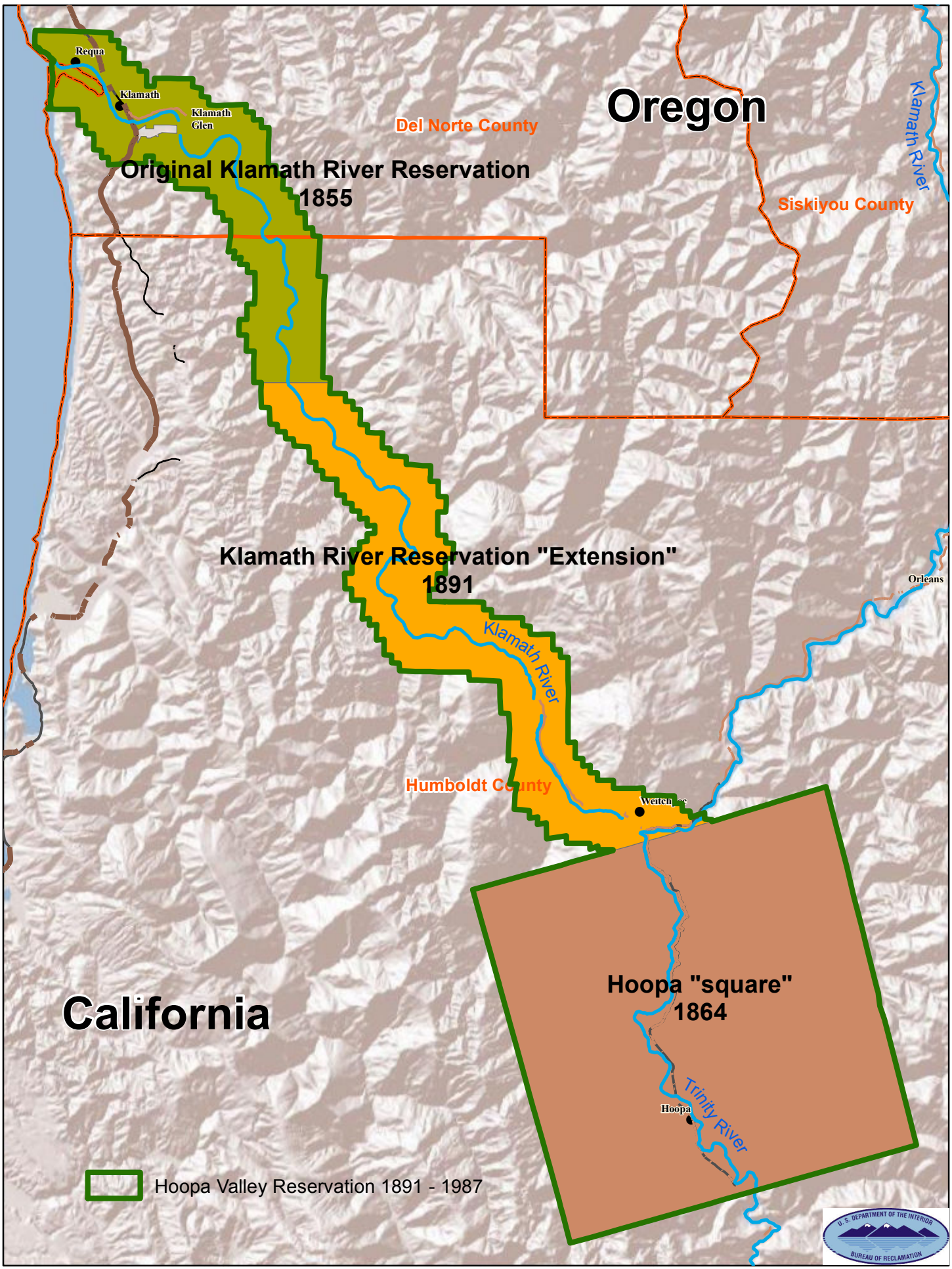
It is hereby ordered that the south and west boundaries and that portion of the north boundary west of Trinity River surveyed, in 1875, by C. T. Bissel, and the courses and distances of the east boundary, and that portion of the north boundary east of Trinity River reported but not surveyed by him, viz: "Beginning at the southeast corner of the reservation at a post set in mound of rocks, marked 'H. V. R., No. 3'; thence south 17½ degrees west, 905.15 chains, to southeast corner of reservation; thence south 72½ degrees west, 480 chains, to the mouth of Trinity River," be, and hereby are, declared to be the exterior boundaries of Hoopa Valley Indian Reservation, and the land embraced therein, an area of 89,572.43 acres, be, and hereby is, withdrawn from public sale, and set apart for Indian purposes, as one of the Indian reservations authorized to be set apart, in California, by act of Congress approved April 8, 1864. (13 Stats., p. 39.)

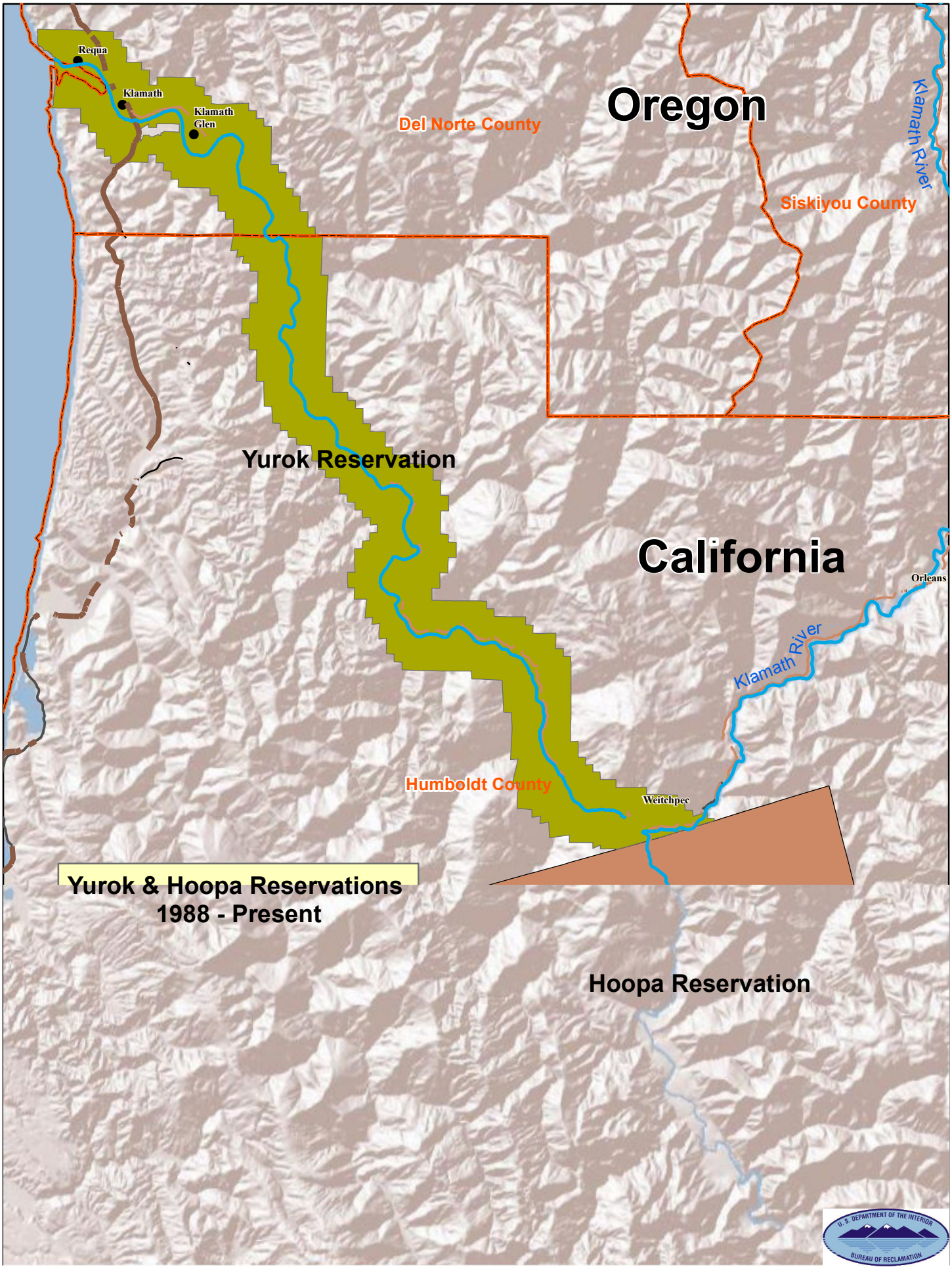
U. S. GRANT.

EXECUTIVE MANSION, *October 16, 1891.*

It is hereby ordered that the limits of the Hoopa Valley Reservation in the state of California, a reservation duly set apart for Indian purposes, as one of the Indian reservations authorized to be set apart, in said State, by Act of Congress approved Apri l8, 1864, (13 Stats., 39), be and the same are hereby extended so as to include a tract of country one mile in width on each side of the Klamath River, and extending from the present limits of the said Hoopa Valley reservation to the Pacific Ocean; *Provided, however*, That any tract or tracts included within the above described boundaries to which valid rights have attached under the laws of the United States are hereby excluded from the reservation as hereby extended.

BENJ. HARRISON.


Oregon
California
Del Norte County
Siskiyou County
Humboldt County
Original Klamath River Reservation
1855
Klamath River Reservation "Extension"
1891
Hoopa "square"
1864
Klamath River
Trinity River
Requa
Klamath
Klamath Glen
Orleans
Hoopa
Hoopa Valley Reservation 1891 - 1987
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION


Requa
Klamath
Klamath Glen
Oregon
Del Norte County
Klamath River
Siskiyou County
Yurok Reservation
California
Orleans
Klamath River
Humboldt County
Weitchpec
Yurok & Hoopa Reservations
1988 - Present
Hoopa Reservation
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Attachment 3

3a KBRA Part I, General Provisions, 1.2. General Recitals, Section 1.2.3. Sustainable Tribal Communities

3b KBRA Part VII. Tribal Program

3c KBRA Part III. Fisheries Program, Section 9 beginning with 9.2 Program Elements, Section 10. Fisheries Restoration Plan, and Section 11. Fisheries Reintroduction and Management Plan

Attachment 3a

KBRA Part I, General Provisions, 1.2. General Recitals, Section 1.2.3. Sustainable Tribal Communities

National Marine Fisheries Service;
United States Department of Agriculture, Forest Service; and
United States Department of the Interior, including Bureau of Indian Affairs, Bureau of Land Management, Bureau of Reclamation, and Fish and Wildlife Service.

Prior to any Federal agency becoming a Party to this Agreement as described above, whenever this Agreement attributes an action to a Federal agency, that attribution states an expectation of the Non-Federal Parties, rather than an obligation of the Federal agency under this Agreement.

1.1.3. Addition of Other Parties

Sixty days after the Effective Date, other entities may subsequently become Parties by following the procedures established in Section 7.2.2.

1.2. General Recitals

1.2.1. Klamath Hydroelectric Project

The Klamath Hydroelectric Project (FERC No. 2082), located on the Klamath River and its tributaries, blocks the upstream passage of anadromous and other fish at River Mile 195 and has other adverse impacts as a result of flow regulation. The Klamath Hydroelectric Settlement Agreement (Hydroelectric Settlement) establishes a process for potential Facilities Removal and operation of the Hydroelectric Project until that time.

1.2.2. Klamath Reclamation Project and Other Irrigation Deliveries

The Parties enter into this Agreement to resolve longstanding disputes between them regarding the amounts, timing, and other conditions of diversion and delivery of water for irrigation, National Wildlife Refuges, and related uses within the Klamath Reclamation Project and by non-federal entities in the Upper Klamath Basin regarding flows and lake levels that support Fish Species and wildlife. The resolution achieved here is intended to protect the sustainability of the agricultural uses and communities along with public and trust resources.

1.2.3. Sustainable Tribal Communities

Tribes have lived in the Klamath River Basin since time immemorial and are expected to continue to do so using sustainable resource-based economies. There are tribal fishing rights in various locations that have associated water rights for the fish to propagate and produce sufficient numbers for harvest. The Tribes, irrigators, and the United States have differed in administrative and judicial settings over the amounts of water needed for fish. This Agreement seeks to resolve these substantial differences and also to provide the Tribes with both sustainable natural resources and sustainable communities.

Attachment 3b

KBRA Part VII. Tribal Program

PART VII.
TRIBAL PROGRAM

31. Overview of Tribal Program

31.1. Recitals

31.1.1. As the original stewards of the natural resources of the Klamath River Basin, the Karuk Tribe, Klamath Tribes, and Yurok Tribe hold special positions in the Basin. The Parties are mindful of the Tribes' interests in, and relation to the Basin ecosystem and its fisheries.

31.1.2. The Parties acknowledge that the Tribes' economic, cultural, and spiritual dependence upon the natural resources of the Klamath Basin have caused the Tribes to be particularly vulnerable as those resources have become scarce. Over the past century, traditional tribal subsistence and related economies have suffered.

31.1.3. The Tribes have a sound and long standing history of competent resource management that provides the Tribes with special understanding of natural resource science and restoration.

31.1.4. Accordingly, the Tribes, Public Agency Parties, and other Parties acknowledge the Tribes' essential role in the Collaborative Management necessary to implement the provisions of this Agreement.

31.2. Purposes

The Parties support the goals of each Tribe to achieve the revitalization of tribal subsistence and related economies during the period immediately following this Agreement. The Parties support the Tribes as they strive to meet a reasonable standard of living, a standard recognized in the reservation of tribal fishing and other related rights, until the fisheries are restored such that Full Participation in Harvest Opportunities are achieved. Funding provided in these sections is, among other purposes, intended to be used to assist the Tribes in developing the capacity to participate as grantees and in the Collaborative Management of the Fisheries Program described in Sections 9 through 13 above.

31.3. Funding

The Non-Federal Parties shall support authorizations and appropriations in addition to existing funds, in the amount of $65 million as estimated in Appendix C-2, to implement the Tribal Program for the first ten years following the Effective Date.

32. Tribal Participation in Fisheries and Other Programs

32.1. Purpose

The Parties support tribal participation in the Fisheries and other programs under this Agreement. Specifically, funding provided for this purpose shall be used in each Tribe's discretion for the purposes of: (i) building each Tribe's internal capacity to participate in the Collaborative Management and restoration of the fisheries; (ii) administration of each Tribe's fisheries-related programs; and (iii) participation in conservation management programs for habitat above Upper Klamath Lake and on the Klamath River.

32.2. Term of Funding

The Non-Federal Parties shall support authorization and appropriation of funds, as estimated in Appendix C-2 for the first ten years after the Effective Date.

32.3. Other Funding

In the Collaborative Management of the Environmental Water and resources of the Klamath Basin, and as consistent with Applicable Law, the Tribes shall be priority recipients of federal grants and funds for Fisheries Program described in Part III. The Tribes will remain eligible for funding associated with fisheries restoration and reintroduction programs outside the scope of this Agreement.

33. Long-term Economic Revitalization Projects

33.1. Other Funds

The Parties acknowledge that this Agreement addresses primarily tribal fishing and water matters, and accordingly agree that they will also support efforts by the Tribes to secure economic revitalization programs and funds such that the Tribes may achieve long-term economic self-sufficiency. Funding provided for Long-Term Economic Revitalization Projects will be used at each Tribe's discretion for development and planning of long-term economic revitalization projects.

33.2. Mazama Project

33.2.1. Acquisition

The Non-Federal Parties shall support the authorization and appropriation of, or otherwise Timely provision to, the Klamath Tribes of $21,000,000 toward the acquisition of the Mazama Forest Project in Klamath County, Oregon. The Parties agree that nothing in the development of the Mazama Forest Project, including but not limited to the Klamath Tribes' purchase of property, or the United States' designation of property as having federal trust status, will alter existing law regarding the applicability of state water law. The Parties agree that, notwithstanding the first sentence in Section 6, any disputes about the

applicability of state water law shall be resolved in a court of competent jurisdiction.

33.2.2. Withdrawal

In the event that the funding described in Section 33.2.1 is not Timely provided, the Klamath Tribes shall have the right to withdraw from this Agreement. Section 7.5 shall not apply to such withdrawal. Prior to exercising the right of withdrawal, the Klamath Tribes shall Timely provide the Parties with a Notice of impending failure which shall set out the relevant circumstances. Following such Notice, the Parties shall meet and confer in an effort to remedy the failure or to amend this Agreement as provided for in Section 7.2.1.B, provided that the referral to the Dispute Resolution Procedures in Section 7.2.1.F shall not apply. If, after 30 days, the failure is not remedied or the Agreement is not amended, then the Klamath Tribes may withdraw from this Agreement by providing a Notice of withdrawal to the Parties, and the Klamath Tribes shall thereafter have no obligation under this Agreement to provide Assurances, waivers, or relinquishments of any kind, and any Assurances, waivers, or relinquishments of any kind they have provided shall terminate.

33.2.3. Sections Surviving Withdrawal

Notwithstanding the withdrawal of the Klamath Tribes pursuant to this Section 33.2, Section 15.3.2.B shall continue in force and effect.

34. Klamath Tribes' Interim Fishing Site

34.1. Petition

Within three months of the Effective Date, the CDFG, Klamath Tribes, and relevant agencies of the United States will jointly petition the California Fish and Game Commission to establish an interim fishing site in the reach of the Klamath River between Iron Gate Dam and the I-5 Bridge. The petition will provide that Chinook salmon fishing in this reach of the river will be open to the Klamath Tribes each salmon season immediately after the hatchery at Iron Gate Dam achieves egg take goals. The provisions regulating this interim fishing site, including the definition of the interim period for this purpose, will be set forth in this joint petition. The Parties will support the petition. The interim fishing regulations will become effective as soon as practicable.

34.2. Alternative Procedure

If the petition is not granted, the United States, the Klamath Tribes, and other interested Parties agree to meet and confer to develop equivalent benefits for the Klamath Tribes.

34.3. No Adverse Impact

Any outcome under this Section 34 will not have any adverse impact upon existing harvest allocation issues among other Tribes and non-Indian interests.

PART VIII.
EXECUTION OF AGREEMENT

35. Authority

35.1. General

Each signatory to this Agreement certifies that he or she is authorized to execute this Agreement and to legally bind the Party he or she represents. As of the Effective Date, this binding effect applies to all obligations which legally may be performed under existing authorities. This binding effect applies to other obligations arising from new authorities arising pursuant to the Authorizing Legislation as provided in Section 3.1.1.

35.2. Public Agency Parties

In signing this Agreement, a Public Agency Party expresses its support for the Agreement and the policies that apply to its exercise of its authorities. By such signing and as provided in Sections 2.2.7 and 7.4.3, no Public Agency Party has taken an action.

36. Counterparts

This Agreement may be executed in counterparts. Each executed counterpart shall have the same force and effect as an original instrument as if all the signatory Parties to all of the counterparts had signed the same document.

37. Concurrent Execution

Each Non-Federal Party shall execute this Agreement and the Hydroelectric Settlement concurrently.

38. New Parties

Any entity listed in Section 1.1.1 of this Agreement that does not execute this Agreement on the Effective Date will become a Party, subject to Section 37, by signing the Agreement within 60 days of the Effective Date, without amendment of this Agreement or other action by existing Parties. After 60 days from the Effective Date, any such entity, or any other entity, may become a Party, subject to Section 37, through an amendment of this Agreement in accordance with Section 7.2.2. Federal Agency Parties shall become Parties pursuant to Section 1.1.2. The Hoopa Valley Tribe may become a Party under Sections 7.2.2. and 37 within 60 days of the Effective Date or otherwise on the following conditions: (a) the Hoopa Valley Tribe agrees to this Agreement and the Hydroelectric Settlement and agrees to insertion of provisions into this Agreement that are equivalent in nature, content and geographic scope as that of the signatory Tribes, including (i) Assurances to water users of the Klamath Reclamation Project and Reclamation and FWS, (ii) relinquishment and release of claims to the United States, and (iii) restriction of the scope of the Agreement to the Klamath River Basin outside of the Trinity River Basin; and (b) the Parties, including specifically the United States, Tribes and KPWU, agree to the amended provisions related specifically to the Hoopa Valley Tribe. In the event that the Hoopa Valley Tribe becomes a Party, the Parties shall amend Appendix C-2 to allocate funding

Attachment 3c

KBRA Part III. Fisheries Program, Section 9 beginning with 9.2 Program Elements, Section 10. Fisheries Restoration Plan, and Section 11 Fisheries Reintroduction and Management Plan

9.1. Recitals

9.1.1. Blockage of Passage

The Parties acknowledge that the Hydroelectric Project has excluded coho salmon, Chinook salmon, steelhead, and Pacific lamprey from the Klamath Basin upstream of Iron Gate Dam. The Parties also acknowledge that coho salmon, Lost River and shortnose suckers and bull trout are presently listed under the Federal Endangered Species Act.

9.1.2. Other Harmful Conditions

Portions of the Klamath River and its tributaries currently present certain conditions harmful to fish. These conditions include degraded riparian habitat and stream channels, passage barriers, diversions resulting in entrainment, adverse water quality conditions, adverse hydraulic conditions, fluctuating water levels, and other impacts, known and unknown. These conditions may result in mortality or injury to fish, and reduce the viability of fish populations. These conditions will probably continue in the future unless reduced by cooperative and concerted efforts to resolve them.

9.1.3. Benefits of Reintroduction

Notwithstanding the conditions described in Sections 9.1.1 through 9.1.2, the Parties expect that the availability of additional habitat and the introduction or reintroduction of Fish Species upstream of Iron Gate Dam are likely to result in significant net conservation benefits.

9.1.4. Benefits of Restoration

The Parties agree to pursue restoration actions above, within, and below the Hydroelectric Project to substantially remove, reduce or mitigate the conditions described in Sections 9.1.1 through 9.1.2.

9.2. Program Elements

9.2.1. Purposes

The purposes of the Fisheries Program are to restore and sustain natural production of Fish Species throughout the Klamath River Basin, excluding the Trinity River. Specifically, this program:

A. provides for reintroduction of anadromous Species throughout their historic range above Iron Gate Dam, including tributaries to Upper Klamath Lake but excluding the Lost River sub-basin, and for reestablishment and maintenance of the ecological functionality and connectivity of Fish habitat;

B. otherwise establishes conditions that, combined with effective implementation of the Water Resources Program in Part IV, will provide for the natural sustainability and genetic diversity of Fish Species, their full utilization of restored and reconnected habitat, Full Participation in Harvest Opportunities, as well as the overall ecosystem health of the Klamath River Basin;

C. assesses status and trends, and the factors that influence those trends, of Fish Species and their habitats as identified in Sections 9.1.1 and 9.1.2, and the effectiveness of actions under this Agreement to achieve this purpose; and

D. provides for adaptive management and reporting as described in Section 5.4 and elsewhere in the Agreement.

9.2.2. Approaches

Throughout the geographic scope of the Fisheries Program described in Section 9.2.3, the Fisheries Program shall use collaboration, incentives, and adaptive management as preferred approaches. The Fisheries Program shall also emphasize restoration and maintenance of properly functioning lake and riverine processes and conditions, and remediation of the conditions described in Section 9.1.2, while also striving to maintain or enhance economic stability of adjacent landowners. Further, the Fisheries Program shall prioritize habitat restoration and monitoring actions to ensure the greatest return on expenditures.

9.2.3. Geographic Scope

The focus of reintroduction shall be the Upper Klamath Basin. The focus of habitat restoration and monitoring shall be the Klamath River Basin, excluding the Trinity River watershed above its confluence with the Klamath River. The Agreement is not intended and shall not be implemented to establish or introduce populations of salmon, steelhead, or Pacific lamprey in the Lost River or its tributaries or the Tule Lake Basin.

9.2.4. Plans

The Parties agree to implement a Fisheries Restoration Plan, a Fisheries Reintroduction Plan, and a Fisheries Monitoring Plan (collectively, "Fisheries Plans"), along with measures in the Water Resources Program described in Part IV.

A. Plan Coordination

The Fisheries Plans shall include common as well as specific elements. They shall allow for Collaborative Management among Fish Managers and shall provide for coordinated performance, including adaptive management.

B. Mitigation of Adverse Impacts

To the extent feasible and appropriate, the Fisheries Plans shall mitigate adverse effects from reintroduction upon other Fish Species. Such effects may include but are not limited to the potential for disease, predation, and competition. In addition, the Fisheries Plans shall include measures, to the extent practicable and lawful, to mitigate threats to species listed under the ESA or other adverse impacts to natural resources, so as to protect the species and avoid disruption of ongoing programs under this Agreement.

9.2.5. Use of Best Available Science

The Fisheries Program shall be based on the best available scientific data and information. Fish Managers shall consider all relevant past and current scientific information.

9.2.6. Fisheries Program Goals

The Fisheries Program shall include goals to evaluate the Fisheries Program's progress and evaluate effectiveness of implementation.

Consistent with the purposes stated in Section 9.2.1, the goals of the Fisheries Program are to (i) restore and maintain ecological functionality and connectivity of historic Fish habitats; (ii) re-establish and maintain naturally sustainable and viable populations of Fish to the full capacity of restored habitats; and (iii) provide for Full Participation in Harvest Opportunities for Fish Species.

The Fisheries Program will establish metrics to evaluate program progress.

The Fish Managers shall use best available science to establish the specific metrics for such goals for each phase of the Fisheries Program. These metrics shall consider and integrate the four parameters for evaluating population viability status, including: abundance, population growth rate, genetic diversity, and population spatial structure.

9.3. Funding

The Non-Federal Parties shall support authorization and appropriation of funds in the amount of $493.2 million, as estimated in Appendix C-2, to implement the Fisheries Program for the first ten years after the Effective Date.

10. Fisheries Restoration Plan

10.1. Phase I of the Fisheries Restoration Plan

10.1.1. Preparation

Within one year of the Effective Date, the Fish Managers shall co-author and distribute a draft of Phase I of the Klamath River Fisheries Restoration Plan.

A. FWS and NMFS shall be co-Lead Parties for administrative tasks in the plan development process.

B. The Fish Managers shall work with other Parties and seek their input during plan development, and shall also consider public input under Applicable Law.

C. The Phase I Plan shall describe how the public comments and recommendations were incorporated. If the Fish Managers cannot agree as co-authors on the content of the Phase I Plan, FWS and NMFS shall author and distribute a Phase I Plan. The Fish Managers shall be responsible for revision of the Phase I Plan as appropriate pursuant to the same process used for the initial plan.

D. NMFS and FWS shall use Best Efforts to complete any NEPA analysis for the Phase I Plan and the Fish Managers shall use Best Efforts to finalize the Phase I Plan by March 31, 2012.

10.1.2. Plan Elements

Based on best available science, Phase I of the Fisheries Restoration Plan shall establish restoration priorities and criteria for restoration project selection for the ten years following the Effective Date. Specific elements will include, but may not be limited to, restoration and permanent protection of riparian vegetation, water quality improvements, restoration of stream channel functions, measures to prevent and control excessive sediment inputs, remediation of Fish passage problems, and prevention of entrainment into diversions. Within these specific elements, the Phase I Plan will address, among other things: (i) coarse sediment management in the Klamath River between Keno Dam and the Shasta River confluence, where coarse sediment supply will be managed, in coordination with any plan for Facilities Removal, to replenish and sustain existing in-river sediment storage capacity, which may subsequently be increased after evaluating the attendant biological benefits; and, (ii) management and reduction of organic and nutrient loads in and above Keno Reservoir and in the Klamath River downstream. The Phase I Plan will identify high priority projects that either: (i) have direct benefits to existing Fish resources; or (ii) will significantly contribute to protecting and preparing habitats for use by anadromous Fish once passage is

restored. The Phase I Plan shall indicate how it will integrate the approaches described in Section 9.2.2.

10.2. Phase II of the Fisheries Restoration Plan

10.2.1. Preparation and Adoption

Within seven years of finalization of the Phase I Plan, the Fish Managers shall co-author and distribute a draft Phase II of the Klamath River Fisheries Restoration Plan.

A. The Fish Managers shall collaborate with other Parties, including the KBCC, and seek their input during plan development, and shall also consider public input under Applicable Law.

B. The Phase II Plan shall describe how these comments and recommendations were incorporated.

C. The FWS and NMFS shall be co-Lead Parties for administrative tasks in the plan development process. If the Fish Managers cannot agree as co-authors on the content of the Phase II Plan, FWS and NMFS shall author and distribute a Phase II Plan.

D. NMFS and FWS shall use Best Efforts to complete any NEPA analysis for the Phase II Plan, and the Fish Managers shall use Best Efforts to finalize the Phase II Plan by March 31, 2022.

10.2.2. Plan Elements

Using the results of the effectiveness monitoring of Phase I actions, the Phase II Plan will establish elements, restoration priorities, and an adaptive management process, for the remaining term of the Agreement. The Phase II Plan will describe how it will integrate the approaches described in Section 9.2.2.

10.2.3. Plan Revision

The Fish Managers shall be responsible for revision of the Phase II Plan as appropriate and pursuant to the same process used for the initial plan.

11. Fisheries Reintroduction and Management Plan

Reintroduction of anadromous Fish into the Upper Klamath Basin by the Fish Managers will involve two planning and implementation phases. Phase I will address the near-term investigations, facilities, actions, monitoring, and decisions necessary to initiate and accomplish the reintroduction of anadromous Fish Species. Phase II will address the management of re-established Fish populations in presently un-occupied habitats and as part of the fisheries of the Klamath River Basin.

11.1. Oregon Wildlife Policy

Because anadromous Fish Species were not part of fisheries management in the Klamath River Basin in Oregon, and in light of Parties' support of the January 15, 2008 public draft of the Agreement, ODFW presented an Amendment to the Klamath River Basin Fish Management Plan (1997) to the Oregon Fish and Wildlife Commission. The Commission adopted the Amendment on July 18, 2008. The 2008 Amendment to the 1997 Klamath River Basin Fish Management Plan (OAR 635-500-3890 *et seq.*) provides Policy direction for ODFW's participation in the implementation of this section.

11.1.1. General Policy

Oregon's Wildlife Policy (ORS 496.012) recognizes that the Oregon Fish and Wildlife Commission represents "the public interest of the State of Oregon" and further will implement the goal "To develop and manage the lands and waters of the state in a manner that will enhance the production and public enjoyment of wildlife." By statutory definition, wildlife includes fish. Nothing in this Agreement modifies or abrogates the Oregon Fish and Wildlife Commission's statutory responsibilities.

11.1.2. Amended Klamath Policy

The July 2008 Amendment to the Klamath River Basin Fish Management Plan (OAR 635-500-3890 *et seq.*) established Goals, Policies, and Objectives to direct ODFW in the development of the Phase I and Phase II Reintroduction and Management Plans.

A. Goal: Self-Sustaining Populations of Anadromous Fish

Oregon's goal is to re-establish in Oregon, self-sustaining, naturally-produced populations of Chinook, steelhead, coho, and lamprey that were historically present in the Upper Klamath Basin, into historic habitats currently vacant of anadromy.

B. Fish Plans

The 2008 Amendment to the Klamath River Basin Fish Management Plan (1997) directs ODFW to develop a Reintroduction Implementation Plan and an Anadromous Fish Conservation Plan for the Oregon portions of the Klamath River Basin. The Reintroduction Implementation Plan corresponds with the Phase I Plan described below. The Anadromous Fish Conservation Plan corresponds with the Phase II Plan described below.

C. Policies

The 2008 Amendment to the Klamath River Basin Fish Management Plan (1997) provides Policies that direct ODFW to: develop a

Reintroduction Implementation Plan prior to release of any Chinook above Upper Klamath Lake; monitor the volitional re-colonization of the Oregon portion of the Klamath River and tributaries by Chinook salmon, steelhead, coho salmon, and Pacific lamprey, and not release anadromous fish into the Oregon portion of the Klamath River and tributaries below Upper Klamath Lake unless re-colonization is proceeding too slowly according to criteria developed in the Reintroduction Plan; and develop a Reintroduction Implementation Plan prior to release of any Chinook above Upper Klamath Lake.

11.2. Oregon Fisheries Reintroduction and Management Plans

11.2.1. Preparation and Adoption

A. Upon receipt of funding to implement this Agreement, but no later than upon state concurrence with an Affirmative Determination under Section 3 of the Hydroelectric Settlement, ODFW and the Klamath Tribes shall prepare, collaboratively with other Fish Managers, the Phase I Reintroduction Plan for reintroduction of anadromous Fish Species into Oregon reaches of the Klamath River Basin. Plan development will include measures to implement early components of reintroduction. It will include participation from interested Parties and other entities capable of adding appropriate technical expertise to the process. ODFW and the Klamath Tribes will use Best Efforts to finalize the Phase I Reintroduction Plan within one year of state concurrence with an Affirmative Determination under Section 3 of the Hydroelectric Settlement.

B. The Phase I Reintroduction Plan will identify facilities and actions necessary to start the reintroduction, as well as monitoring, evaluation, and other investigations as appropriate to narrow uncertainties. The Phase I Plan will be adaptable in order to incorporate knowledge gained from monitoring and evaluation during the reintroduction. Additionally, the Fish Managers from the reaches of the Klamath River below Upper Klamath Lake will develop specific actions to be incorporated into the Fisheries Monitoring Plan to assess the volitional re-colonization of those reaches of river and tributaries by Fish currently blocked by Iron Gate Dam.

C. ODFW and the Klamath Tribes shall implement the reintroduction actions in Oregon. Reintroduction actions in California shall be implemented by the Fish Managers in California.

D. Once the implementation of Phase I Reintroduction yields results to guide the management of anadromous Fish in Oregon as described in Section 11.3.2, Phase II Reintroduction will be initiated.

E. ODFW, in close coordination with the Klamath Tribes, shall prepare for the Oregon Fish and Wildlife Commission an Anadromous Fish Conservation Plan to guide ODFW's management of established anadromous fish populations in the Oregon reaches of the Klamath River Basin. The Oregon Fish and Wildlife Commission's decision on this plan will provide policy guidance to ODFW for participation in development of a basinwide plan to manage reintroduced fish populations in the Klamath Basin.

F. Following the Oregon Fish and Wildlife Commission's approval of ODFW's Anadromous Fish Conservation Plan for Oregon's reaches of the Klamath River Basin, ODFW and other Fish Managers shall prepare collaboratively the Phase II Reintroduction Plan to describe the management of new populations of anadromous Fish in the basin as integral components of Fisheries management of the entire Klamath River Basin. The Phase II Reintroduction Plan will be incorporated into a plan for the management of Klamath Fisheries that will fulfill the requirements of the Pacific Fisheries Management Council. This latter plan will be prepared by the Fish Managers and will be submitted to the respective policy decision bodies of the Fish Managers for their adoption. This planning effort will include participation from interested Parties or other entities capable of adding appropriate technical expertise to the process.

11.2.2. Elements

The Phase I Reintroduction and Phase II Reintroduction Plans will present specific management options for managing Chinook salmon, coho salmon, steelhead trout and Pacific lamprey in the Klamath River Basin, where anadromous Fish were historically present. The implementation plan will identify near-term and long-term actions necessary to address key uncertainties and develop specific strategies for achieving the goals of reintroduction.

A. Schedule

ODFW shall conduct activities necessary to prepare the Phase I Reintroduction Plan beginning as early as 2010. Key investigations that do not require Fish passage through the Hydroelectric Project (e.g.

stock selection, outmigrant behavior, and reintroduction methods) will begin as soon as funding is available.

B. Lost River

The Reintroduction Plan will not propose to introduce anadromous Fish into the Lost River and Tule Lake subbasin.

11.3. Oregon Implementation

The Fish Managers shall annually provide a report to the Klamath Basin Coordinating Council on the progress of implementing the Reintroduction Plan. During implementation of the plans, the Fish Managers shall include participation by interested Parties and other entities capable of adding technical expertise to the process.

11.3.1. Implementation of Phase I Reintroduction

A. Above Upper Klamath Lake

In Phase I Reintroduction, ODFW and the Klamath Tribes, in collaboration with the other Fish Managers, shall introduce Chinook salmon into Upper Klamath Lake and tributaries. This phase will require active intervention and movement of fish into habitats above Upper Klamath Lake. A variety of release and rearing strategies will be utilized to optimize opportunities for success. An adaptive management approach will be utilized to determine appropriate race(s) and life history of Chinook to release (spring and/or fall Chinook) with best opportunities for successful rearing, emigration to the ocean and return.

B. Below Upper Klamath Lake

During Phase I Reintroduction, the Fish Managers shall monitor and evaluate natural re-colonization of native Chinook and coho salmon, steelhead trout and Pacific lamprey into the Klamath River and tributaries below Upper Klamath Lake. No active intervention or movement of Fish will be immediately proposed to re-establish salmon, steelhead or lamprey in these stream areas during the initial portion of Phase I Reintroduction. However, if monitoring reveals that re-colonization is not occurring or is too slow, the Fish Managers may pursue active reintroduction of salmon and lamprey into habitats below Klamath Lake.

C. Sport and Commercial Fisheries

To the extent possible, adult salmon returning to Upper Klamath Lake and tributaries from Phase I Reintroduction efforts shall be protected

to minimize their harvest in sport, commercial and tribal fisheries until the Phase II Reintroduction Plan is adopted.

D. Research

Research investigations shall be undertaken during Phase I Reintroduction to determine appropriate stocks which meet strict disease criteria and migration ability, potential competition and interaction of re-introduced Fish with existing native stocks, and natural production potential for anadromous Fish in the upper basin. In addition, research will inform adaptive management of active reintroduction efforts in and above Upper Klamath Lake.

11.3.2. Implementation of Phase II Reintroduction

On a continuing basis, the Fish Managers shall ascertain the status of reintroduced or recolonized populations of anadromous Fish in the Klamath River and tributaries. The Fish Managers shall include participation by interested Parties and other entities capable of adding technical expertise to the process. Once self-sustaining populations of Chinook salmon and steelhead are established in the Upper Klamath Basin, at levels of population productivity consistently above replacement, Phase II will be initiated. As described in Section 11.2.1.E, ODFW will initiate Phase II by preparing Oregon's Anadromous Fish Conservation Plan for the Oregon Fish and Wildlife Commission's approval. Following the Oregon Fish and Wildlife Commission's approval of the Anadromous Fish Conservation Plan, the Fish Managers and interested parties will develop the Phase II Reintroduction Plan. In Phase II Reintroduction, Fish Managers will implement management actions to achieve objectives identified in the Phase II plan that will guide basinwide management of the re-established fish populations. The re-established populations in the Upper Klamath Basin will contribute to the Fisheries of the basin as a whole. Management actions will insure that tribal, commercial, and sport harvests are managed in a way that provides for escapement of salmon and steelhead into the Upper Klamath Basin at levels that sustain healthy populations.

11.4. California Fisheries Reintroduction Plan

11.4.1. General

Natural reintroduction of anadromous fish within the California portion of the Klamath Basin will commence immediately once fish passage is restored. The California Department of Fish and Game shall adopt a passive (wait and see) approach to reintroduction which shall include development of reintroduction goals, monitoring protocols, habitat assessments and other investigations as appropriate. The Plan shall also include development of guidelines for use of a conservation fish hatchery to more quickly establish naturally producing populations in the wild if deemed appropriate and necessary.

11.4.2. Reintroduction Plan

Upon an Affirmative Determination by the Secretary under Section 3 of the Hydroelectric Settlement, the California Department of Fish and Game shall begin a California Fisheries Reintroduction Plan. The Plan shall be developed in collaboration with the Tribes and other Fish Managers and will be developed in coordination with the Oregon Fisheries Reintroduction Plan as described in Sections 11.2 and 11.3. It will include participation from interested Parties and other entities capable of adding appropriate technical expertise to the process. CDFG will use Best Efforts to finalize its California Fisheries Reintroduction Plan within two years of the Secretarial Determination under Section 3 of the Hydroelectric Settlement.

11.4.3. Adaptive Management

The Plan shall include an adaptive management approach during reintroduction to allow for inclusion of new information as it becomes available and provide flexibility in the methods used to achieve established goals. For example, if monitoring reveals that re-colonization is not occurring or is too slow, the Fish Managers may pursue active reintroduction of native anadromous fish. Such reintroduction actions could include a variety of release and rearing strategies to optimize opportunities for success. The adaptive management approach would be utilized to determine appropriate race(s) and life history of Chinook to release (spring and/or fall Chinook) with best opportunities for successful rearing, emigration to the ocean and return. Research would inform any adaptive management of active reintroduction efforts. One such research priority would be to determine appropriate stocks for active reintroduction which meet strict disease criteria and migration ability. Research would also need to address, potential competition and interaction of reintroduced fish with existing native stocks, and natural production potential for anadromous fish.

11.4.4. Conservation Hatchery

In the context of this Agreement, a conservation hatchery is an artificial fish production facility with the primary objective of enabling naturally produced fishes to fully support re-establishing populations. Fishes produced in such a facility must fit within the ecological context of the Klamath River such that (i) artificially produced fishes demonstrate the range of life history characteristics representative of naturally produced fishes; (ii) the genetic structure of the artificially produced fishes matches that of the naturally produced fishes; (iii) the number of fishes produced in the hatchery does not overwhelm the naturally produced fishes as returning adults; and (iv) artificially produced fishes do not introduce new diseases or greater susceptibility to existing diseases to the naturally producing population(s). A successful conservation hatchery program will continually decrease the dependence on artificial production as naturally produced fishes become more abundant, successful, and dispersed among the range of available habitats. A successful conservation hatchery eventually stops

Attachment 4

4a Karuk Tribe Water Quality Comments to FERC

4b Health Advisory

Attachment 4a

Karuk Tribe Water Quality Comments to FERC

Karuk Tribe of California
Department of Natural Resources
PO Box 282
Orleans, CA 95556
Email: ctucker@karuk.us

December 1, 2006

Federal Energy Regulatory Commission
Attn: Margalie R. Salas, Secretary
888 First Street, N.E.
Washington, DC 20426

RE: Comments on Draft EIS in Klamath Hydroelectric Project
Docket for Filing: P-2082-027 (Klamath)

Dear Ms. Salas:

These are our formal written comments on the Draft Environmental Impacts Statement (DEIS) in this docket as cited above regarding environmental analysis under NEPA of alternatives currently under consideration by FERC staff regarding relicensing and/or decommissioning of the Klamath Hydroelectric Project (License No. P-2082-027). These comments are in addition to, and supplement, any other comments that have been given verbally at public meetings by Tribal representatives.

Please note that given the problems with the document, some of which result from the numerous Energy Policy Act (EPAct) Appeals Administrative Law Judge's Rulings (ALJ rulings) and the filing of a critical sediment report from the California Coastal Conservancy, the draft EIS should be withdrawn and rewritten. Short of this, a supplemental draft EIS is clearly warranted. This is the only way that the public will have an opportunity to comment on FERC's analysis of this new information.

Comments on the existing Draft Environmental Impact Statement (DEIS) follow.

I. THE DRAFT EIS FAILS TO CONSIDER ALL REASONABLE ALTERNATIVES AND THEREFORE FAILS TO MEET NEPA REQUIREMENTS.

Under Section 10(j) of the FPA, licenses for hydroelectric projects must include conditions to protect, mitigate damages to, and enhance fish and wildlife resources, including related spawning grounds and habitat. These conditions are to be based on recommendations received from federal and state fish and wildlife agencies as well as Tribes. The Commission is required to include such recommendations unless it finds that they are inconsistent with Part I of the FPA or other applicable law, and that alternative conditions will adequately address fish and wildlife issues.

The National Marine Fisheries Service (NMFS), in its FPA Sec. 10(a) Recommendations (March 27, 2006) strongly recommended full "4-dam removal" decommissioning. Concurring with NMFS, numerous other responders have also recommended "4-dam removal" option, including the Pacific Coast Federation of Fishermen's Associations (PCFFA), the Institute for Fisheries Resources, every major Tribal Government within the basin, and (if certain water quality pre-conditions cannot be met) several state agencies.

In light of these strong recommendation by Tribal, NGO, state, federal and agencies, the "4-dam removal" option should at least be thoroughly analyzed. Failure to do so in the DEIS makes its overall analysis generally suspect, pre-biased toward retention of at least two of these dams (Copco No. 2 and J.C. Boyle).

NEPA rules require that FERC "Rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated." (Rule 40 C.F.R. § 1502.14)

Although the dEIS includes a cost analysis for removal of additional project facilities including COPCO II and JC Boyle dams, the removal of these dams are not considered to be part of a "reasonable" alternative (section 2.4.4). The rationale for this deduction is insufficient.

Recommendations for FEIS:
Include a four dam removal scenario as a proposed alternative.

II. THE DEIS FAILS TO FAIRLY EVALUATE REGIONAL POWER NEEDS

The DEIS cites studies from the North American Electric Reliability Council. Although FERC acknowledges that the Council finds that there are adequate supplies of electricity in the near term, FERC concludes that the power the KHP provides would continue to be useful in the local needs for power (section 1.2).

However, FERC fails to consider recent reports from the Northwest Power and Conservation Council which limits its analysis to Oregon, Washington, Idaho, and Montana. According to the report, "The Northwest's power supply is currently about 2,400 average megawatts surplus"(http://www.nwcouncil.org/news/2006_10/3.pdf). Given that the dams have a rated capacity of 161 megawatts and their current actual production is limited by ramp rates and flow requirements to 90 megawatts, they represent less than 4% of the annual surplus.

In addition, the DEIS fails to cite the California Energy Commission's (2004) filing to FERC that requests that FERC consider decommissioning the KHP because:

- "low power - high impact energy facilities can create substantial net environmental benefits if decommissioning proves to be feasible and cost-effective, and if replacement energy is available."

- "The Klamath project is a small energy facility … Loss of some or all of this energy would not significantly affect PacifiCorp's ability to provide electricity to its 1.6 million customers."
- "Replacement energy is available locally and regionally."
- "Klamath River is one of the most important salmon rivers in California, and salmon restoration is an important state policy objective."
- "Energy generation is one of several contributing factors to the decline of Klamath River fisheries."

Recommendations for FEIS:
We request that in its final EIS, FERC respond to these comments and thoroughly explain the reasons why it ignores or rejects the position of the CEC.

III. THE STAFF PREFERRED ALTERNATIVE FAILS TO PROTECT AND ENHANCE HABITAT FOR ESA LISTED COHO SALMON.

FERC, under Section 7 of the Endangered Species Act (ESA) will be required to submit a Biological Assessment of the impacts of Project relicensing on the species in the Basin listed as threatened or endangered and to consult with the Trustee wildlife agencies, in this case both US Fish and Wildlife (for resident fish and terrestrial species) and the National Marine Fisheries Service (NMFS) for impact on ESA listed anadromous salmonids.

The Southern Oregon/Northern California Coast coho salmon (SONCC) Evolutionary Significant Unit (*Oncorhynchus kisutch*) was listed as threatened under the ESA on May 6, 1997 (*Fed. Reg.* 24588-24609 (May 6, 1997). The designation of critical habitat for the coho stocks within the above-mentioned ESU followed in May, 1999 (*Fed. Reg.* 24049-24062 (May 5, 1999).

PacifiCorp's Klamath Hydroelectric Project denies salmonids, including ESA listed coho salmon access to traditional spawning grounds in the Upper Klamath Basin (Hamilton et al., 2006). No fish passage facilities of any sort are present at Iron Gate or at Copco 1 and Copco 2 dams. Substandard fish ladders intended to pass only resident fish are present at J.C. Boyle and Keno dams.

According to the recent decision of the Energy Policy Act (EPAct) Hearing Administrative Law Judge ("ALJ Ruling"), at least 58 miles of suitable coho habitat exists within the confines of the project. Under Section 7 of the Endangered Species Act (16 U.S.C. § 1531 *et seq.*), Project impacts to the ESA listed species must be assessed, including impacts attributable to the Project since its construction.

Recommendations for FEIS:
The staff recommendations fail to address the need to improve conditions and provide additional habitat for this. We urge FERC to include provisions for volitional fish passage, preferably in the form of dam removal as recommended by Tribes and Fish Agencies, to provide coho access their full historic range as described by Hamilton et al.

IV. THE DEIS FAILS TO ACCURATELY DESCRIBE THE AREA OF PROJECT EFFECT (APE)

Although FERC concludes that the APE is greater than that proposed by PacifiCorp and extends the APE downstream of Iron Gate Dam to the confluence of the Scott River (3.3.9.2.2), this boundary is arbitrary. Given that the dams negatively affect salmon as well as other aquatic and terrestrial species in the entire Klamath River as well as commercial fishing opportunities along 700 miles of Oregon and California coastline, the APE should include the length of the river and the coastline representing the Klamath Management Zone. Clearly the cultures, economies, and ecosystems affected by the dams are impacted by the project. This fact is even acknowledged by FERC. The project related economic sectors analysis includes the wider geographic region (3.3.8.1.2). Clearly, the reason the project impacts the economies of the areas throughout the Klamath Basin as well as the Klamath Management Zone is because the project affects the ecologies and cultures of these regions. Therefore, these regions should be included in the APE.

Recommendations for FEIS:
Redefine the APE to include the entire Klamath Basin and Klamath Management Zone.

V. THE DEIS FAILS TO ADEQUATELY DESCRIBE KHP AFFECTS ON KARUK CULTURAL RESOURCES AND CONTEMPORARY CULTURAL PRACTICES

The DEIS does not fully address the significant KHP impacts on contemporary Karuk cultural and religious resources and practices. FERC acknowledges many of the water qualtity impacts of the KHP but fails to fully evaluate how poor water quality directly and indirectly affects contemporary cultural and religious ceremonies.

Water Quality plays a very significant role in Karuk Tribal culture as culturally relevant aquatic species are profoundly affected by the KHP water quality impacts. For example, the giant salamander (puuf puuf) is an important figure in Karuk legend (King, 2004). The crayfish is an integral ingredient in one of Pikiavish (World Renewal) Ceremony.

Water quality also affects the ability of Fatawana, or World Renewal Priests, to conduct ceremonies. Pikiavish starts with the Spring Salmon Ceremony in early spring and continues throughout late summer into early fall. Key ceremonial participants bath multiple times a day in the Klamath River for ten days straight. This is the time that the KHP has its most egregious impacts on water quality and KHP induced algae blooms are at their zenith.

The water quality conditions in the Klamath River must meet the following criteria in order to not interfere with cultural and religious ceremonies and practices:

1. Water quality conditions must allow for specific species to be present in adequate abundance. This includes species that are consumed by participants such as salmon and lamprey as well as species are use in ceremonies such as crayfish and willows.
2. Water conditions must be safe for what is usually termed “recreational contact” as well as human consumption (Salter, 2006).

Table 1 describes the terrestrial and aquatic species required for different ceremonial and cultural practices over the course of the year (Reed et al., 2006). This includes cultural and religious ceremonies, cultural activities, basket making, and subsistence hunting, fishing and gathering.

Table 1.

KARUK TRIBE CULTURAL USE OF THE KLAMATH RIVER (PRELIMINAR										
RESOURCE	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**Oc**
Ceremonies										
Plants	X	X	X	X	X	X	X	X	X	
Fish				X	X	X	X	X	X	
Fishing	X	X	X	X	X	X	X	X	X	
Water-drinking, steaming, cooking				X	X	X	X	X	X	
Rocks	X	X	X	X	X	X	X	X	X	
Bathing				X	X	X	X	X	X	
Boating				X	X	X	X	X	X	
Wildlife	X	X	X	X	X	X	X	X	X	
River & Trail Access	X	X	X	X	X	X	X	X	X	
Activities										
Plants	X	X	X	X	X	X	X	X	X	
Water-drinking, steaming, cooking	X	X	X	X	X	X	X	X	X	
Rocks	X	X	X	X	X	X	X	X	X	
Bathing	X	X	X	X	X	X	X	X	X	
Boating	X	X	X	X	X	X	X	X	X	
River & Trail Access	X	X	X	X	X	X	X	X	X	
Basket Materials										
Roots		X	X	X	X	X	X	X	X	
Sticks		X	X	X	X			X		
River & Trail Access		X	X	X	X	X	X	X	X	
Subsistence										
Plants	X	X	X	X	X	X	X	X	X	
Fishing	X	X	X	X	X	X	X	X	X	
Water-drinking, steaming, cooking	X	X	X	X	X	X	X	X	X	
Wildlife	X	X	X	X	X	X	X	X	X	
River & Trail Access	X	X	X	X	X	X	X	X	X	

The DEIS fails to address the impacts of algal toxins on Karuk subsistence fishermen and the staff recommended alternative fails to mandate that PacifiCorp monitor the toxicological affects of microcystin toxins on Karuk fishermen.

The Karuk Tribe practices traditional dip net fishing at Ishi Pishi Falls near what is now Somes Bar, CA. To date, no study has evaluated the impact of algal toxins on these fishermen who come into contact with water as well as breath water vapors from the river. Both contact and inhalation of vapors are considered microcystin exposure pathways by the World Health Organization.

Recommendations for FEIS:

1. FERC should mandate a testing program to access the affects of microcystin exposure on traditional fishermen.
2. FERC should include a more thorough analysis of the cultural impacts of the KHP focusing on contemporary cultural and religious practices. This includes impacts to the fishery as well as the direct and indirect impacts to materials used in ceremonial regalia and traditional crafts (birds. Plants, otters etc.,) (Salter, 2006).
3. In addition to analyzing the impacts to fish species, impacts to other culturally relevant species such as mussels, crayfish, and salamanders should be evaluated and considered.
4. Fish, including salmon, steelhead, lamprey, and sturgeon, should be defined as a cultural resource.
5. KHP impacts on water quality from the standpoint of modest human consumption during ceremonies should be evaluated and considered.
6. KHP impacts on traditional food sources other than fish, such as watercress, Indian rubarb, fresh water mussels, and crayfish, should be evaluated and considered.
7. The KHP affects stream flow and sediment distribution. The impacts this has had on traditional and contemporary cultural sites have not been adequately evaluated and analyzed.
8. FERC should include a social justice section in the FEIS. Given that Tribes have born the brunt of the negative impacts of the project (poor water quality, declining fisheries, etc.), yet have received few benefits. To this day, many Tribal communities in both Karuk and Yurok territories do not have electricity. Many of these communities are in PacifiCorp's service district. The Environmental Justice section should also more thoroughly analyze the health and economic consequences of the rapid diet shift imposed on the Karuk and other tribes by the denied access to traditional foods sources that have declined as a consequence the KHP operations, including increased health care costs. This year 2006 the tribal fishery produced less than 500 fish, last year Tribal fishermen caught less than 200 hundred and the year before that less than 100 fish were harvested. The Karuk Tribe has over 3,400 members.

VI. THE DEIS FAILS TO DESCRIBE THE REGIONAL ECONOMIC BENEFITS OF DAM REMOVAL ALTERNATIVES.

The Karuk Tribe recently filed with FERC a study titled *A Prelimary Economic Assessment of Dam Removal: Klamath River* by Kruse et al. (Accession No.: 200611275034). The report provides insight into the costs and benefits of dam removal for Siskiyou County, CA. The short term and long term economic benefits of removal should be included in the analysis of a four dam removal alternative in the final EIS.

Likewise, the fact that PacifiCorp owns over 11,000 acres around the reservoirs should be considered. Currently, FERC acknowledges that PacifiCorp pays a considerable amount in property and other taxes to Siskiyou and Klamath Counties and implies these tax benefits would end if dams were removed. However, there is no analysis of the property tax benefits of dam removal considering the improvements in aesthetics, recreation and water quality that would result. Such an analysis should be included in the final EIS.

Recommendations for FEIS:
Include a detailed analysis of the potential economic benefits of dam removal for Klamath and Siskiyou Counties taking into consideration property values as well as regional benefits of dam de-construction and likely habitat restoration projects.

VII. FERC FAILS TO ADDRESS HOW THE FOUR PROPOSED ALTERNATIVES FULFILL TRIBAL TRUST OBLIGATIONS

FERC has a Tribal Trust responsibility. Rule 18 C.F.R. § 2.1c paragraph (b) states, "The Commission recognizes that, as an independent agency of the federal government, it has a trust responsibility to Indian Tribes and this historic relationship requires it to adhere to certain fiduciary standards in its dealings with Indian Tribes." Paragraph (e) states "The Commission, in keeping with its trust responsibility, will assure that tribal concerns and interests are considered whenever the Commission's actions or decisions have the potential to adversely affect Indian tribes or Indian trust resources."

Recommendations for FEIS:
Given FERC's mandate to fulfill tribal trust obligations of the federal government, the final EIS should include a full evaluation of how each of the proposed alternatives affects Tribal trust resources and fulfill FERC's Tribal Trust obligations.

VIII. ECONOMIC VIABILITY OF THE PROJECT SHOULD USE THE STATE AND FEDERAL AGENCY MANDATORY TERMS AND CONDITIONS (AS DESCRIBED IN SECTIONS 4E AND 18 OF THE FEDERAL POWER ACT) AS THE BASELINE

Existing economic studies (including FERC's own economic analyses presented in the DEIS) suggest that this project will be economically marginal or non-viable under any conceivable relicensing scenario if volitional fish passage is required. Indeed, in recent testimony before the Public Utilities Commission of California, PacifiCorp noted that during the past 100 years, circumstances in the Klamath Basin have changed

dramatically, impacted by Endangered Species Act requirements, Tribal Trust requirements, and U.S. Bureau of Reclamation water management policies.

According to PacifiCorp, "these and other restrictions cause PacifiCorp to operate the Klamath Hydroelectric Project more for compliance than for generation. Making matters worse, return flow from the Klamath customers is unpredictable, unmanaged, and often occurs during high-water periods. Each of these factors has negative effects on PacifiCorp's ability to use the Klamath River to generate hydroelectric power."

The testimony continues, "The result at best; PacifiCorp must adjust generation schedules to maintain system balance, compliance with ramp rates, reservoir elevation commitments, and downstream minimum flow requirements; at worst, PacifiCorp must spill water throughout its system and incur risk management costs; and, in no event can PacifiCorp rely on flow from the Klamath Irrigation Project when it schedules generation (PacifiCorp PUC Opening Brief)."

Recommendation for FEIS:
This testimony from the licensee, FERC's own analysis, and the federal agencies' fishway prescriptions which have been bolstered by the recent ALJ decision, suggests strongly that decommissioning of the lower four dams is a viable and logical option. *Thus, we urge FERC to recommend the removal of Iron Gate, Copco I, Copco II, and JC Boyle in the FEIS.*

IX. THE DEIS FAIL TO ACKNOWLEDGE THE FULL RANGE OF ANADROMOUS PACIFIC LAMPREY HABITAT LOSS CAUSED BY THE KHP

The DEIS acknowledges the historic presence of resident and anadromous species of lamprey above and below the current project, but not the full historic range lost due to the KHP. The DEIS confirms the historic presence of Pacific lamprey above Iron Gate Dam upstream to at least to Spencer Creek. The DEIS suggests that the species may have occurred much further upstream, but goes on to state Pacific lamprey species were not well documented in those areas. The DEIS should assume Pacific lamprey were historically present above the project and had a historic range that included Upper Klamath Lake tributaries because Pacific Lamprey populations typically coincide with populations of anadromous salmon. Resident lamprey species are currently well documented above Spencer Creek and in tributaries above Upper Klamath Lake and no habitat limitations specific to Pacific lamprey other than migration blockage are presented in the DEIS.

Lamprey species are difficult to observe due to their benthic and nocturnal life styles and therefore difficult to document. Effective lamprey sampling techniques were not available before project dam construction and therefore species may have been easily overlooked. It should be assumed that Pacific lamprey were present within the more than 350 miles of historic anadromous salmon habitat the DEIS describes because no other habitat constraints are described other than dams blocking migration. According to Hamilton et al. (2006):

> "Kroeber and Barrett (1960) reported that Pacific lamprey ascended to the Klamath Lakes, based on the accounts of Native Americans. While the difficulty in distinguishing the anadramous Pacific lamprey from Klamath Upper Basin resident lamprey taxa brings this account into question, we note that the historical distribution of Pacific lamprey in the Columbia and Snake rivers was coincident wherever salmon occurred (p.17)."

Recommendation for FEIS:
Describe the historic range of Pacific lamprey more accurately.

X. THE DEIS DOES NOT ADEQUATELY ADDRESS UPSTREAM AND DOWNSTREAM MIGRATION NEEDS OF LAMPREY AND NO MITIGATION FOR THESE IMPACTS ARE PROPOSED IN THE STAFF ALTERNATIVE

Trap and haul methods are considered in the DEIS staff alternative, but trap and haul methods are designed only for fall chinook which can be easily trapped, identified and sorted. Trap and haul methods will not facilitate safe upstream and downstream migrations of Pacific lamprey and/or other lamprey species. Juvenile Pacific lamprey (ammocetes) can not be identified or distinguished from resident species of lamprey therefore sorting juvenile lamprey from other species is not possible. Trapping methods for all life stages of lamprey, most notably juveniles, are so difficult that a successful trap and haul operation is likely impossible.

The DEIS acknowledges the difficulties of successfully screening larval lamprey because of small size and fragile body type, therefore installations of screens will not benefit or mitigate mortality caused to lampreys during downstream migration past the KHP. The DEIS also acknowledges that larval lamprey are poor swimmers and downstream migration is a function of drift associated with stream velocity and run of the river conditions. Stream velocity in project reservoirs is severely reduced therefore larval lamprey passage past project reservoirs may be impossible.

Recommendation for FEIS:
Recommend dam removal as the best means to address impacts to Pacific lamprey.

XI. THE DEIS SHOULD RECOGNIZE HABITAT IMPACTS TO JUVENILE LAMPREYS DUE TO DISRUPTIONS IN SEDIMENT TRANSPORT AND ALLUVIAL PROCESSES WITHIN THE PROJECT AREA AND DOWNSTREAM OF IRON GATE DAM. NO ACTIONS ARE PROPOSED TO MITIGATE HABITAT IMPACTS IN THE STAFF ALTERNATIVE.

Larval lamprey require soft sediments composed of silt, sand and fine organic litter which is found deposited in low velocity backwater pools, eddies and other alluvial deposition zones. Quality and quantity of larval lamprey habitat downstream of Iron Gate Dam needs to be further investigated and included in the DEIS. Sediment trapped behind all project dams is likely causing reductions of suitable habitat for all benthic fish including

Pacific lamprey and resident lamprey. Furthermore, peaking operations below JC Boyle and Copco dams are likely causing fine sediments to be scoured and transported downstream to reservoirs and thereby reducing the frequency of fine sediment deposits which form the type habitat required by all species of lamprey during the larval life stage. Fish habitat studies and modeling were designed for salmonid species and results presented in the DEIS do not adequately address impacts to lamprey habitats.

Recommendation for FEIS:
Recognize the habitat impacts of the KHP on juvenile lamprey species due to disruptions in sediment transport and alluvial processes. Propose an alternative, such as the removal of the lower four dams, to address these impacts.

XII. THE DEIS SHOULD RECOGNIZE THAT PACIFIC LAMPREY HAVE A LONG FRESHWATER RESIDENCE TIME BEFORE OCEAN MIGRATION AND THEREFORE MORE SUSCEPTIBLE TO CUMULATIVE IMPACTS CAUSED BY THE PROJECT

Pacific Lamprey have a 2 to 7 year fresh water residence time which is much longer than anadromous salmonids. Therefore project impacts described in the DEIS occur over a period of multiple years. Cumulative impacts include; standing during peaking operations, non native fish predation, entrainment in diversions and habitat degradation.

XIII. THE ISSUE OF THE TOXIC ALGAL SPECIES *MICROCYSTIS AERUGINOSA* IN THE KLAMATH RIVER IS DEALT WITH INADEQUATELY IN THE DEIS.

While the DEIS presents some useful information regarding *Microcystis*, it does not incorporate information from the most current and comprehensive studies (Kann 2006a, Kann and Corum 2006), filed with FERC in March, 2006. The failure to use this information may explain the DEIS' failure to recognize the potential seriousness of the *Microcystis* problem in the Klamath River downstream of Iron Gate Dam all the way to the estuary, and the role of KHP structures and operations in the basinwide distribution and abundance of *Microcystis.* The DEIS does not, therefore, advance adequate solutions to these problems, nor do it propose adequate monitoring of them.

A technical memoranda detailing a *Microcystis* study from 2006 (Kann 2006b) has also been filed concurrently with these comments. It should be reviewed by FERC staff and incorporated into the FEIS, since it details a large *Microcystis* bloom again occurring in Copco and Iron Gate Reservoirs with levels of *Microcystis* and microcystin exceeding 393 million cells/ml and 12,000 µg/L, respectively.

There are several flaws in the DEIS' analysis of *Microcystis*

1. DEIS deficiency: The DEIS fails to recognize the downstream extent of the high concentrations of *Microcystis* concentrations, nor does it recognize the potential

consequences of such concentrations on human health, fish health, and ceremonial and religious practices of the Karuk Tribe.

Page 3-144 of the DEIS states:

> "If a monitoring program is implemented for *Microcystis* and its toxin in project reservoirs, monitoring results that trigger public health agency notification would enable such agencies to make a determination regarding whether there is a health risk to the public who come in contact with Klamath River water downstream of Iron Gate dam. Because algal blooms typically occur in reservoirs, not in free flowing river reaches, we expect the concentration of microcystin downstream of reservoirs where trigger levels may be detected, to be lower and less toxic. Because algal blooms typically occur in reservoirs, not in free flowing river reaches, we expect the concentration of microcystin downstream of reservoirs where trigger levels may be detected, to be lower and less toxic. Consequently, we find that monitoring for *Microcystis* in free-flowing portions of the Klamath River from Iron Gate dam to the estuary, as Conservation Groups recommend, would be inappropriate to include as a condition of any new license that may be issued for this project." (page 3-144).

There are at least three reasons why this failure to recognize the significance of downstream microcystin toxins issues on the Klamath River is problematic. Each is described in the following text.

First, although phytoplankton samples from the U.S. Fish and Wildlife Service and the Yurok Tribe in 2005 showed that *Microcystis* cell densities generally followed a decreasing trend as the river flowed from Iron Gate Dam to the estuary, cell counts were still relatively high (Kann 2006a, Fetcho 2006). While cells counts in the main water column never exceeded the WHO moderate probability of adverse health effects threshold of 100,000 cells/mL, densities frequently exceeded 10,000 cells/mL with several measurements exceeding 40,000 cells/mL. The 40,000 cell/ml level for *Microcystis* is the level currently adopted by the State of Oregon, Humboldt County Health Department and the Yurok and Karuk Tribes for public health advisories. Note that the 100,000 cells/ml WHO level is a general level for all blue-green species and recent research has shown that 40,000-50,000 cells/ml provides a more protective level for *Microcystis* (e.g., NHMRC 2005). Moreover, *Microcystis* cell concentration exceeded 1.3 million cells/ml in a backwater area near the confluence of Coon Creek nearly 100 miles downstream from Iron Gate Dam in 2005. Microcystin toxin at this station was ~50 µg/L, well over the 8 µg/L level used by the State of Oregon for designating an increased probability of adverse health affects.

Second, the highest *Microcystis* cell counts in 2005 were detected in mid-September, during the critical period of salmon migration and high cultural and recreation use of the river. While monitoring and warning notices would restrain fisherman from fishing during periods when toxic algae advisories were in place, the coincident timing of these

advisories would likely result in the loss of all or most of the fishing season. This would lead to economic losses to communities on the river and coast from loss of recreational fishing opportunities. It would also be devastating to Tribal members, because this is the time of the year for many important ceremonies and subsistence fishing. For certain ceremonies, medicine men are required to bathe and even drink Klamath River water. Subsistence fishermen dipnet for fish in backwaters and eddies where toxic algae can bloom at levels that threaten their health. Monitoring obviously fails to prevent migrating salmon from entering the river and does nothing to reduce their exposure to high toxin concentrations. The Yurok Tribe (Fetcho 2006) has detected microcystin in the livers of adult steelhead in the lower Klamath River. Monitoring alone is clearly an inadequate response by FERC to the KHP-driven *Microcystis* problem.

Finally, a review of the available data (Kann 2006a, Kann and Corum 2006) shows clearly that through creation of ideal *Microcystis* habitat, that Iron Gate and Copco reservoirs are principal contributors to the high *Microcystis* cell counts observed below the reservoirs. PacifiCorp, as owner and operator of the KHP, should be required to take responsibility for monitoring the entire area downstream affected by the *Microcystis* problem – that is, all the way down the river to its mouth.

Recommendations for FEIS: Using the information provided here, FERC staff should re-write appropriate sections (i.e. 3.3.2.2.2 “Monitoring and Control of Algae that Pose a Risk to Fish, Wildlife, and Public Health” and “Dam Removal to Enhance Water Quality", 5.2.21 “Dam Removal”, 5.1.2 “Summary of Effects”) to acknowledge the downstream extent of high concentrations of KHP-related *Microcystis* concentrations, and the attendant consequences for human health and fish health.

2. DEIS deficiency: The DEIS fails to recognize that Iron Gate and Copco reservoirs increase the risk of *Microcystis* re-growth downstream

By providing ideal habitat for, and producing algal blooms, Iron Gate and Copco Reservoirs have dramatically increased the amount of *Microcystis* in the lower Klamath River. This increase in inoculum means that *Microcystis* cells have an increased likelihood of dispersing to suitable *Microcystis* habitats, like quiet backwaters, downstream, and that blooms in such habitats can develop much more rapidly because they start from a larger number of cells. In fact, *Microcystis* is capable of re-developing downstream of Iron Gate. It was detected at the extremely high level of 1.3 million cells/mL in a backwater area near the confluence of Coon Creek nearly 100 miles downstream of Iron Gate Dam (Kann 2006a).

Recommendations for FEIS: Using the information provided here, FERC staff should re-write appropriate sections (i.e. 3.3.2.2.2 “Monitoring and Control of Algae that Pose a Risk to Fish, Wildlife, and Public Health” and "Dam Removal to Enhance Water Quality", 5.2.21 “Dam Removal”, 5.1.2 “Summary of Effects”), to explicitly acknowledge that blooms in Iron Gate and Copco Reservoirs increase the risk of, and are principal contributors to *Microcystis* re-growth downstream

3. DEIS deficiency: The DEIS incorrectly assumes that the *Microcystis* blooms in KHP reservoirs are triggered by inoculation from Upper Klamath Lake upstream.

Page 3-144 lines 14-16 of the EIS states:
"The persistence of *Microcystis* in Upper Klamath Lake suggests that there would be continuing availability of algal cells to seed *Microcystis* blooms under favorable conditions in all project reservoirs." Although *Microcystis* does not produce true spores or akinetes, the vegetative cells and colonies can persist downstream, re-growing when optimal conditions are encountered. We agree that *Microcystis* is present in the Klamath River from Upper Klamath Lake to Iron Gate Dam, and that blooms will, therefore, likely continue to occur seasonally as long as suitable habitat exists. However, we strongly disagree with FERC's implication that Upper Klamath Lake is the necessary "seed" source for the *Microcystis* blooms in KHP reservoirs such as Iron Gate and Copco, For example, it is well known that *Microcystis* colonies overwinter on the bottom sediment of lakes and reservoirs, and serve as new infective colonies when habitat conditions are conducive (Reynolds et al. 1981) As shown clearly in the multiple datasets reviewed in Kann (2006), *Microcystis* densities during the algal growing season were typically far higher in Iron Gate and Copco Reservoirs than they were at the outlet of Upper Klamath Lake or in the Klamath River directly above Copco Reservoir. In fact, even though concentrations of *Microcystis* in Copco exceeded 163 million cells/ml in 2005and 393 million cells/ml in 2006, no Microcystis was detected at the sampling station in the Klamath above Copco (Kann and Corum 2006, Kann 2006b). Moreover, given over-wintering colonies likely contained in reservoir sediments, the maintenance of *Microcystis* populations would occur even in the absence of inoculant from Upper Klamath Lake; especially under the pond-like conditions created by the KHP dams.

Recommendations for FEIS: Page 3-144 lines 14-16 should be revised to read "The persistence of *Microcystis* in Upper Klamath Lake, Copco Reservoir, and Iron Gate Reservoir suggests that there would be continuing availability of algal cells to seed *Microcystis* blooms under favorable conditions in all project reservoirs. The calm, warm, nutrient-rich waters of Iron Gate and Copco Reservoirs provide ideal habitat for *Microcystis* blooms (Water Board 2006, Kann 2006a, Kann and Corum 2006); thus, we would expect *Microcystis* to continue to thrive in these project reservoirs even with proposed management actions."

4. DEIS deficiency: The DEIS incorrectly states that 2005 was the first documented *Microcystis* bloom in the Klamath River downstream of Upper Klamath Lake.

The following two quotes are examples of statements from the DEIS regarding the 2005 *Microcystis* blooms:

> "Although the toxic algae M*icrocystis aeruginosa* has been known to occur regularly in Upper Klamath Lake (Gilroy et al., 2000), where it may degrade the quality of commercially harvested populations of the blue-green algae, *Aphanizomenon flos-aquae*, and as far as 125 miles downstream of the project reservoirs (Kann et al., 2006), this was the first

> time the extent of the blooms and their toxicity, at locations other than Upper Klamath Lake, had been documented and health advisories issued by public agencies (Water Board) for project waters" (page 3-143)
>
> "Microcystis aeruginosa has appeared regularly in Upper Klamath Lake and the extent of the blooms and toxicity documented in 2005 indicates that the algae has dispersed downstream and may have bloomed in project reservoirs prior to last year's documentation. However, in the absence of a structured monitoring program, any previous occurrence of toxic algal blooms would have been undetected." (page 3-144)

In fact, a well-documented toxic bloom occurred in Copco Reservoir on September 29th 2004 when 1.9 million cells/ml of *Microcystis* were associated with a microcystin toxin concentration of 482 µg/L (Kann and Corum 2006). In addition, *Microcystis* was frequently detected in KHP reservoirs in a pre-2005 monitoring program conducted by PacifiCorp from 2001 to 2004. While not specifically designed as a *Microcystis* monitoring program, phytoplankton samples were taken approximately 4 to 9 times per year at many sites between Link River and the Shasta River from 2001-2004. The methodology used in this sampling is described in Raymond (2005); an overall summary of results for all species is presented in Kann and Asarian (2006); and Kann (2006) focuses solely on *Microcystis*. FERC's suggestion that recent *Microcystis* blooms may be a result of algae that were dispersed downstream from UKL is inconsistent with expected algal-habitat dynamics in a riverine system. Blue-green algae have notably been entering the river system from UKL for many years (e.g., Phinney and Peak 1961), and thus recent dispersion is an unlikely cause of KHP reservoir blooms. Rather, these blooms are the direct result of habitat conditions created by the reservoirs and have been occurring for many years, In fact, these same authors (Phinney and Peak 1961) also state that:

> "Wherever along its length the river had been impounded, whether behind a dam or in a backwater or slough, the water had produced blooms comparable with that in Upper Klamath Lake. It can be predicted that the construction of additional impoundments on the Klamath River will greatly increase the organic load of this already impossibly burdened stream and will probably bring an end to fish production in this stream."

Iron Gate Reservoir, one of the KHP reservoirs that currently experiences large blooms of toxic *Microcystis,* was constructed subsequent to the Phinney and Peak (1961) prediction.

As noted previously in our comments regarding Recommended Terms and Conditions (filed with FERC in March, 2006), PacifiCorp frequently detected *Microcystis*, yet fails to mention *Microcystis* altogether in its 7000+ page Final License Application to FERC. Nor did PacifiCorp notify the public, inform water quality agencies, nor post public health warnings at its reservoir access points.

Recommendations for FEIS: For the reasons stated above, the text excerpted above from pages 3-143 should be revised as follows:

> "The toxic algae M*icrocystis aeruginosa* has been known to occur regularly in Upper Klamath Lake (Gilroy et al., 2000), where it may degrade the quality of commercially harvested populations of the blue-green algae, *Aphanizomenon flos-aquae*, and toxicity sampling has confirmed the presence of microcystin toxin in the lake. *Microcystis* was detected in PacifiCorp's 2001-2004 phytoplankton sampling program; however, these detections were not reported to public health agencies. In addition, a toxic bloom was documented in Copco Reservoir in 2004 when 1.9 million cells/ml of *Microcystis* were associated with a microcystin toxin concentration of 482 µg/L (Kann and Corum 2006). The first year in which there was detailed sampling specifically targeting *Microcystis*, including microcystin toxin analysis, in project reservoirs was 2005. Also in 2005, *Microcystis* was detected approximately 190 miles downstream of project reservoirs in the Klamath River estuary (Kann 2006a). In response to that 2005 information, health advisories were issued by public agencies for the project reservoirs and the Klamath River downstream (Water Board 2005). A public health advisory was issued again in 2006 (Water Board 2006)."

Additionally, the text excerpted above from pages 3-144 should be revised as follows:

> "Microcystis aeruginosa has appeared regularly in Upper Klamath Lake, although typically only low concentrations are detected at the lake's outlet (Kann 2006a). In its 2001-2004 phytoplankton monitoring program, PacifiCorp regularly observed *Microcystis* blooms in Iron Gate and Copco Reservoirs (Kann 2006a; Kann and Asarian 2006), indicating that *Microcystis* was well-established in those reservoirs prior to the detailed documentation of blooms in 2005 and 2006. Because PacifiCorp did not inform public health agencies of its findings, the public was not made aware of the *Microcystis* situation until 2005."

5. DEIS deficiency: The DEIS fails to recognize the Hoopa Valley Tribe's criteria for *Microcystis* and microcystin.

Page 3-143 at line 14 of the DEIS states: "There are no federal or California regulatory guidelines for cyanobacteria and their toxins." This statement ignores the Hoopa Valley Tribe's (Hoopa TEPA 2006) adopted criteria for *Microcystis aeruginosa* and microcystin (Table 1). These standards have been approved by the Tribal Council of the Hoopa Valley Tribe, and are pending approval from the U.S. EPA.

Table 1. Proposed *Microcystis aeruginosa* and microcystin criteria for the Klamath River on the Hoopa Valley Indian Reservation.

Parameter	**Proposed Standard***	**Rationale for Proposed**
Microcystis aeruginosa cell density	<5,000 cells/mL for drinking water <50,000 cells/mL for recreational water	Combination of WHO and Australian Guidelines--protective of public health

Microcystin toxin concentration	<1µg/L total microcystins for drinking water <10 µg/L total microcystins for recreational water	Combination of WHO and Australian Guidelines--protective of public health

*The presence of cyanobacterial scums poses the highest health risk and are to be avoided at all times.

Recommendations for FEIS: We suggest that the quote above found on page 3-143 at line 14 be replaced with: "The State of California and federal agencies have not yet adopted regulatory guidelines for cyanobacteria and their toxins, but the Hoopa Valley Tribe has adopted criteria for *Microcystis aeruginosa* and microcystin for the Klamath River on the Hoopa Valley Indian Reservation. For recreational waters, the Hoopa criteria are a *Microcystis aeruginosa* cell density of <50,000 cells/mL and <10 µg/L total microcystins"

6. DEIS deficiency: The DEIS considers the use of an algaecide to control *Microcystis* blooms.

Pages 3-148 to 3-149 of the DEIS states that "using an algaecide to control a *Microcystis* bloom could be effective in reducing the amount of microcystin toxin, and associated human health risk, in project reservoirs." It is incorrect to assume that using an algaecide on *Microcystis* will be a benefit to human health. When an algaecide is used on *Microcystis*, the cells are lysed, releasing the toxin microcystin. Therefore, all of the toxin is released in one large pulse. This could be detrimental to humans, wildlife, and fish. While it might be reasonable to close down the reservoirs to recreational use for a period of time to treat the reservoirs with an algaecide, it is not reasonable to expect to close the river downstream to human access. Toxic algae blooms occur not only during periods of high recreational use, but also during periods of ceremonial use and subsistence fishing by Tribal members. Furthermore, it is not possible to keep fish and wildlife out of the river or reservoirs.

Page 3-149 of the DEIS goes on to state that "However, depending on the algaecide used, there could be associated adverse water quality effects." This does not mention the implications on water quality that copper sulfate (a possible algaecide mentioned in the DEIS) could have. Effects could include fish kills from copper toxicity in the reservoirs and river, decreased dissolved oxygen, and bioaccumulation of copper.

Recommendations for FEIS: We suggest that the FEIS acknowledge the impacts of algaecides mentioned above and state that, due to these reasons, algaecides are not reasonable to use to control *Microcystis* blooms.

XIV. THE DEIS CONTAINS NO DISCUSSION OF THE EFFECTS OF PEAKING/BYPASS OPERATIONS ON NUTRIENT RETENTION (REMOVAL) BETWEEN J.C. BOYLE RESERVOIR AND COPCO RESERVOIR.

The DEIS contains no discussion of the effects of peaking/bypass operations on nutrient retention (removal) between J.C. Boyle Reservoir and Copco Reservoir. This is disappointing because we have commented on this subject during each of several rounds

of comments: PacifiCorp's Final License Application in April 2004, Scoping Document 1 comments in July 2004, and Recommended Terms and Conditions submittal in March 2006. To date FERC has neither agreed nor disagreed with our position that peaking and bypass operations have a detrimental effect on downstream water quality. We request that FERC respond to this matter in its final EIS.

Effect of peaking operations

As the river fluctuates from 350 cubic feet per second (cfs) to 1500, or even 3000 cfs, and back each day during peaking operations, attached algae is scoured during such high flows, then dries out during low flows. The increased water depth during the peaking flows also reduces the amount of sunlight penetrating through the Klamath River's murky water, further reducing attached algae growth by limiting the amount of light that reaches the river's bed. The net effect of these processes is that attached algae are scarce within the peaking reach (Fig. 1)

In the portions of the Klamath River not subject to hydropower peaking, the channel margins are habitats favored by benthic algae, since shallow water provides ample sunlight and the low water velocities do not scour the substrate (Fig. 2). Biggs (2000) noted that filamentous algae are most often concentrated in the stream margins. The channel margins are most effected by hydropower peaking. Therefore, as PacifiCorp (2005) itself has acknowledged, benthic algae production in reaches that are effected by peaking declines as does the over-all nutrient stripping capability of the river.

Figure 1. The southeastern edge of the Klamath River's channel at Stateline river access during non-peaking hours, approximately 5 miles upstream of Copco Dam. Note the complete lack of attached algae and rooted aquatic plants. Photo by Kier Associates, August 2006.

Figure 2. The southeastern edge of the Klamath River's channel just downstream of the Interstate-5 Bridge at river mile 179, approximately ten miles downstream of Iron Gate Dam. Note abundant attached algae and rooted aquatic plants. Photo by Kier Associates, August 2006.

PacifiCorp has asserted that the high gradient of the stream channel between Keno and Stateline (six miles above Copco Reservoir) limits the ability of attached algae to grow. We agree that while gradient is an important factor in determining the rates of algal assimilation and denitrification within any river reach; the examination of the longitudinal profile of the Klamath River (Fig. 3) nevertheless suggests there are several areas with low- to moderate gradient, totaling 14.3 miles. These include (Note: elevations/miles have been determined from USGS topographic maps):

- The area submerged under J.C. Boyle Reservoir (river mile 228.2 to R.M. 224.6, elevation 3793 to 3720) = 20 ft/mi gradient over 3.6 miles
- From the USGS gage below J.C. Boyle Powerhouse (R.M. 219.7, elevation 3275) to the end of Frain Ranch (R.M. 214.4, 3130 feet) = 27 ft/mi. gradient over 5.3 miles
- From Stateline (R.M. 209, elev. 2740) to Copco Reservoir (R.M. 203.6, elev. 2605) = 25 ft/mi gradient over 5.4 miles

These gradients are approximately twice that of the 12.8 feet per mile that the Klamath River drops from Iron Gate Dam (2180 feet) to Weitchpec (300 feet) in 146.5 miles, but they are likely still low enough that attached algae could thrive. Given the differences in gradient, we would not expect that assimilation rates would necessarily be the same as in the reach below Iron Gate, but would clearly be higher than current conditions that are

influenced by peaking operations. In free-flowing river reaches below Iron Gate Dam, mass-balance nitrogen budgets show that in the warm low-flow July-to-September period, an average of about 0.35% of the Klamath River's nitrogen is removed each mile that the river flows downstream of Iron Gate Dam (Asarian and Kann 2006a).

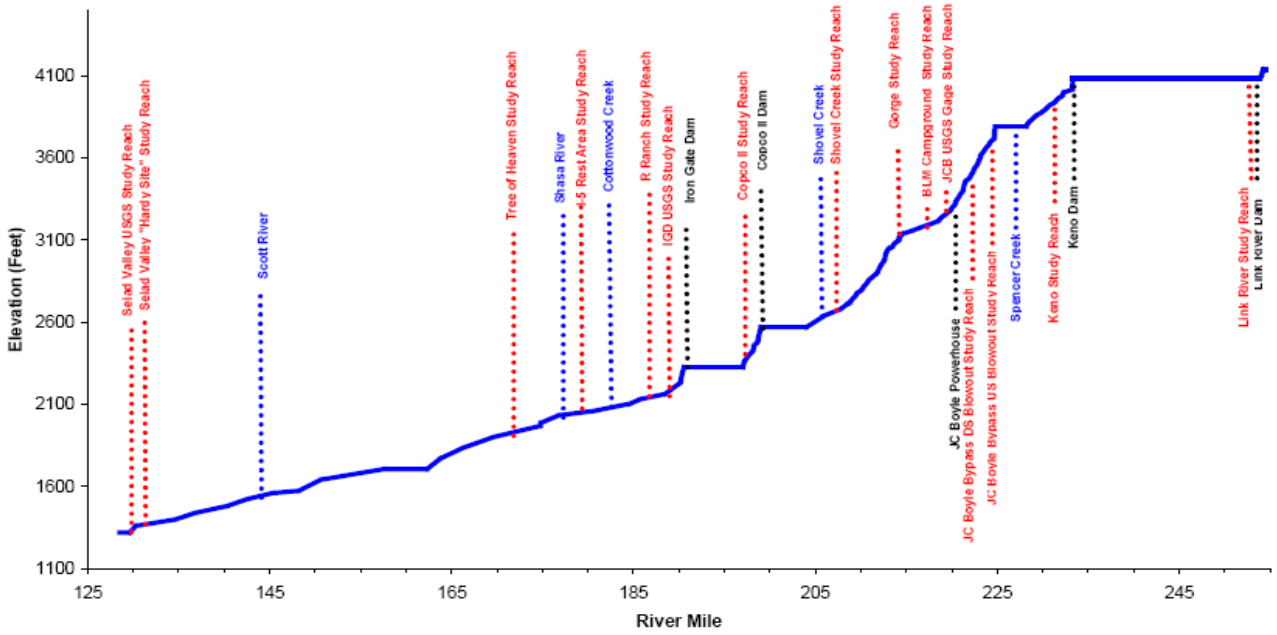


Figure 3. Longitudinal profile of the Klamath River from Link River to Seiad Valley. Note that this figure shows the existing conditions of the water surface, including the reservoirs. Figure from PacifiCorp (2004).

The effect of bypass operations

The steep riverine reaches of the Klamath River (Keno Dam to J.C. Boyle Reservoir; the peaking reach from J.C. Boyle Dam to just below the J.C. Boyle Powerhouse; and the downstream end of Frain Ranch to Stateline) appear to provide a significant benefit to Klamath River water quality. PacifiCorp's 2001-2004 phytoplankton data show substantial decreases in phytoplankton biomass through river reaches like Keno Dam to J.C. Boyle Reservoir and J.C. Boyle Dam to Copco Reservoir (Kann and Asarian 2006). The likely reason for this is that turbulence in these reaches kills phytoplankton, transforms it into organic matter and begins the decomposition process. Once organic matter has decayed into dissolved inorganic nutrients it can be taken up by attached algae, resulting in reduced nutrient concentrations and improving downstream water quality overall.

Current alterations in the bypass reach allow phytoplankton to persist further downstream, delaying improvement in water quality. For example, at J.C. Boyle Dam, most of the Klamath River's water is diverted into a concrete canal that runs parallel to the river for several miles (Figure 4) before re-joining the river at the J.C. Boyle Powerhouse. The canal is low gradient with low water velocity and low turbulence, allowing phytoplankton to pass through it intact. The diverted water does mix violently

at the J.C. Boyle Powerhouse, but for only a few moments compared to the multi-hour, 5-mile, constantly-frothing journey that water in the river channel through the bypass reach experiences.

Figure 4. Excerpt from a panoramic photo of the J.C. Boyle Bypass reach and canal. Original photo by Thomas Dunklin (http://www.thomasbdunklin.com).

Figure 4. The canal that carries water from J.C. Boyle to the powerhouse. Photo by Katherine Pedery (http://www.pelicannetwork.net/salmon.boyle.htm).

In addition to depriving the water of turbulent mixing, the canal provides an extremely poor growing environment for attached algae. The water surface in the canal is exposed to sunlight, but the combination of turbid water and the canal's vertical walls result in very little sunlight reaching its bottom where attached algae could grow. In contrast, although in many other reaches of the Klamath River attached algae may not grow well in the deep light-limited water in mid-channel, it thrives in the shallower water along the channel margins.

Because most of the water is diverted, only a small portion of the remaining streamflow in the river between JC Boyle Dam and the powerhouse is subjected to the turbulent mixing that destroys phytoplankton and begins the decomposition process. Thus, the net effect of the diversion is that the combined water in the river below the J.C. Boyle Powerhouse would have more intact phytoplankton and organic matter, and it will take longer to fully decompose and to be removed from the water column than would be the case if no water were diverted. In addition, the lack of adequate growing conditions in the canal allows for very little or no assimilation of nutrients by attached algae. The net result of these factors would be higher nutrient concentration downstream than would exist absent the diversion.

The 1.4 mile long Copco 2 Bypass reach has similar effects on water quality, albeit for a shorter distance.

Recommendations for FEIS:

We recommend that FERC consider the points that we have presented above and revise the EIS to recognize the effects of project peaking/bypass operations on downstream water quality. The affected reaches include the J.C. Boyle Bypass Reach, J.C. Boyle Peaking Reach, and the Copco 2 Bypass Reach. The FEIS sections requiring revision include 3.3.2.2.2 "Dam Removal to Enhance Water Quality", 3.3.3.2.4 "Dam Removal or Decommissioning", 5.2.21 "Dam Removal", 5.2.5 "Instream Flows", and 5.1.2 "Summary of Effects". We also recommend that the EIS include an alternative that analyzes the affects of the removal of J.C. Boyle Dam, including the effects on downstream water quality described above.

XV. EFFECTS OF IRON GATE AND COPCO RESERVOIRS ON NITROGEN DYNAMICS ARE INADEQUATELY ADDRESSED IN THE DEIS

We agree with the FERC staff's conclusion that Iron Gate and Copco Reservoirs can act as both nutrient source and sinks, depending on the time of year, but we would like to provide some additional information that needs to be incorporated into the EIS.

PacifiCorp has submitted comments to FERC regarding the Kann and Asarian (2005) nutrient budgets for Iron Gate and Copco Reservoirs for the year 2002, stating that nutrient retention in Iron Gate and Copco Reservoirs should not be analyzed in isolation, but rather in tandem to determine the net affect on retention. We agree, although the reasoning for keeping the systems separate was to allow for the evaluation of management measures that could involve either of the reservoirs separately.

That said, when evaluated for the combined retention effect of both reservoirs, there were still two significant periods when net negative retention (that is, nutrient input from the reservoirs themselves) occurred for both TP and TN. For example, for TN in 2002 the two periods were from 5/24 to 6/19 (30 metric tons) and 7/17 to 8/14 (68 metric tons)(Figure 5).

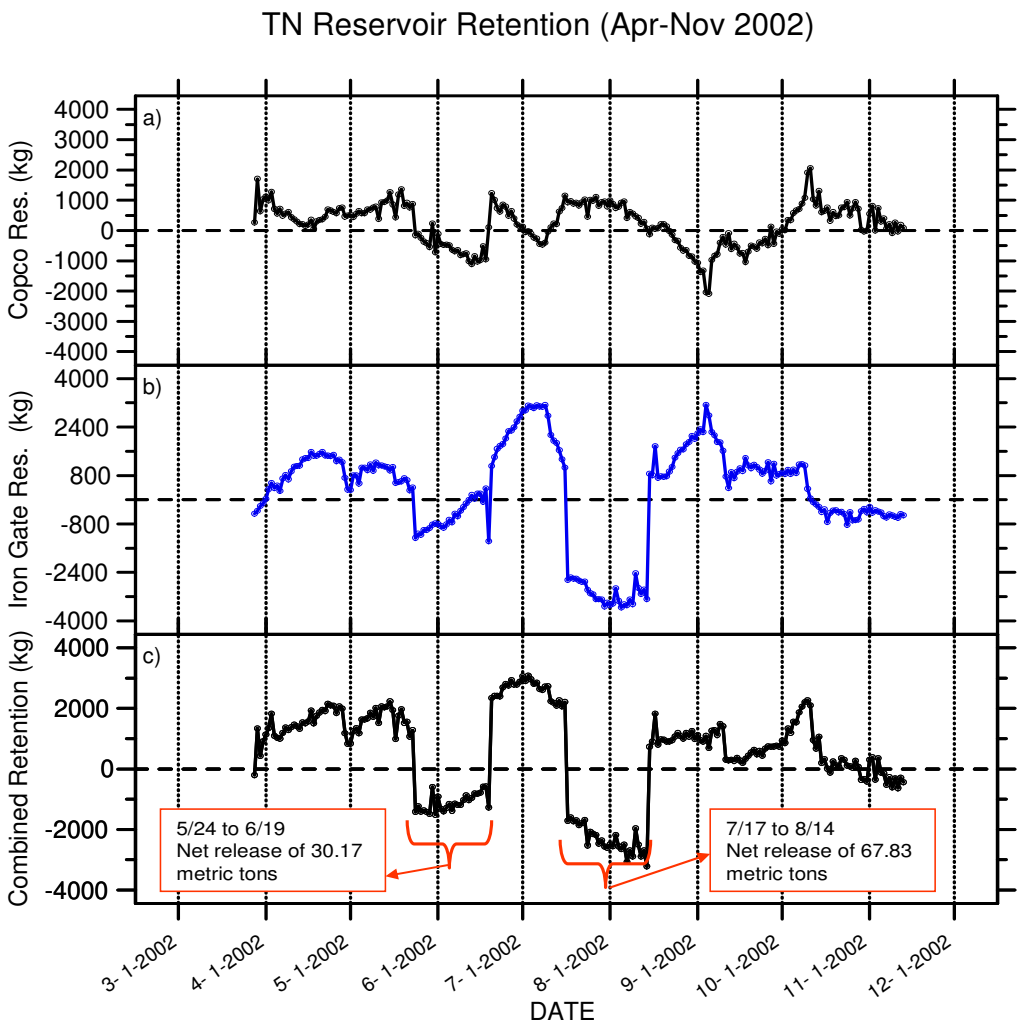


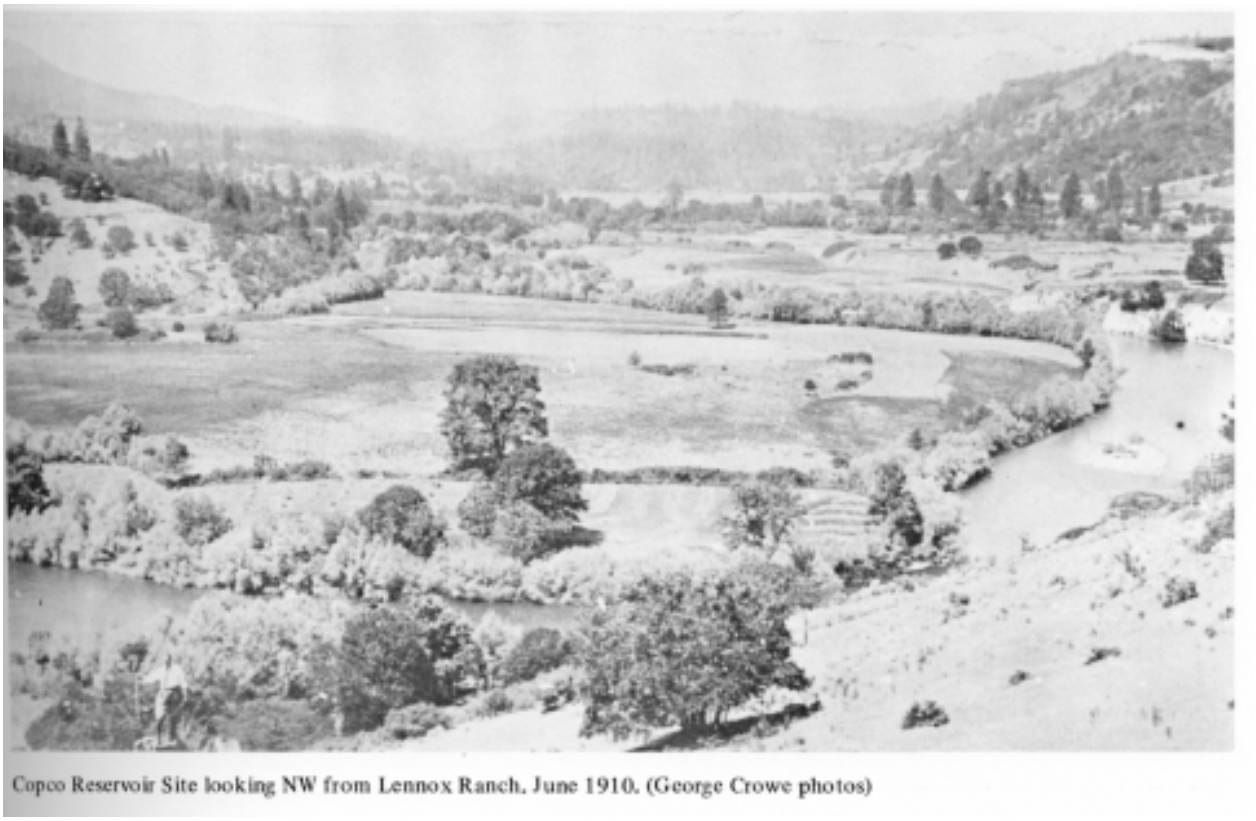
Figure 5. Combined total nitrogen retention in Iron Gate and Copco Reservoirs (based on data from Kann and Asarian 2005).

As noted in Asarian and Kann (2006a), evaluation of the true reservoir effect on nutrient retention requires a further comparison of the combined retention of Iron Gate and Copco reservoirs with that of the retention that would occur through natural processes absent these reservoirs.

Asarian and Kann (2006a) constructed mass-balance nitrogen budgets for free-flowing river reaches downstream of Iron Gate Dam. The results showed that for reaches between Iron Gate Dam and Orleans (140 miles downstream) in the warm low-flow July-to-September period, an average of about 0.35% of the Klamath River's nitrogen is removed each mile the river flows downstream of Iron Gate Dam (Asarian and Kann 2006a).

To estimate potential retention in the historic river channel that is currently inundated by Copco and Iron Gate Reservoirs, Asarian and Kann (2006a) applied retention rates calculated for the Klamath River reach from Iron Gate to Seiad Valley (see Kann and Asarian 2006a for details). Retention rates for the Iron Gate to Seiad reach were chosen

because it is the reach directly below the reservoirs, is of similar gradient (e.g., see historical topographic maps included in the bathymetric survey report (Eilers and Gubala 2003) and in the December 16, 2005 submissions to the Federal Energy Regulatory Commission (FERC) by PacifiCorp), and because historic photos of the inundated area, (example below) shows that this reach is markedly different from the steeper gradient gorge reach below JC Boyle.



Copco Reservoir Site looking NW from Lennox Ranch, June 1910. (George Crowe photos)

Figure 6. Historic photo of an area now inundated by Copco Reservoir. The Lennox Ranch referred to in the photo caption was approximately halfway between the present-day upstream- and downstream ends of Copco Reservoir. Photo from Boyle (1976).

The comparison indicated that the free-flowing river reaches below Iron Gate Dam retain nutrients at a moderate consistent rate, while the combined retention of Iron Gate and Copco reservoirs alternates between positive and negative values (Asarian and Kann, 2006a) (Figure 7).

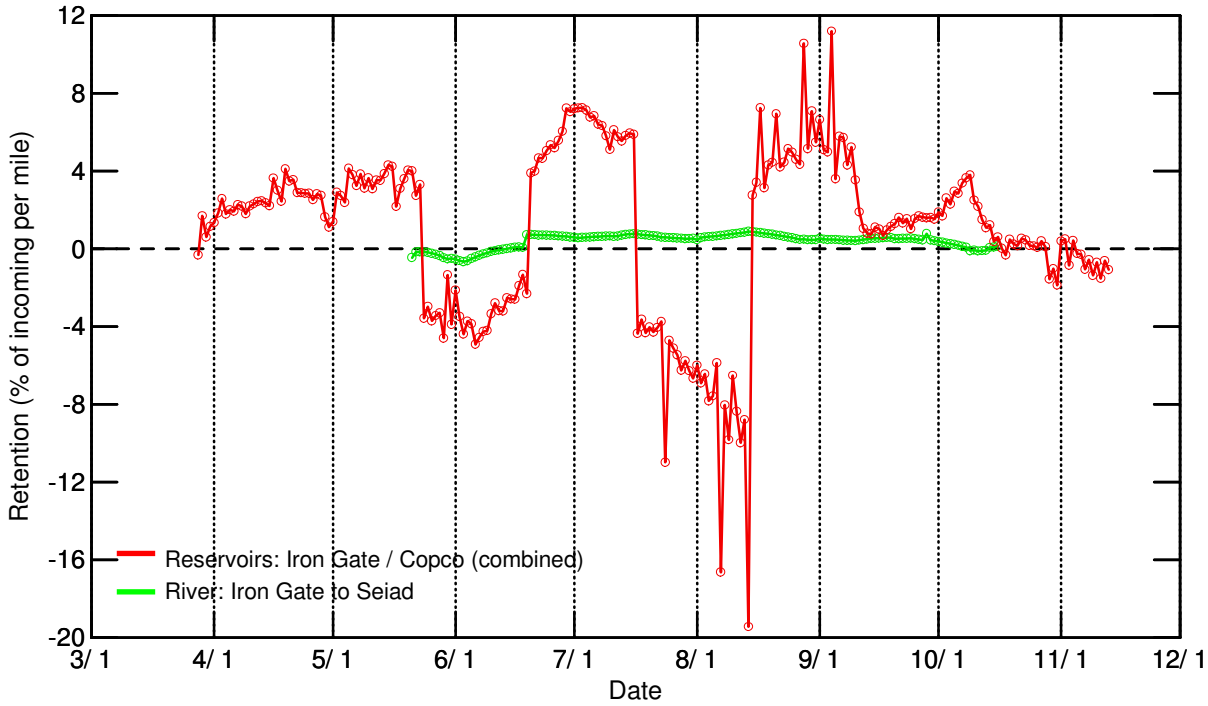


Figure 7. Comparison of combined retention in Iron Gate and Copco Reservoirs (from Kann and Asarian 2005) with retention in the river reach from Iron Gate to Seiad Valley, for the year 2002.

This comparison of the historic streambed -- now inundated -- with current reservoir retention indicates that when retention due to natural river processes is factored into the reservoir retention estimated in Kann and Asarian (2005), that reservoir retention is minimal (4.6% of incoming load) or even negative (-3.3% of incoming load) during the periods evaluated (May 21 – October 16 and July 1 – September 30, respectively). This indicates that during this critical July-September period, river reaches are more effective at retaining nitrogen and would have greater benefit on downstream water quality than the reservoirs. Full details of this comparison are provided in Asarian and Kann (2006a).

Recommendations for FEIS:
The information that we have provided in this section is not intended for the amendment of FERC's position, but rather to provide FERC with additional information with which to strengthen the conclusion that it has reached with regard to the impacts of Iron Gate and Copco reservoirs on the nitrogen dynamics of the Klamath River. The appropriate section of the EIS should be revised to include this information. At a minimum, FERC staff should review Asarian and Kann (2006) and cite this work in the FEIS.

XVI. THE DEIS CARBON DISPLACEMENT CALCULATIONS SHOULD BE RECALCULATED

We support FERC's decision to include an analysis of the KHP's greenhouse gas emissions in the EIS, as global climate change is a significant problem for the world in

general, and Klamath River's salmon in particular. That said, we have some substantial disagreements with FERC's calculation concerning carbon displacement.

Section 4.8 of the DEIS estimates the amount of carbon that would be emitted from a natural gas power plant that would presumably provide replacement power were the KHP to be decommissioned. As described below, the "carbon intensity factor" used by FERC for this calculation assumes that the electricity would be replaced by an old inefficient natural gas power plant.

The "carbon intensity factor" of 155 kilograms of carbon per megawatt hour (kg C/MWh) used by FERC to calculate the KHP's carbon displacement apparently assumes that the electricity would be replaced by an old inefficient natural gas power plant -- although no reference is provided for the origin of the number. In reality, a new natural gas power plant would likely have a far higher carbon efficiency. The heat rate (a measure of efficiency) of large-scale new efficient combined cycle natural gas power plants is 0.007 million BTU/MWh (CEC 2005). According to U.S. EPA (2003), the calculation for carbon intensity from natural gas electrical generation is:

> Carbon intensity = (Heat rate)*(31.9 lbs C/ million BTU)*(0.995)
>
> Carbon intensity = (0.007 million BTU/KWh)*(31.9 lbs C/ million BTU)*(0.995)*(1 kg/2.204 lbs)*(1000 KWh/MWh) = 101 kg C/MWh

Thus, FERC's carbon intensity factor of 53% is too high (155 vs. 101). A more realistic estimate for KHP carbon displacement is 265,262 metric tons of carbon dioxide (CO_2) per year, rather than FERC's estimate of 407,085 MT CO_2/yr.

Table 2 shows a comparison of FERC's estimate for the KHP's carbon displacement with a revised, more realistic estimate based on a more efficient power plant.

Annual Generation[1]	Carbon Intensity		Carbon Emissions	Carbon Dioxide Emissions
(MWh)	Source	(kg C/MWh)	(MT C/yr)	(MT CO_2/yr)
716,800	new combined cycle[1]	101	72,397	265,262
716,800	old inefficient[2]	155	111,104	407,085

[1]Source: CEC (2005) and U.S. EPA (2003).
[2]Source: FERC DEIS, originally from PacifiCorp
[3]Carbon dioxide emissions = (Carbon emissions)*(3.66412) [ratio of CO_2 molecular weight to C atomic weight].

Recommendations for FEIS:
We request that the calculation of KHP carbon displacement in section 4.8 of the EIS be revised to use a more realistic number for carbon intensity, such as 101 kg C/MWh. In addition, the carbon displacement calculation should include an offset for the global

warming potential of methane production in the KHP reservoir discussed below. This would best be achieved by adding a methane column to Table 4.7.

XVII. THE DEIS MAKE NO MENTION OF THE FACT THAT KHP RESERVOIRS EMIT THE POTENT GREENHOUSE GAS METHANE, DESPITE COMPELLING EVIDENCE THAT METHANE IS PRODUCED IN KHP RESERVOIRS

In its analysis of the KHP's effect on greenhouse gas emissions, the DEIS make no mention of the fact that KHP reservoirs emit the potent greenhouse gas methane, despite compelling evidence that methane is produced in KHP reservoirs.

Methane is a substantial contributor to anthropogenic greenhouse gas emissions. On a mass basis, methane's global warming potential is 23 times higher than carbon dioxide (IPCC 2001). Hydroelectric reservoirs are now widely recognized as anthropogenic sources of methane, with some reservoirs producing more greenhouse gas emissions than fossil-fuel generation facilities (Graham-Rowe 2005, Cullenward and Victor 2006).

Lakes and reservoirs emit methane through four processes: 1. ebullition (bubbles), 2. water column storage (gas accumulated in the hypolimnion during stratified periods is released during the fall turnover), 3. diffusive emission, and 4. plant mediated emission (Bastviken et al. 2004, Fig. 8). Emissions vary widely among lakes, and they depend upon lake-specific factors such as lake area, water depth, concentrations of total phosphorus, dissolved organic carbon and methane, and the anoxic lake volume fraction (Bastviken et al. 2004).

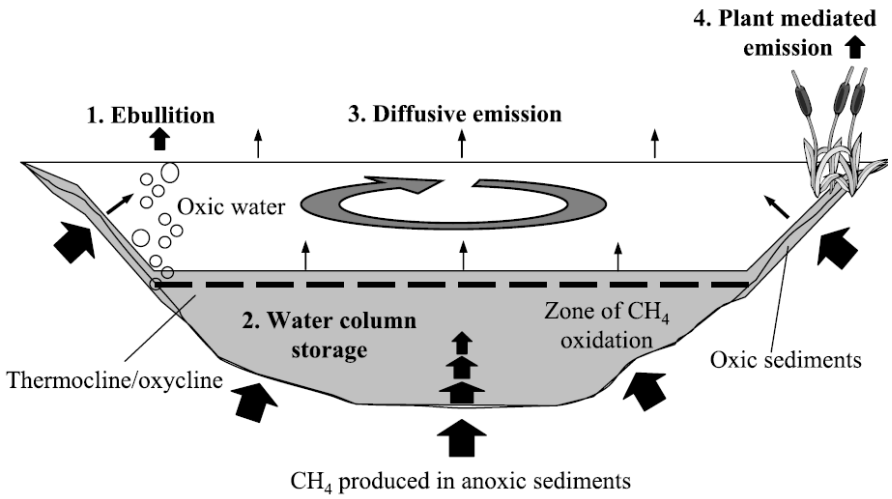


Figure 8. Illustration of emission pathways and methane dynamics in a stratified lake. Figure from Bastviken et al. (2004).

While we are not aware of any measurements of methane concentrations in KHP reservoirs, water quality data from project reservoirs show conditions that foster methane production, including widespread summer anoxia in KHP reservoirs, particularly in Keno, Iron Gate, and Copco. Hydroacoustic sampling has identified bubbles in the deep

portions of Iron Gate and Copco Reservoirs on several occasions (Eilers and Eilers 2004). In addition, a massive bubbling event was observed in Copco Reservoir on October 31, 2003 (Eilers and Eilers 2004). Corum (pers. comm.) observed a similar but less dramatic bubbling event in Copco Reservoir on October 18, 2005. As described above, bubbling (ebullition) is only one of four pathways by which lakes can emit methane.

The DEIS acknowledges the likely production of methane in KHP reservoirs at page 3-149: "Methane production, which is strongly suspected as occurring under certain similar anoxic conditions, at least in Iron Gate reservoir (Eilers and Eilers, 2004), can also produce taste and odor problems"

Due to a lack of KHP-specific data, estimating its methane emissions precisely is not possible at this time; however, methane emissions have been measured in reservoirs around the world and classified based on lake characteristics, so it is possible to generate reasonable estimates. Bastviken et al. (2004) presents a review of studies of methane emissions from lakes and reservoirs in North America and Eurasia, and describes the lake characteristics that affect the quantity of methane produced in a lake. Using data from 73 lakes, Bastviken et al. (2004) developed regression equations to predict lake emissions based on lake characteristics.

Most lakes and reservoirs where methane emissions have been studied have water quality superior to that of the KHP reservoirs and hence are likely to emit even less methane than the KHP reservoirs. For instance, Soumis et al. (2004) measured methane emissions from hydroelectric reservoirs in the western United States, but all of them had much better water quality than the KHP reservoirs (i.e. no anoxic hypolimnion), so data from those reservoirs are not directly applicable despite their geographic proximity. Only 2 of the 73 lakes studied in Bastviken et al. (2004) have total phosphorus concentrations similar to the KHP reservoirs. These include Priest Pot, a 2.5 acre small pond in the United Kingdom, and Lake Mendota at Madison, Wisconsin. Lake Mendota is 9,740 acres, with a maximum depth of 83 feet, making it approximately 10 times larger than Iron Gate and Copco Reservoirs, and somewhat shallower. Similar to KHP reservoirs, both Priest Pot and Mendota are subject to substantial seasonal algae blooms.

Using a variety of literature-based methane flux rates, and then applying the total area of project reservoirs, we have calculated the annual global warming potential of methane emissions from KHP reservoirs (Table 3). Given the lake/reservoir characteristics, it is likely that methane flux rates for KHP reservoirs are somewhere between those of Lake Mendota and Priest Pot. Hence, the annual global warming potential of methane emissions from KHP reservoirs is approximately equivalent to 3 to 12% of the KHP's carbon displacement (Table 3). While this is not a huge percentage, it is not insignificant. Site-specific studies of KHP reservoirs could be used to refine the estimate.

Table 3. Comparison estimated global warming potential (GWP) of methane (CH_4) emissions from KHP reservoirs and global warming emissions from a natural gas power plant that would replace KHP electrical generation.

KHP Reservoir Area[1]	CH4 Flux		CH4 Mass Flow Rate[4]	CH4 Mass Flow Rate[5]	Global Warming Potential per Year[6]	KHP Carbon Dioxide Displacement[7]	GWP of Methane Emissions as % of Displacement[8]
(m^2)	Source	(mg CH_4 / m^2d)	(MT CH_4 / d)	(MT CH_4 / yr)	(MT CO2 equivalent /yr)	(MT CO2/yr)	(%)
19,582,738	Lake Shasta[2]	11	0.215	79	1,808	265,262	0.68%
19,582,738	Lake Mendota[3]	50	0.979	357	8,220	265,262	3.10%
19,582,738		100	1.958	715	16,440	265,262	6.20%
19,582,738	Priest Pot[3]	193	3.779	1380	31,729	265,262	11.96%
19,582,738	flooded rainforest reservoir[2]	500	9.791	3574	82,199	265,262	30.99%

[1]Area [m^2] = Keno + J.C. Boyle + Copco + Iron Gate = 2475 + 420 + 1000 + 944 = 4839 acres, unit conversion to m^2= 19582738
[2]Source: Soumis et al. (2004)
[3]Source: Bastviken et al. (2004)
[4]CH_4 mass flow rate [MT CH_4/d] = (CH_4 flux)*(Area)
[5]CH_4 mass flow rate [MT CH_4/yr] = (CH_4 mass flow rate)*(365 d/yr)
[6]Global Warming Potential per year [MT CO_2 equivalents/yr] = (CH_4 mass flow rate)*(23) because CH_4 is 23 times more potent than CO_2 a mass basis [IPCC 2001]
[7]KHP Carbon Displacement = Amount of carbon that would be released annually from a natural gas power plant that would replace KHP generation. (101 kg C/MWh)*(KHP generation 716,800 MWh/yr)*(3.664124552 kg CO^2/kg C)/(unit conversion 1000 kg/MT)) [Source: FERC DEIS and Table 3]
[8]GWP of Methane Emissions as % of Displacement = (Global Warming Potential per year)/ (KHP Carbon Displacement)

Recommendations for FEIS:
We request that FERC consider the points we have provided above, and revise section 4.8 of the EIS to include recognition that KHP reservoirs can produce substantial quantities of methane, a potent greenhouse gas. Similar to the exercise shown above, section 4.8 of the EIS should also include estimates for the amount of methane produced in KHP reservoirs, and compare that with the FERC estimate of KHP carbon displacement (the annual amount of carbon that would be generated were the KHP replaced by a natural gas-fueled power plant). In other words, a more reasonable analysis of the relative benefit/detriment of the KHP on global warming should include both the more realistic carbon displacement effect shown above, and the further offset due to reservoir methane production.

XVIII. SECONDARY ISSUES

In this section, we provide comments on issues of lesser concern. After "General notes regarding DEIS figures and tables of water quality data", our comments are listed below with page numbers and section numbers that refer to the relevant portion of the EIS.

General notes regarding DEIS figures and tables of water quality data

In the case of many figures of water quality data in the DEIS, there is no notation provided regarding the number of samples collected at each site, the times of year in which samples were collected, nor the differences in the timing of sample collection between sites. In most sampling programs, more data are collected at some sites than others. It is important to have knowledge of such differences when interpreting data, particularly when the trends are subtle. Many sites have only a few data points so they should probably be excluded from the charts and tables. Since water quality parameters change between seasons and years, creating charts and tables that mix infrequently and frequently-sampled sites can suggest trends that are in fact simply artifacts of sample collection timing.

Many figures and table are cited as "(Source: PacifiCorp, 2004a, as modified by staff)" [the Final License Application] but it is unclear whether a particular figure or table was originally created by PacifiCorp or whether FERC staff created the figure or table from data provided by PacifiCorp. If FERC staff actually created a figure or table from PacifiCorp data, then we suggest its identity be changed to read "(Source data: PacifiCorp, 2004a, as modified by staff)"

In addition, most of the figures and tables do not include sites downstream of the immediate KHP area. As such, they do not provide proper context for understanding the basin-wide spatial trends in temperature, dissolved oxygen, pH, nutrients, and algae.

Given these deficiencies, many of the figures and tables displaying water quality data in the DEIS are of limited value. Fixing these deficiencies may not be worth the time required, given the other elements of the EIS that need improvement. On the other hand, if these figures and tables are intended to inform policy decisions, then they should be fixed.

3.0 ENVIRONMENTAL CONSEQUENCES

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

3.3.2 Water Resources

3.3.2.1 Affected Environment

Page 3-103

Table 3-26 shows dissolved oxygen (D.O.) data and is a prime example of the issues noted above in "General notes regarding DEIS figures and tables of water quality data." Although it is not noted in the DEIS, we assume that this table appears to include only grab sample data, not automated, continuous recording multi-parameter probes. At sites such as the Klamath River above the Shasta River, where dissolved oxygen dynamics are driven primarily by attached algae and macrophytes, the calculation of average monthly D.O. is of little value. Algae photosynthesize and produce oxygen during daylight hours, then consume oxygen at night through respiration, producing large daily swings in D.O. At such sites the mean monthly D.O. will tell more about what time of day the samples were collected than of any spatial or monthly trends. In the depths of reservoirs, where D.O. levels do not undergo diurnal fluctuations and D.O. dynamics are driven primary by biological oxygen demand and sediment oxygen demand, then monthly means are useful.

An additional issue is that the data in the figure is cited as being from PacifiCorp's Final License Application (FLA). The FLA was submitted in February 2004, yet this table includes data from 2004, presumably from the months after the FLA was submitted to FERC, indicating that the citation may be incorrect.

Some of the numbers in the table are highly suspect, likely an artifact of the (unknown) low number of samples. For example, it is highly unlikely that the actual summer monthly mean D.O. for Copco reservoir outflow and Iron Gate reservoir outflow are really as high as shown in the table.

While the automated probe data for temperature, pH, and D.O. are not available for as many years and as many sites as are the grab sample data, there is a substantial amount of data that encompasses most of the major monitoring sites in KHP area for at least one season. Most of the available data have been assembled and are available as electronic appendix C in Asarian and Kann (2006a), filed at FERC as accession number 20060811-5089. The FEIS should make use of these data.

P3-109 to 3-113

Figures 3-31 through 3-34 and the text that explains them are problematic for many reasons. First, they suffer from the same problems as many of the DEIS figures (see comments above regarding General notes regarding DEIS figures and tables of water quality data). Second, site names in the figures are illegibly blurry, apparently due to conversion between various computer programs. Third, box plots with median, interquartile ranges, and outliers would be more useful than the minimum, mean, and maximum plots presented in the DEIS.

Fourth, if the data in the charts come from the 2000-2003 spreadsheet posted on PacifiCorp's website, then the 2000 data are flawed. Apparently, PacifiCorp accidentally deleted a cell in the spreadsheet so that the some columns became offset from the others. The result is that much of the 2000 data have dates, depths, and sites that are offset one row from the original correct data. For instance, data listed as collected at a site in August was actually collected in September. Even worse, data for the beginning and end of the sampling season was shifted from one site to another.

Fifth, apparently these charts contain only PacifiCorp's 2000-2003 data while substantial additional datasets (e.g. from USGS, USFWS, Karuk Tribe, and Yurok Tribe) are available and have been compiled into a single database that also includes PacifiCorp's 2000-2004 data (though as described above PacifiCorp's 2000 data should not be used). This larger dataset is available as electronic appendices C and E in Asarian and Kann (2006), filed at FERC as accession number 20060811-5089.

P3-113 and P3-114
Table 3-30 suffers from many of the same problems as Figures 3-31 to 3-34. As described above, this includes 1) the lack of any information regarding organic nitrogen (typically the most abundant for of nitrogen in the Klamath River) or total nitrogen, 2) no mention of the number of samples, 3) likely inclusion of erroneous PacifiCorp 2000 data, 4) failure to use all available data, 5) no data downstream of the Shasta River.

The statement that "Seasonal changes in water quality constituents below Iron Gate dam are not large (Table 3-30)" does not appear to be supported by the available data. After making that statement, the DEIS then goes on to describe that there are differences in seasonal concentration, contradicting the original statement. An increase in nitrate values from approximately 0.2 mg/L in the May-August period to approximately 0.4 in the September-November period is characterized in the DEIS as a "slight" increase, a substantial understatement considering that it is a doubling of concentration. The DEIS should note that the 1.99 mg/L average ammonia concentration above the Shasta River is driven largely by a single, seemingly impossibly high measurement in 2004 (3.84 mg/L). Additionally, the DEIS should identify whether or not table 3-30 includes PacifiCorp's filtered and unfiltered samples for 2004, or just the unfiltered samples. Asarian and Kann (2006) analyzed seasonal and interannual variations in total nitrogen (TN) concentration in the Klamath River. Appendix A of that document includes detailed charts of total nitrogen concentrations for sites with available data for 1998-2002. The charts show that in most years there are seasonal differences in TN concentrations below Iron Gate Dam, with values typically higher in August-November than May-July.

Page 3-113
The information provided in Table 3-29 is useful but it could be improved substantially by including information regarding the number of samples collected. Additionally, information regarding nitrate, organic nitrogen, and total nitrogen should be added.

Page 3-115
Lines 5 and 6 of this page in the DEIS state "In Copco and Iron Gate reservoirs, BOD is lower and sediment effects become a more important influence on the quality of the overlying water." We are not aware of any evidence to support this assertion. The statement should have a literature citation or mention of some specific data to support it, or it should be removed altogether.

Page 3-117

Figure 3-36 shows 1996-1997 data for chlorophyll below Iron Gate Dam. Similar to many DEIS figures, it does not list the number of samples and the months in which the samples were collected. Without such information, it is impossible to interpret any trends. Given the large variations in monthly chlorophyll levels shown in Figure 3-35, the spatial trends that appear in Figure 3-36 could be meaningless if the sites were not sampled during the same time of year.

Page 3-117
While the DEIS presents some useful information regarding *Microcystis*, it does not incorporate the information from the most current and comprehensive studies (Kann 2006a, Kann and Corum 2006, filed at FERC in March 2006 and Kann 2006b, filed in December 2006). This section should be re-written using information from those documents. For more information about how the DEIS' discussions and analyses of *Microcystis* should be improved, see our comments regarding "Toxic algae" in the "Detailed Comments Regarding Major Issues" section above.

Minor note: The document cited as "Kahn et al. in 2005" on lines 10 and 18 is not in the references, and should be "Kann".

Page 3-118
To emphasize the point that 2005 was not an abnormal year for *Microcystis*, the following text should be added to Line 5: "SWRCB (2006) issued a similar health advisory again in 2006, noting that *Microcystis* concentrations in the reservoirs were higher in 2006 than 2005."

The following text should be added to Line 22: "Additional details regarding Klamath River periphyton data are contained in Appendix G of the Hoopa Valley Tribe's water quality standards (Hoopa TEPA 2006)."

The paragraph regarding PacifiCorp's phytoplankton data in lines 6 through 12 requires some revisions. For instance, mean algal abundance is not the best metric to use to describe overall phytoplankton trends. Because colony sizes can vary by orders of magnitude, calculating the total number of colonies of all species in a sample provides excessive weight to small algal species such as *Rhodomonas minuta* and under-weighs important species with large colonies such as *Aphanizomenon flos-aquae*. We recommend deleting that paragraph and adding the following text instead:

> PacifiCorp performed phytoplankton sampling from 2001 to 2004 at 22 sites in the vicinity of the Klamath Hydroelectric Project, including the Klamath River, its tributaries, and Upper Klamath Lake. Sampling methodology is described in Raymond (2005), an overall summary of results for all species are presented in Kann and Asarian (2006), and Kann (2006a) focuses solely on *Microcystis*. According to Kann and Asarian (2006), the overall longitudinal trend for phytoplankton biovolume and important nitrogen-fixing and bloom forming species all confirm the same

declining trend from Upper Klamath Lake to above Copco Reservoir, with a subsequent increase in the Copco/Iron Gate Reservoir complex.

PacifiCorp's data also shows low incidence and magnitude of *Microcystis* leaving UKL and in the Klamath River above Copco Reservoir, and high incidence and magnitude in Copco and Iron Gate Reservoirs (Kann 2006a). Kann (2006a) notes that this pattern is consistent with literature (Huisman et al. 2004 and Reynolds 1986) showing that *Microcystis* and other buoyant cyanobacteria do not dominate in conditions of turbulent mixing such as that known to occur in the Klamath River above Copco and Iron Gate Reservoirs.

Kann (2006a) also analyzed *Microcystis aeruginosa* (MSAE) data from Upper Klamath Lake collected by the Klamath Tribes, Karuk Tribe data from Iron Gate and Copco Reservoirs, and Yurok/USFWS data from the lower Klamath River, summarizing: "Taken together these data provide compelling evidence that Copco and Iron Gate Reservoirs are providing ideal habitat for MSAE; increasing concentrations dramatically from those upstream, and exporting MSAE to the downstream environment."

3.3.2.2 Environmental Effects

3.3.2.2.2 Water Quality

Page 3-136 to 3-137
This page of the DEIS states: "PacifiCorp analyzed the hypothetical release of hypolimnetic water from both Copco and Iron Gate reservoirs using the CE-QUAL-W2 modeling system which has since been incorporated by the EPA into their technical analysis of the forthcoming Klamath River TMDL, giving the model a high level of credibility." We agree that the model has a high level of credibility for flow and temperature, but we disagree strongly that it is credible for analysis of dissolved oxygen, nutrients, attached algae, and phytoplankton. For example, Asarian and Kann (2006b) calculated total nitrogen and total phosphorus from model outputs for the Existing Condition (EC) scenario, and compared them to field data. The results showed that the model consistently under-predicted total nitrogen levels at Iron Gate Dam several-fold, indicating that the model greatly over-predicts nutrient retention in KHP reservoirs. Due to this difference between model outputs and field data, comparisons between the Without Project (WOP) and EC scenario results for nutrient-dependent parameters such as dissolved oxygen should be regarded with skepticism.

As such, we request that "for predicting flow and temperature" (i.e., "…giving the model a high level of credibility for predicting flow and temperature.") be added to the end of sentence quoted above.

Page 3-138

For reasons stated above in our comments on page 3-137, we request that the following text be added to the end of line 8:

> "It should be noted here that a comparison of measured data and Existing Condition model predictions showed that the model consistently under-predicted total nitrogen levels at Iron Gate Dam by several-fold and under-predicted phosphorus to a somewhat lesser degree (Asarian and Kann 2006b), indicating that the model greatly over-predicts nitrogen retention in KHP reservoirs. Given these results, comparisons between the Without Project (WOP) and EC scenario results for nutrient-dependent parameters such as dissolved oxygen should be examined skeptically, as modeled nitrogen WOP concentrations may be erroneously high relative to the EC concentrations."

Monitoring and Control of Algae that Pose a Risk to Fish, Wildlife, and Public Health
Page 3-143.
Please see comments regarding "Toxic Algae" in the "Detailed Comments Regarding Major Issues" section above. This section of the EIS needs to be revised to respond to those comments.

Pages 3-143 to 3-145
This section contains good discussions of the relationships between the parasite *C. shasta* and *Cladophora* algae. We agree with FERC staff's view of this issue. We suggest the following minor revision. The citations for "Stocking (2006, as cited by Resighini Rancheria, 2006)" refers to a presentation given at Humboldt State University in February 2006. All of the information included in the DEIS from that presentation are included in Stocking's now complete master's thesis, so the citations should be changed to that document (Stocking 2006, see References section below for full citation).

Project-wide Water Quality Management

Page 3-147
The DEIS states on Lines 21 to 25:

> "PacifiCorp suggests that Copco and Iron Gate reservoirs trap and remove nutrients from the Klamath River. Table 3-29 shows the concentrations of total phosphorous, orthophosphate phosphorus, and ammonia in the hypolimnion of Copco reservoir increase in the summer, which could be used to support such conclusions; however, the concentration data alone are not enough to irrefutably support PacifiCorp's position."

We disagree with FERC's choice of the phrase "are not enough to irrefutably support PacifiCorp's position" in this sentence, as it is far too charitable to PacifiCorp's position. More appropriate would be "offer some support for PacifiCorp's position." In fact, Table 3-29 offers only weak support for PacifiCorp's position, for several reasons. First, there is no presentation of data upstream of Copco. This is important because nutrient concentrations generally increase throughout the whole Klamath during summer, likely

due to increased concentrations from upstream sources such as UKL. Second, the lumping of several years together can be useful but also misleading due to changes in the number/timing of samples between years, and changes in concentration between years. For instance, concentrations from Link Dam to Copco were generally lower in 2001 and 2002, and higher in 2003 and 2004 (see Asarian and Kann 2006a for details). Without notations regarding the number/ timing of samples, it is difficult to know if the apparent patterns are real. Third, the volume of the hypolimnion in Copco is relatively small. Table 3-29 does provide evidence that nutrient concentrations in Copco's hypolimnion are elevated compared to other parts of Iron Gate and Copco Reservoirs but does not indicate anything about the mass of nutrients accumulating, the effect on the river, the source of those increased nutrient concentrations nor their ultimate fate. Based on the review of PacifiCorp's model by Asarian and Kann (2006), it is clear that the modeling outputs that PacifiCorp relies on to assert that the reservoirs trap and remove nutrients do not agree with observed data. These data show that the model consistently under-predicts nutrient concentrations in the river directly below the reservoirs. Further analyses described in detail above (Asarian and Kann 2006a, Kann and Asarian 2005) also show that when compared to the nutrient retention that would have occurred under historic non-inundated conditions, not only is the sink effect of the reservoirs minimal, but the reservoirs actually generate nutrients during certain periods.

Pages 3-148
We concur with FERC staff's view that KHP reservoirs can act as both sources and sinks, depending on the time of year. Please see our comments regarding "Effect of Iron Gate and Copco Reservoirs on Nitrogen Dynamics" in the "Detailed Comments Regarding Major Issues" section above. This section of the EIS needs to be revised to respond to those comments.

Pages 3-149
This sentence on lines 2 and 3 "However, depending on the algaecide used, there could be associated adverse water quality effects" should be replaced with "However, applying algaecide is known to cause release of cell-bound microcystin toxin into the water column, and depending on the algaecide used, there could be other associated adverse toxicity effects."

Dam Removal to Enhance Water Quality

Page 3-150
On lines 20 to 23, the DEIS states "If water quality objectives are not met for reasons that aren't related to project operations (e.g., the quality of water entering the development is similar to the quality of water leaving the development), it would be inappropriate to consider decommissioning the development." We strongly disagree with this statement as worded. We agree that PacifiCorp should not be held responsible for problems not related to the KHP; however, analysis of whether "the quality of water entering the development is similar to the quality of water leaving the development" is an incomplete way to assess the effects of the project on water quality for. As we have stated

repeatedly, the true measure of the KHP's affect on water quality is the comparison of current (with-project) conditions at Iron Gate Dam with the conditions that would exist at Iron Gate Dam absent the KHP. Though related, these are separate questions with different answers.

Although many parameters (with the notable exception of *Microcystis*) exiting the KHP at Iron Gate decrease from values entering the KHP at Keno, this does not mean that the KHP has a beneficial, or no affect on water quality. First, many parameters (e.g., nitrogen, phosphorus, chlorophyll, algal biomass, and blue-green algal biomass) may decline between Keno and above Copco Reservoir, but then can increase substantially through the Copco/Iron Gate complex (e.g., Asarian and Kann 2006a,b and Kann and Asarian 2006). Thus, the overall effect of a major portion of the KHP is an increase in various water quality parameters. Second, the KHP receives substantial amounts of clean water from the springs in the J.C. Boyle bypass reach and tributaries such as Spencer, Shovel, Fall, and Jenny creeks. These inputs substantially dilute the nutrient-rich mainstem Klamath River. As we noted in the Recommended Terms and Conditions that we filed with FERC in March 2006, these tributaries and springs clearly pre-date the KHP and cannot legitimately be claimed as part of any KHP "benefit" to water quality. Third, natural river processes (currently confounded by the KHP) remove nutrients from the water column as the river flows downstream. These processes include denitrification by micro-organisms in the hyporheic zone and assimilation by algae attached to the bed of the river, and are discussed above in our comments regarding "Effect of Iron Gate and Copco Reservoirs on Nitrogen Dynamics" in the "Detailed Comments Regarding Major Issues" section above.

In the Recommended Terms and Conditions that we filed with FERC in March 2006, to quantify the effect of dilution, we examined U.S. Geological Survey stream gage data over a 10-year period from 1995-2004 during the time of year having low flows and poor water quality – July 1 to September 31. The J.C. Boyle gage is located downstream of the J.C. Boyle Powerhouse return at river mile 219.7, the Iron Gate gage is located downstream of Iron Gate Dam at river mile 189.5, and the Keno Gage is located downstream of Keno Dam at river mile 233.3. We examined a three-month period, rather than a shorter period such as August, in order to minimize "errors" due to differences in reservoir management (e.g. if the amount of water stored in a reservoir were to increase or decrease substantially over a short period of time).

Mean streamflow averages 674 cfs at Keno, 939 cfs at J.C. Boyle (141% of Keno), and 1036 cfs at Iron Gate (156% of Keno). This translates into accretions of 265 cfs between Keno and the J.C. Boyle gage, primarily due to springs in the J.C. Boyle Bypass Reach, with much smaller contributions from Spencer Creek and other tributaries. Accretions between J.C. Boyle and the Iron Gate gage average 97 cfs include Shovel, Jenny, Fall, Camp, and Bogus Creeks (note that while Bogus Creek is below Iron Gate Dam, it is upstream of the USGS gage).

Nutrient concentrations in the springs are so low relative to the mainstem Klamath River that the dilution effect is similar, though not identical, to the addition of pure water. To

provide some quantitative detail to this discussion, we calculated expected total nitrogen (TN) concentration at Iron Gate Dam based on this dilution (Table 10). Average TN concentration at Keno for available data in the June-October period of 1996-2003 was 1.83 mg/L (Asarian and Kann 2006a), 12.8 times higher than the 0.15 TN concentration cited by PacifiCorp for the springs. Based on dilution from these accretions, TN concentration at Iron Gate Dam should be expected to be only 67.8% (a 32.2% decrease) of what it is at Keno (Table 10).

Table 10. Effect of the tributary/spring accretion on total nitrogen (TN) concentrations from Keno to Iron Gate. Flows are means from July 1 - September 31 for the 10-year period 1995-2004. TN Concentrations are means of June-October 1996, 1997, 1998, 2002, and 2003 (Asarian and Kann 2006a).

	Flow		TN Conc.	Load		Combined TN Conc.	
Source	(cfs)	(% of IG)	(mg/L)	(kg/day)	(% of combined)	(mg/L)	(% of Keno)
River at Keno	674	65.1%	1.93	3183	96.0%		
Accr. Keno to IG	362	34.9%	0.15	133	4.0%		
Combined	1036	100.0%		3316	100.0%	**1.31**	**67.8%**

Page 3-150

Regarding PacifiCorp's water quality model, the DEIS states on lines 30 to 34:

> "Unfortunately, because many of the other parameters in the model (e.g., pH, nutrients, and algae) are driven by much more complex biochemical processes than temperature, modeling results for these parameters are contingent on the quality of the entire dataset and subject to variable interpretation. We base much of our analysis of the potential effects of dam removal on our review of existing water quality data from the riverine reaches and general principles that typically influence water quality."

We agree with FERC's approach of relying on field data and general principles, rather than model outputs, for parameters other than temperature, especially given the failure of the model to accurately predict nitrogen transport as described by Asarian and Kann (2006b). In addition to the issues of lack of an adequate amount of data for some parameters, it is important to note that model structure can also be an issue. For instance, PacifiCorp's model does not include nitrogen fixation in reservoirs (or denitrification in river reaches). Thus, if nitrogen fixation is an important factor in Klamath River water quality dynamics, and given the large annual blooms of *Aphanizomenon flos-aquae* in KHP reservoirs (Kann and Asarian 2006) it would certainly appear to be important, then no amount of additional model input data will result in an accurate characterization of nutrient dynamics. We recommend, therefore, that after "variable interpretation." the following sentence be added: "In addition, issues with model structure such as the lack of simulation of nitrogen fixation by algae in project reservoirs hinder model performance for nutrient-dependent parameters such as dissolved oxygen, pH, and algae."

Page 3-151, line 17
Regarding "Biggs (2000, as cited by Resighini Rancheria, 2006)", this document was e-filed at FERC (accession number 20060328-5082) as part of a series of reference documents, so FERC staff can examine the original document if they wish.

Page 3-151lines 2 to 13
In its discussions regarding the impacts of the removal of J.C. Boyle Dam on water quality, FERC does not mention two important factors discussed above in the section Detailed Comments Regarding Major Issues, namely the affects of bypass and peaking operations on downstream water quality. This section should be revised to include those issues, as they are attributable to J.C. Boyle Dam, and would cease with dam removal.

Another important issue that needs to be added to this section is the occurrence of *Microcystis* blooms in J.C. Boyle reservoir. PacifiCorp's phytoplankton data show that on October 17, 2004, *Microcystis* comprised 60% of the phytoplankton biovolume of the sample (see Figure 17 in Kann and Asarian 2006). *Microcystis* was not detected in samples collected at PacifiCorp sites upstream including Above J.C. Boyle Reservoir, Below Keno Dam, and Link River on any day in 2004 including October 17, although it was detected several times by the Klamath Tribes at Pelican Marina (note: J.C. Boyle Reservoir was not sampled in 2004). In contrast, *Microcystis* was detected on October 10 at 58% of the sample's biovolume downstream at Above J.C. Boyle Powerhouse, and throughout the season in and below Copco and Iron Gate Reservoirs. This information regarding *Microcystis* should be added to the EIS. Hence, we suggest the following sentence be added to the discussion of the water quality effects of removing J.C. Boyle Dam:

> "In October, 2004, PacifiCorp detected *Microcystis aeruginosa* at its site below J.C. Boyle Dam during a year when it was not detected at sites upstream between Link River and above J.C. Boyle Reservoir, indicating that J.C. Boyle Reservoir was the likely source of the *Microcystis*. Hence, removal of J.C. Boyle Dam could reduce the amount of *Microcystis* above Copco Reservoir."

3.3.2.4 Unavoidable Adverse Effects

Page 3-157 Line 18
We agree that the KHP results in unmitigable impacts to water temperature in the Klamath River. The first sentence should be strengthened to recognize the project's adverse impacts on fall chinook spawning and incubation.

Page 3-157 Line 24
Language should be added regarding the toxic alga *Microcystis aeruginosa*.

3.3.3.1.4 Diseases Affecting Salmon and Steelhead

Page 3-212 Lines 6 to 15

This section should mention the findings of Stocking (2006) regarding the distribution of the intermediate polychaete fish parasite host. These key findings are described in the DEIS page 3-145. Also, see comments regarding page 3-145 above.

3.3.3.2.3 Disease Management

Page 3-285 to 3-286
We generally agree with the DEIS' discussion of how the KHP contributes to fish disease, although it is somewhat incomplete (see comments below).

We only partially agree with FERC's statement that "Efforts to restore passage of anadromous fish to areas upstream of the project may provide little or no benefit if disease problems in the Klamath River downstream of the project are not effectively addressed." (Page 3-285, lines 19-21). We agree that disease is a serious problem in Klamath River; however, providing fish passage should assist in reducing fish disease. Fish ladders would reduce crowding during spawning by expanding the availability of spawning habitat. Dam removal would provide multiple benefits, simultaneously providing fish passage to the Upper Basin, improving water quality, and reducing pathogen loads.

Page 3-285
The DEIS list of how the KHP "has likely contributed to conditions that foster disease losses in the lower Klamath River" should have a fourth factor added to it: "4) algae from blooms in project reservoirs are flushed downstream where they settle and provide habitat for the polychaete alternate host for *C. shasta* and *P. minibicornis*." We then recommend that the following paragraph be added as further explanation:

> "PacifiCorp's 2001-2004 phytoplankton sampling program has documented the existence of large blooms of algae in project reservoirs. A longitudinal analysis of the data shows that phytoplankton biovolume is highest in Upper Klamath Lake, then follows a generally declining trend to the reach above Copco Reservoir, and then increases substantially in the Copco/Iron Gate Reservoir complex (Kann and Asarian 2006). The limited number of available samples from the river below suggests that phytoplankton levels decrease as the water flows downstream from Iron Gate Dam to sites above the Shasta River and Interstate 5. This decrease indicates that much of the phytoplankton are dying and decaying into organic matter. Stocking (2006) found that fine benthic organic matter was the primary habitat for the *M. speciosa* polychaete, so if the organic matter settles to the riverbed before it fully decays, it could provide polychaete habitat. Increased habitat for *M speciosa* could increase its population size, increasing *C. shasta* and *P. minibicornis* infection in *M speciosa*, releasing more parasite spores into the water, and resulting in increasing rates of disease in juvenile salmonids. Through these mechanisms, the growth of phytoplankton in reservoirs and subsequent

discharge into the Klamath River below can contribute to disease outbreaks in juvenile salmonids."

For illustrative purposes, we include a photograph taken below Iron Gate Dam on a day when phytoplankton were streaming out of Iron Gate reservoir at high densities (Figure 9).

Figure 9. The edge of the Klamath River below Iron Gate Dam in late August 2006 with small particles of free-floating algae flushed out of Iron Gate Reservoir at very high densities. Photo by Kier Associates.

Page 3-286

Lines 15-16 of this page state "…DO levels predicted by PacifiCorp's water quality model indicate that stressful conditions for juvenile fall Chinook generally occur starting in late May…" As a general rule, whenever field data are available they should be used in place of model outputs. In most years since 2000, extensive water quality data have been collected using multi-parameter automated probes at Iron Gate Dam and other sites downstream. We recommend that FERC staff examine this rich dataset to see if it provides the same answer as PacifiCorp's water quality model. See our comments above regarding Page 3-103 for instruction on how to locate these data.

Page 3-287

Some of the items to be explored in the disease management plan have the potential for serious adverse affects. For instance, dragging a chain over the riverbed to dislodge attached algae would likely release nutrients downstream. If this were done during the algal growing season, it would likely stimulate the growth of attached algae downstream. It could also harm macroinvertebrates and lamprey ammocoetes by disturbing substrate. Similarly, chemical control has a high potential for adverse unexpected reactions. We recommend that efforts not be directed at symptoms, but they should, instead, be directed at efforts to reduce the river's nutrient burden, including the removal of dams. Regarding FERC's proposal to develop disease resistant stocks, the priority should, instead, be toward maintaining existing natural genetic diversity.

While we appreciate the attention devoted to *Cladophora* in the DEIS in general, and in the disease management plan, FERC staff should be careful not to overlook the point that Stocking (2006) found more polychaete populations living in fine benthic organic matter (69) than in *Cladophora* (32). From a practical standpoint the distinction may not matter much, since effective solutions for reducing each habitat would likely be similar (scouring flows and reducing nutrient concentrations), except that symptom-treating efforts like dragging chains across the river's bed or chemical control would do nothing to reduce fine benthic organic matter.

3.3.3.2.4 Dam Removal or Decommissioning

Effects of Mainstem Dam Removal on Fish Disease

Page 3-289 Lines 27-31
Discussions on this page overlook the important point that J.C. Boyle Dam affects downstream water quality not just with its relatively small reservoir, but by enabling peaking and bypass operations. As is discussed in detail in various places in the DEIS, water quality affects fish disease. Please refer to our comments regarding "Effects of Peaking/Bypass Operation on Downstream Water Quality" in the "Detailed Comments Regarding Major Issues" section above. This section should be revised to include those issues, as they are enabled by J.C. Boyle Dam, and would cease with dam removal.

Page 3-289 Lines 43-44
Temperature is a primary driving factor in the metabolism of attached algae (Biggs 2000). Hence, the thermal lag also extends the growing season for attached algae (and perhaps macrophytes) downstream of Iron Gate Dam, extending the period of poor water quality (excessive pH and D.O.) into the fall. This section of the EIS should be revised to include that. We suggest "Because temperature is a primary influence in growth of attached algae (Biggs 2000), the thermal lag extends the growing season for attached algae, resulting in degraded pH and dissolved oxygen conditions in the late summer and early fall."

Adverse Effects of Dam Removal on Aquatic Resources

P3-292

Discussions regarding the amount and toxicity of sediments in KHP reservoirs in this section of the EIS should be updated with the information from California's State Coastal Conservancy (2006) study which was released shortly after the DEIS was completed. The results indicate that the toxicity of the sediments in the lower four dams is very low, that only a relatively small portion of the total stored sediment would erode in the event of dam decommissioning, and that the sediment will not cause downstream flooding.

3.3.5.2 Environmental Effects

3.3.5.2.2 Coho Salmon

Effects on Critical Habitat

4.0 Developmental Analysis

Table 4-3 contains FERC's estimates of costs and benefits for the five alternatives analyzed in the DEIS. Because the mandatory conditions for fish passage must legally be included in any new KHP license issued by FERC, our comments here focus on the Staff Alternative with Mandatory Conditions.

FERC estimates that if the KHP were to be decommissioned, it would be replaced by a natural gas power plant, producing electricity at $41.50/MWh. The cost of KHP generation for the Staff Alternative with Mandatory Conditions is $99.24/MWh, or 2.39 times higher than replacement power (presumably natural gas).

While FERC does not have the authority to mandate what type of power would replace the KHP if it were decommissioned, the EIS should contain some discussion of the costs of various types of electrical generation. For instance, the EIS should note that the annual cost of the Staff Alternative with Mandatory Conditions is actually substantially more expensive than wind power. The approximate installed cost of large-scale wind farms is $1000/kW, with costs ranging from $30-60/MWh (CEC 2006). Within the vicinity of the KHP, there are locations in close proximity to transmission lines that have wind conditions suitable for commercial-scale wind farm development, including the southern portion of the Shasta River basin north of the town of Weed (Northwestern U.S. Wind Mapping Project 2006).

Given the extremely high cost, it would be a disservice to PacifiCorp's customers to add volitional fish passage at KHP facilities. Decommissioning the KHP and replacing it with truly clean energy would be much cheaper, and would have the added benefits of reversing the KHP's tragically adverse impacts upon Klamath River water quality and fisheries, and eliminating the KHP methane emissions.

4.7 KENO DEVELOPMENT ANALYSIS

Pages 4-10 to 4-19

Although we have not conducted an in-depth analysis regarding whether Keno Dam serves "project purposes", we recognize the severity of water quality problems in Keno Reservoir and the need for them to be remedied. PacifiCorp constructed Keno Dam, and therefore bears responsibility for its impacts. This would be best accomplished by keeping Keno in the KHP license application, so that its impacts can be analyzed and their mitigation correctly provided in the context of project regulation. We therefore request that FERC reject PacifiCorp's proposal to remove Keno Dam from any new license.

It is our opinion that PacifiCorp's request to remove Keno from its application for a license is equivalent to asking to decommission with the development left intact. As such, FERC has the authority to place conditions on Keno Dam even if it is to be removed from the KHP. Hence, we request that should FERC accept PacifiCorp's proposal to remove Keno from the KHP, that it order PacifiCorp to cooperate and to fund efforts to improve water quality in Keno Reservoir through nutrient load reductions.

4.8 GREENHOUSE GAS EMISSIONS

Page 4-20
Please refer to our comments above regarding "Greenhouse Gas Emissions" in the "Detailed Comments Regarding Major Issues"

5.1.2 Summary of Effects

Pages 5-11 to 5-18
Table 5.1 requires some revisions. There is no analysis of how the various alternatives affect greenhouse gas emissions, including both carbon dioxide (from replacement power) and methane (from KHP reservoirs).

Page 5-13
The water quality section of Table 5.1 should be revised to include language regarding about how the various alternatives affect taste and odor compounds, pH, and ammonia. In addition, regarding the effects of the "Staff Alternative" on *Microcystis*, the DEIS states "*Microcystis* monitoring would enable public notification of potential health risks from contact recreation at project reservoirs", yet does not mention that the "Retirement of Copco No. 1 and Iron Gate Developments" scenario would nearly eliminate the *Microcystis* problem lower Klamath River. This is an oversight that requires correction.

5.2 DISCUSSION OF KEY ISSUES

5.2.4 Water Quality Management

Pages 5-25 to 5-26
The DEIS proposes inadequate measures to deal with water quality. First, a "comprehensive water quality management plan." Second, the installation of turbine

venting at Iron Gate Dam to increase dissolved oxygen levels in the outlet of Iron Gate Dam.

The DEIS relies too heavily on plans to solve critical issues in the KHP. The plans are too vague in their time frames for implementation. Time is a critical component for restoration of declining Tribal trust fisheries stocks whose health is directly tied to water quality issues. Trust is also an issue for stakeholders in the basin who would have to rely on Pacificorp to develop and implement these plans. However, even if the plans are implemented successfully and in a timely manner, they will not bring the water quality in and from the KHP up to Tribal, federal, and state standards. Therefore, the only option is to decommission the lower four dams for the sake of water quality health.

One of the DEIS' justifications for the cost of a development of a water quality management plan is that the KHP causes "modification of the temperature regime downstream of Iron Gate dam in a manner that adversely influences salmon." This statement is indeed true; however, as acknowledged by both PacifiCorp and the DEIS, there is no way to adequately mitigate for KHP impacts to temperature other than dam removal. Additional study and the development of a water quality management plan cannot change that fact, and we should not pretend otherwise.

With the exceptions noted above, the DEIS does an adequately characterizes KHP impacts to water quality and fish disease. Hence, it is extremely disappointing that the only explicitly required measure the DEIS proposes to mitigate for the multitude of adverse impacts is a turbine venting system. Unfortunately, given the wide-ranging water quality impacts of the KHP, this measure will do little to improve overall water quality.

We have not done an in-depth evaluation of whether turbine venting would be sufficient to enable water released from Iron Gate Dam to meet California's water quality standards for dissolved oxygen. However, at best, this measure would only improve dissolved oxygen levels in the immediate vicinity of the dam. Most of the dissolved oxygen problems in the Klamath River are caused by excessive growths of attached algae and rooted aquatic macrophytes that cover large portions of the river, hence oxygenation at a single point will be largely ineffective. Turbine venting would do nothing to mitigate for the KHP's many impacts to water quality and fish disease. As described in the EIS, a partial list includes fostering massive blooms of nitrogen fixing (*Aphanizomenon flos-aquae*) and toxigenic (*Microcystis aeruginosa*) blue-green algae that are flushed into the river below, the alteration of nutrient dynamics by interrupting natural river processes that remove nutrient from the water column as the river flows downstream, and causing a thermal lag with detrimental effects to salmonids.

The only way to eliminate the KHP's impacts to water quality is to decommission the four lower dams in the project. Actions such as turbine venting, hypolimnetic aeration, and algaecide application are as yet untested, are not likely to be fully effective, and have a high potential for adverse affects.

5.2.5 Instream Flows

J.C. Boyle Bypassed Reach

Pages 5-26
Discussions in this section should be revised to acknowledge the important point that bypass operations have a detrimental effect on downstream water quality. For details, please refer to our comments regarding "Effects of Peaking/Bypass Operation on Downstream Water Quality" in the "Detailed Comments Regarding Major Issues" section above.

J.C. Boyle Peaking Reach

Pages 5-28
Discussions in this section should be revised to acknowledge the important point that peaking operations have a detrimental effect on downstream water quality. For details, please refer to our comments regarding "Effects of Peaking/Bypass Operation on Downstream Water Quality" in the "Detailed Comments Regarding Major Issues" section above.

Copco No. 1 and Copco No. 2 Developments

Pages 5-28
Discussions in this section should be revised to acknowledge the important point that bypass operations in the Copco 2 Bypass Reach have a detrimental effect on downstream water quality. For details, please refer to our comments regarding "Effects of Peaking/Bypass Operation on Downstream Water Quality" in the "Detailed Comments Regarding Major Issues" section above.

5.2.6 Anadromous Fish Restoration

Pages 5-35 to 5-38
This section of the EIS requires major revisions. The DEIS overestimates the benefits of trap and haul, and underestimates the benefits of volitional fish passage (ladders). We choose not to provide details here, but instead refer FERC staff to the ALJ's Decision and record, which makes clear that volitional fish passage is superior to trap and haul, and that the DEIS's concerns regarding water quality and predation on downstream migrants in KHP reservoir are overstated.

In addition, this section of the EIS needs to be revised to include consideration of how to provide fish passage for all historic and currently suitable habitat above Iron Gate Dam for native anadromous and Tribal Trust fish species, including: fall-run Chinook, spring run Chinook, steelhead, coho, and lamprey.

5.2.7 Fish Disease Management

Pages 5-38 to 5-39

Discussions in this section of the DEIS regarding how the Iron Gate and Copco reservoirs affect water quality and fish disease are generally correct, but are lacking regarding a some important issues, and hence requires revision. Information should be added (based on the comments provided herein) regarding how KHP bypass and peaking operations also affect water quality. Additionally, the EIS should note that *Microcystis* is not just a public health threat but it is also a threat to fish health.

After describing the effects of Iron Gate and Copco Reservoirs on fish disease, the DEIS states that:

> "However, because of the substantial costs of dam removal, and due to the urgency of the disease situation in the lower Klamath River, we also evaluate measures that would involve developing and implementing approaches for reducing the incidence of fish diseases downstream of Iron Gate dam through a disease monitoring and management plan. The plan would focus on developing measures that could be implemented in the near term and potentially reduce disease losses in a much shorter time frame and at a much lower cost than dam removal."

We disagree with the DEIS conclusion that despite the KHP's severe fish disease-driven impacts that dam removal is too expensive, and that a fish disease management plan could adequately address the problem at a lower cost. First, we are extremely skeptical that this plan will result in a substantial reduction in fish disease in the Klamath River. Second, because federal law requires that FERC must include USFWS/NMFS mandatory conditions for volitional fish passage in any KHP license granted, there will be substantial investment in providing volitional fish passage. The question is whether that fish passage will consist of fish ladders, or dam removal. As noted in the recent ALJ Decision and record, fish ladders would provide definite benefits to anadromous fish in the Klamath River by proving access to historic habitats. By reducing crowding in the spawning grounds below Iron Gate Dam, ladders may well cause some reduction in fish disease. However, as described fairly well in the DEIS, dam removal would provide a wide range of additional benefits, including access to more historic habitat, improved water quality and reduced levels of fish disease.

As Table 4-3 makes clear, the Staff Alternative with Mandatory Conditions is more expensive than the Retirement of Copco No. 1 and Iron Gate Developments. Given that federal law requires FERC to include the USFWS/NMFS mandatory conditions for volitional fish passage, FERC must include volitional fish passage in any license granted. In the DEIS, FERC analyzed only two alternatives that include volitional fish passage, and the Retirement of Copco No. 1 and Iron Gate Developments was the less expensive of the two alternatives. Dam removal will provide multiple, better benefits, and it is cheaper. Thus, we see no reason why FERC should choose fish ladders, and a hypothetical plan to reduce disease, as these actions will be more expensive and less effective than dam removal.

Removal of the dams would result in permanent long-term improvements to Klamath River water quality and a reduction in fish disease.

It should also be noted that the economic analyses in Table 4-3 are not a true cost-benefit analysis, but is actually an analysis of the private costs/benefits to PacifiCorp. If public benefits such as the value of restored anadromous fisheries and endangered species protection were included in the analysis, dam removal would be even cheaper. Also, the value of dam decommissioning to counties, communities, and Tribal members needs to be considered (for example, see Kruse and Scholtz 2006).

5.2.21 Dam Removal

Pages 5-56 to 5-58

The DEIS underestimates the impact of J.C. Boyle and Copco No. 2 Dams on water quality. For example, "Because of their greater effect on downstream water quality, and because of the quality and quantity of habitat that they inundate, we conclude that the removal of Iron Gate and Copco No. 1 dams would provide a much greater benefit than removing the Copco No. 2 and J.C. Boyle dams." While we agree that Iron Gate and Copco No. 1 Dams have *greater* effects on water quality, we disagree that this should be used as a justification for leaving J.C. Boyle and Copco No. 2 Dams in place. As described above in our discussions regarding "Effects of Peaking/Bypass Operation on Downstream Water Quality" in the "Detailed Comments Regarding Major Issues" section, these dams enable bypass and peaking operations that result in impaired water quality downstream. Section 5.2.21 should be revised to take into account these impacts.

Additionally, discussions regarding the amount and toxicity of sediments in KHP reservoirs in this section of the EIS should be updated with information from California's State Coastal Conservancy (2006) study that was released shortly after the DEIS was completed. The results indicate that toxicity of the sediments in the lower four dams is very low, and that only a relatively small portion of the total stored sediment would erode in the event of decommissioning, and that the sediment will not cause downstream flooding.

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CERTIFICATE OF FILING AND SERVICE

P-2082

I hereby certify that I have this day served the foregoing documents upon each person designated on the official service list compiled by the Secretary in this proceeding.

Dated this 1st day of December, 2006

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Attachment 4b

Health Advisory

HEALTH ADVISORY

AVOID WATER CONTACT IN IRON GATE AND COPCO RESERVOIRS

Pollution has resulted in high levels of blue-green algae that can produce harmful toxins. This has resulted in violations of the State's water quality standards

- Do not use this water for drinking or cooking
- Fish from these waters previously tested positive for an algal toxin. Limit or avoid consuming fish as the risk to human health is being evaluated by public health agencies
- Do not consume fish innards, and wash fillets with drinking water

Children and pets are at greatest risk

For more information contact staff at:

North Coast Regional Water Quality Control Board

(707) 576-2220

Attachment 5

5a Bureau of the Census Maps

5b Bureau of the Census 5-Year Average 2005–2009 Unemployment, Income, and Poverty Estimates for the Karuk Tribe Area

5c Bureau of the Census Definitions

5d Bureau of Indian Affairs Labor Force Report Definitions

Attachment 5a

Bureau of the Census Maps

County Subdivision Outline Map Legend and County Location Index

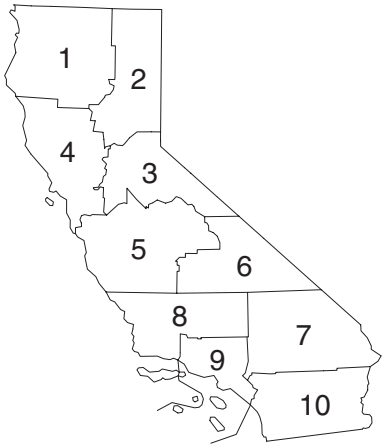
Map Legend

	International
CAMPO	American Indian Reservation (Federal)
ZIA	Off-Reservation Trust Land
Tetlin	Tribal Designated Statistical Areas
	State
ERIE	County
YORK	County Subdivision[1]
ROME	Incorporated Place[1]
Zena	Census Designated Place
Lake Erie	Large River, Lake, Water Body, or Shoreline
	A fishhook joins contiguous and/or discontiguous parts of the same geographic entity

[1] A '*' following a place name indicates that the place is coextensive with a separate county subdivision. The county subdivision name is shown only if different than the name of the place.

Note: All legal boundaries and names are as of January 1, 2000. Where international, state, county, and/or county subdivision boundaries coincide, the map shows the boundary symbol for the highest level of these geographic entities. The county boundary is always shown. Where a county subdivision boundary coincides with a place boundary, the map does not show the place boundary symbol. Any geographic entity name may include '(pt.)' if some portion of the entity extends beyond the limits of the map area displayed on the page, or if multiple discontiguous pieces of the entity have been discretely labeled on the page. A geographic entity name may include '(pts.)' if many discontiguous pieces exist for that entity that cannot be discretely labeled. The boundaries shown on this map are for Census Bureau statistical data collection and tabulation purposes only; their depiction and designation for statistical purposes does not constitute a determination of jurisdictional authority or rights of ownership or entitlement.

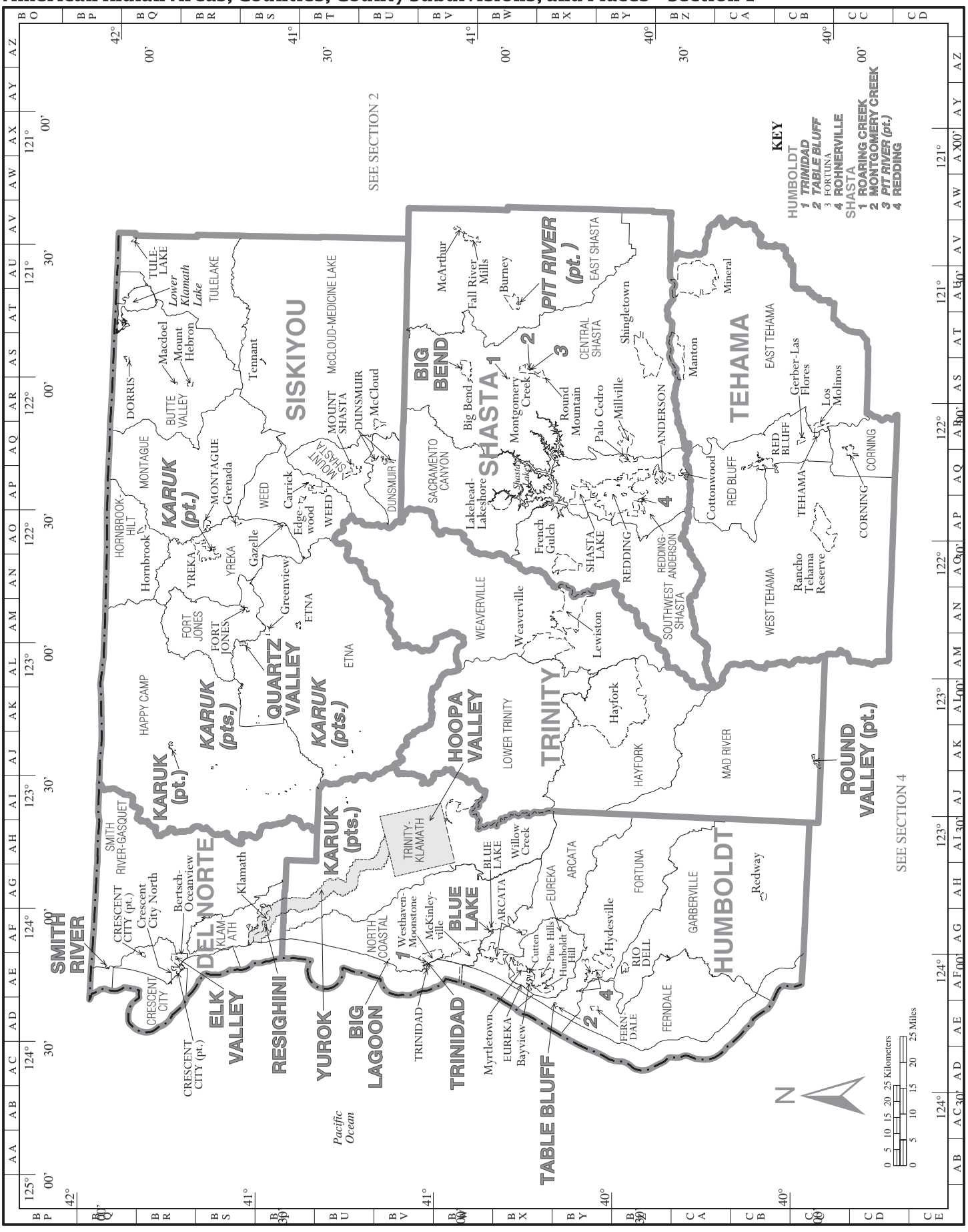
Map Sections



County Location Index

This list presents the reference coordinates for each county on the county subdivision outline map. Map section numbers refer to the county subdivision outline maps only.

COUNTY	MAP SEC	MAP REF	COUNTY	MAP SEC	MAP REF	COUNTY	MAP SEC	MAP REF
Alameda	4	AS-CQ	Napa	4	AQ-CK	Tuolumne	3	BE-CN
Alpine	3	BF-CK	Nevada	2	AZ-CG	Ventura	9	BJ-DJ
Amador	3	BA-CL	Orange	9	BR-DN	Yolo	4	AS-CJ
Butte	2	AU-CE	Placer	3	AZ-CH	Yuba	2	AV-CG
Calaveras	3	BA-CM	Plumas	2	AY-CB			
Colusa	4	AQ-CG	Riverside	10	CC-DN			
Contra Costa	4	AS-CO	Sacramento	3	AV-CL			
Del Norte	1	AG-BR	San Benito	5	AX-CW			
El Dorado	3	BA-CJ	San Bernardino	7	CA-DG			
Fresno	5	BG-CV	San Diego	10	BX-DR			
Glenn	4	AP-CE	San Francisco	4	AP-CP			
Humboldt	1	AG-BX	San Joaquin	3	AW-CO			
Imperial	10	CF-DR	San Luis Obispo	8	BB-DD			
Inyo	6	BT-CW	San Mateo	4	AP-CR			
Kern	8	BL-DD	Santa Barbara	8	BD-DH			
Kings	5	BF-CZ	Santa Clara	5	AT-CS			
Lake	4	AN-CH	Santa Cruz	5	AR-CT			
Lassen	2	BA-BX	Shasta	1	AR-BX			
Los Angeles	9	BO-DJ	Sierra	2	BA-CE			
Madera	5	BF-CS	Siskiyou	1	AO-BS			
Marin	4	AN-CN	Solano	4	AS-CM			
Mariposa	5	BE-CQ	Sonoma	4	AM-CK			
Mendocino	4	AJ-CF	Stanislaus	5	AY-CQ			
Merced	5	AZ-CS	Sutter	4	AT-CH			
Modoc	2	AZ-BS	Tehama	1	AQ-CB			
Mono	3	BK-CO	Trinity	1	AL-BY			
Monterey	5	AW-CY	Tulare	6	BL-CY			


KEY
HUMBOLDT
1 TRINIDAD
2 TABLE BLUFF
3 FORTUNA
4 ROHNERVILLE
SHASTA
1 ROARING CREEK
2 MONTGOMERY CREEK
3 PIT RIVER (pt.)
4 REDDING
SEE SECTION 2
SEE SECTION 4
SISKIYOU
DEL NORTE
SMITH RIVER
ELK VALLEY
RESIGHINI
YUROK
BIG LAGOON
TRINIDAD
TABLE BLUFF
KARUK (pt.)
KARUK (pts.)
QUARTZ VALLEY
HOOPA VALLEY
TRINITY
ROUND VALLEY (pt.)
BIG BEND
SHASTA
PIT RIVER (pt.)
TEHAMA
HUMBOLDT
Pacific Ocean
N
0 5 10 15 20 25 Kilometers
0 5 10 15 20 25 Miles

Attachment 5b

Bureau of the Census 5-Year Average 2005–2009 Unemployment, Income, and Poverty Estimates for the Karuk Tribe Area

Attachment 5b

Bureau of the Census 5-Year Average 2005–2009 Unemployment, Income, and Poverty Estimates for the Karuk Tribe Area

Geographic areas	Census unemploy-ment (%)	Median household income (2009 dollars)[1]	Per capita income (2009 dollars)	Poverty status (%)	Poverty – families, female householder, no husband, children under 5 (%)	Poverty – families, female householder, no husband, children under 18 (%)
Karuk Reservation & Off-Res. Trust Lands	17.2	18,906	8,617	58.3	86.8	86.8
Siskiyou County	5.7	37,938	22,528	15.4	65.3	40.4
Happy Camp CCD	6.3	32,150	19,163	21.5	57.5	51.0
Etna CCD	3.6	45,000	22,880	11.8	na	na
Yreka CCD	5.3	35,645	22,853	17.9	100	56.6
Yreka City	6.1	33,448	22,077	20.4	63.0	44.0
Humboldt County	4.8	39,124	23,496	18.2	63.0	43.3
Trinity-Klamath CCD	8.1	29,094	15,837	23.5	93.1	51.0
California	5.0	60,392	29,020	13.2	36.9	32.2

Source: American Community Survey DP03 "selected economic characteristics: 2005-2009." American Indian population data were not available when the data was released.

[1] Median household income and per capita income are in 2009 inflation-adjusted dollars.

Attachment 5c

Bureau of the Census Definitions

Attachment 5c

Census Bureau - Glossary (online): http://factfinder.census.gov/home/en/epss/glossary_e.html#employed.

American Indian Area, Alaska Native Area, Hawaiian Home Land (AIANAHH)
A Census Bureau term referring to these types of geographic areas: federal and state American Indian reservations, American Indian off-reservation trust land (individual or tribal), Oklahoma tribal statistical area (in 1990 tribal jurisdictional statistical area), tribal designated statistical area, state designated American Indian statistical area, Alaska Native Regional Corporation, Alaska Native village statistical area, and Hawaiian home lands.

American Indian off-reservation trust land
Lands held in trust by the federal government for either a tribe or an individual member of that tribe. They may be located on or outside of the reservation; the Census Bureau recognizes and tabulates data only for the off-reservation trust lands because the tribe has primary governmental authority over these lands.

American Indian reservation
Land that has been set aside for the use of the tribe. There are two types of American Indian reservations, federal and state. These entities are designated as colonies, communities, pueblos, ranches, rancherias, reservations, reserves, tribal towns, and villages.

American Indian Reservation - federal
Areas with boundaries established by treaty, statute, and/or executive or court order recognized by the federal government as territory in which American Indian tribes have primary governmental authority. The U.S. Census Bureau contacts representatives of American Indian tribal governments to identify the boundaries. The Bureau of Indian Affairs (BIA) maintains a list of federally recognized tribal governments.

American Indian Reservation - state
Lands held in trust by state governments for the use and benefit of a given tribe. A governor-appointed state liaison provides the names and boundaries for state reservations. The names of the American Indian reservations recognized by state governments, but not by the federal government, are followed by "(state)" in the data presentations.

American Indian Tribal Subdivision
Administrative subdivisions of federally recognized American Indian reservations, off-reservations trust lands, and Okalahoma tribal statistical areas (OTSAs), known as an area, chapter, community, or district. Internal units of self-government or administration that serve social, cultural, and/or economic purposes for American Indians. Provided in 1980 as "American Indian subreservation areas." These areas were not available in 1990.

American Indian tribe/Selected American Indian categories
Self-identification among people of American Indian descent. Many American Indians are members of a principal tribe or group empowered to negotiate and make decisions on behalf of the individual members.

Employed
Employed includes all civilians 16 years old and over who were either (1) "at work" -- those who did any work at all during the reference week as paid employees, worked in their own business or profession, worked on their own farm, or worked 15 hours or more as unpaid workers on a family farm or in a family business; or (2) were "with a job but not at work" -- those who did not work during the reference week but had jobs or businesses from which they were temporarily absent due to illness, bad weather, industrial dispute, vacation, or other personal reasons. Excluded from the employed are people whose only activity consisted of work around the house or unpaid volunteer work for religious, charitable, and similar organizations; also excluded are people on active duty in the United States Armed Forces. The reference week is the calendar week preceding the date on which the respondents completed their questionnaires or were interviewed. This week may not be the same for all respondents.

Household
A household includes all the people who occupy a housing unit as their usual place of residence.

Labor force
The labor force includes all people classified in the civilian labor force, plus members of the U.S. Armed Forces (people on active duty with the United States Army, Air Force, Navy, Marine Corps, or Coast Guard). The Civilian Labor Force consists of people classified as employed or unemployed.

Median age
This measure divides the age distribution in a stated area into two equal parts: one-half of the population falling below the median value and one-half above the median value.

Median income
The median income divides the income distribution into two equal groups, one having incomes above the median, and other having incomes below the median.

Occupation
Occupation describes the kind of work the person does on the job. For employed people, the data refer to the person's job during the reference week. For those who worked at two or more jobs, the data refer to the job at which the person worked the greatest number of hours. Some examples of occupational groups shown in this product include managerial occupations; business and financial specialists; scientists and technicians; entertainment; healthcare; food service; personal services; sales; office and administrative support; farming; maintenance and repair; and production workers.

Per capita income
Average obtained by dividing aggregate income by total population of an area.

Poverty
Following the Office of Management and Budget's (OMB's) Directive 14, the Census Bureau uses a set of money income thresholds that vary by family size and composition to detect who is poor. If the total income for a family or unrelated individual falls below the relevant poverty threshold, then the family or unrelated individual is classified as being "below the poverty level."

Race
Race is a self-identification data item in which respondents choose the race or races with which they most closely identify.

For Census 2000:
In 1997, after a lengthy analysis and public comment period, the Federal Office of Management and Budget (OMB) revised the standards for how the Federal government would collect and present data on race and ethnicity. The new guidelines reflect "the increasing diversity of our Nation's population, stemming from growth in interracial marriages and immigration."

These new guidelines revised some of the racial categories used in 1990 and preceding censuses and allowed respondents to report as many race categories as were necessary to identify themselves on the Census 2000 questionnaire.

How the new guidelines affect Census 2000 results and the comparison with data from 1990:
Census 2000 race data are not directly comparable with data from 1990 and previous censuses. See the Census 2000 Brief, "Overview of Race and Hispanic Origin".

Race Alone categories (6):
Includes the minimum 5 race categories required by OMB, plus the 'some other race alone' included by the Census Bureau for Census 2000, with the approval of OMB.

White alone
Black or African-American alone
American Indian or Alaska Native alone
Asian alone
Native Hawaiian or other Pacific Islander alone
Some other race alone

Race Alone or in combination categories (63):
There will be other tabulations where 'race alone or in combination' will be shown. These tabulations include not only persons who marked only one race (the 'race alone' category) but also those who marked that race and at least one other race. For example, a person who indicated that she was of Filipino and African-American background would be included in the African-American alone or in combination count, as well as in the Asian alone or in combination count. The alone or in combination totals are tallies of responses, rather than respondents. So the sum of the race alone or in combination will add to more than the total population.

Some tabulations will show the number of persons who checked 'two or more races'.

In some tables, including the first release of Census 2000 information, data will be tabulated for 63 possible combinations of race:
6 race alone categories
15 categories of 2 races (e.g., White and African American, White and Asian, etc.)
20 categories of 3 races
15 categories of 4 races
6 categories of 5 races
1 category of 6 races
=63 possible combinations

Some tables will show data for 7 race categories: the 6 (mutually-exclusive) major race-alone categories (White, African-American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, and some other race) and a 'two or more races' category. The sum of these 7 categories will add to 100 percent of the population.

Unemployed
All civilians 16 years old and over are classified as unemployed if they (1) were neither "at work" nor "with a job but not at work" during the reference week, and (2) were actively looking for work during the last 4 weeks, and (3) were available to accept a job. Also included as unemployed are civilians who did not work at all during the reference week, were waiting to be called back to a job from which they had been laid off, and were available for work except for temporary illness.

March 14, 2001

Question: Can data users compare data by race from Census 2000 with previous censuses?

Answer: Data on race from Census 2000 are not directly comparable with those from the 1990 census and previous censuses due, in large part, to giving respondents the option to report more than one race. Other factors, such as reversing the order of the questions on race and Hispanic origin and changing question wording and format, also may affect comparability.

Question: Why didn't the Census Bureau allow respondents to report more than one race in previous censuses?

Answer: The decision to use the instruction "mark one or more races" was reached by the Office of Management and Budget in 1997 after noting evidence of increasing numbers of children from interracial unions and the need to measure the increased diversity in the United States. Prior to this decision, most efforts to collect data on race (including those by the Census Bureau) asked people to report one race.

Question: What census data products will include data by race.

Answer: Data by race will appear in most Census 2000 data products. A large portion of Census 2000 data products will be made available on the Internet through the American FactFinder web page. Data on race also will be made available through paper reports and computer media such as CD-ROM and DVD. A description of our data products and a schedule for their release can be found on our web site at www.census.gov. Click on "Schedule", which will take you to the "Census 2000 Products at a Glance."

Question: How will data on race be presented?

Answer: Data on race will be shown using several different options. For example, in the Public Law 94-171 (redistricting) file, data will be shown for 63 racial categories. These include White alone, Black or African American alone, American Indian and Alaska Native alone, Asian alone, Native Hawaiian and Other Pacific Islander alone, Some other race alone and 57 possible combinations of the above six categories.

In data products where it will not be possible to show 63 racial categories, such as the Demographic Profiles, data will be shown for seven mutually exclusive and exhaustive categories. The seven categories are White alone, Black or African American alone, American Indian and Alaska Native alone, Asian alone, Native Hawaiian and Other Pacific Islander alone, Some other race alone, and Two or more races. The two or more races category represents all those respondents who reported more than one race.

A third option provides data about people who reported a race either alone or in combination with one or more other races. For example, the White alone or in combination category consists of those respondents who reported White, whether or not they reported any other races. In other words, people who reported only White or who reported combinations such as "White ***and*** Black or African American," or "White ***and*** Asian ***and*** American Indian and Alaska Native" are included in the White alone or in combination category. Using this option there are six alone or in combinations groups: White alone or in combination; Black or African American alone or in combination, American Indian and Alaska Native alone or in combination, Asian alone or in combination, Native Hawaiian and Other Pacific Islander alone or in combination, and Some other race alone or in combination. If the number of people in these six categories is calculated, it will equal the total number of responses and will generally exceed the total population.

Question: How were decisions made on which census data products would and would not contain data on race?

Answer: The decision on which products would include which tabulation option for race was determined through consultations with data users, especially our race and ethnic advisory committees. Ultimately, the decision was based on the Census Bureau's ability to provide data users with reliable and accurate data without violating respondents' confidentiality.

Question: Will the Census Bureau develop methods to facilitate comparisons between the race data in Census 2000 and previous censuses?

Answer: An OMB federal agency working group is studying possible bridging methods for comparing Census 2000 data on race with data from previous censuses. The Census Bureau did not develop these methods, but it is participating with the working group that is evaluating them. The Census Bureau is conducting evaluation studies to understand better the impact of changes to the question on race. For example, during the summer of 2001, the Census Bureau will implement a Census Quality Survey, gathering data from approximately 50,000 households, to assess the reporting of race and Hispanic origin in Census 2000. The purpose of this study is to produce a data file that will assist users in developing ways to make comparisons between Census 2000 data on race, where respondents were asked to report one or more races, and data on race from other sources that asked for only a single race.

Question: Does the Census Bureau have a policy on which tabulation options data users should use when comparing data on race from Census 2000 and previous censuses?

Answer: The Census Bureau is providing different tabulation options so that users may decide which option best satisfies their needs. In addition, the Census Bureau will provide a data file, using results from the Census Quality Survey to be conducted in the summer of 2001, that will assist users in developing ways to make comparisons between Census 2000 data on race, where respondents were asked to report one or more races, and data on race from other sources that asked for only a single race.

Question: What are the race groups that federal agencies are to use to comply with the Office of Management and Budget's guidance for civil rights monitoring and enforcement?

Answer: The categories (made available in OMB Bulletin No. 00-02, "Guidance on Aggregation and Allocation of Data on Race for Use in Civil Rights Monitoring and Enforcement") to be used are:

1. American Indian and Alaska Native
2. Asian
3. Black or African American
4. Native Hawaiian and Other Pacific Islander
5. White
6. American Indian and Alaska Native *and* White
7. Asian *and* White
8. Black or African American *and* White
9. American Indian and Alaska Native *and* Black or African American
10. >1 percent: Fill in if applicable with multiracial combinations greater than 1% of the population
11. Balance of individuals reporting more than one race
12. Total

The use of these categories, including the identification of specific two or more race combinations greater than 1 percent, is mandatory for civil rights monitoring and enforcement agencies. For more information, see www.whitehouse.gov/omb/bulletins/b00-02.html

Question: If data users combined a single race group, such as White, with all of the possible combination groups that include White, such as "White ***and*** Black or African American," "White ***and*** American Indian and Alaska Native ***and*** Asian," will such entries equal the total race population for White for a given jurisdiction?

Answer: While this total provides the maximum number of people who identify with being White, regardless of what other races were reported, it cannot be used with other racial categories to add to the total population. This

White total includes race combinations such as "White ***and*** Black or African American" that also would be included in the total of people who reported Black or African American regardless of other races reported.

By contrast, the "one-race" categories added to the "Two or more races" category equals the total population. See example below:

	Population Counts for City X
Total Population	500,000
One Race - Total	450,000
White	400,000
Black or African American	10,000
American Indian and Alaska Native	5,000
Asian	500
Native Hawaiian and Other Pacific Islander	100
Some Other Race	34,400
Two or more races - Total	50,000

Question: How does the Census Bureau define race and ethnicity?

Answer: Census Bureau complies with the Office of Management and Budget's standards for maintaining, collecting, and presenting data on race, which were revised in October 1997. They generally reflect a social definition of race recognized in this country. They do not conform to any biological, anthropological or genetic criteria.

In accordance with the Office of Management and Budget definition of ethnicity, the Census Bureau provides data for the basic categories in the OMB standards: Hispanic or Latino and Not Hispanic or Latino. In general, the Census Bureau defines ethnicity or origin as the heritage, nationality group, lineage, or country of birth of the person or the person 's parents or ancestors before their arrival in the United States. People who identify their origin as Spanish, Hispanic, or Latino may be of any race.

According to the revised Office of Management and Budget standards noted above, race is considered a separate concept from Hispanic origin (ethnicity) and, wherever possible, separate questions should be asked on each concept.

Question: How did the Census Bureau handle multiple responses to the race question in the 1990 census?

Answer: The 1990 Census data capture system was not designed to capture multiple circles being filled by respondents. When individuals marked the Other race circle and provided a multiple write in, the response was assigned according to the first write in. For example, a write in of "Black-White" was assigned a code of Black, a write in of "White-Black" was assigned a code of White. Separate codes were assigned to the various combinations of write ins for research and evaluation purposes.

Information gathered prior to the 1990 census indicated that less than one half of one percent of the population would mark more than one circle.

Question: Will multiple responses be captured for the question on Hispanic origin?

Answer: The Census Bureau followed the recommendation of its Hispanic Advisory Committee and captured multiple responses to the question on Hispanic origin for research purposes. However, multiple responses ultimately were assigned a code of one category for the official Census 2000 data.

Question: Is the multiracial population in the U.S. growing? Do we know the size of this population?

Answer: This is the first census that collected and tabulated data on people reporting two or more races, so we do not have an exact measure of change in the multiracial population. However, Census Bureau research shows

that the number of children living in mixed-race families has been increasing in the past two decades. In 1970, the number of children living in mixed-race families totaled 460,000. This number increased to 996,070 in 1980 and reached almost 2 million in 1990. In 1990, children in mixed-race households accounted for 4 percent of all children in households.

The Census Bureau's 1996 National Content Survey and the Bureau of Labor Statistics' 1995 Current Population Survey Supplement on Race and Ethnicity indicated that, nationwide, less then 2 percent of the population self-identified as multiracial.

Additional Information:

Number of Children Living in Mixed-Race Families

Year	Number
1970	460,000
1980	996,070
1990	1,937,496

Question: How will data for people reporting two or more races be tabulated beyond showing a total number of people reporting two or more races?

Answer: The Census Bureau will use two approaches in its standard data products, to present data for people reporting two or more races. One approach, which will be implemented in selected data products, is to show the 57 possible combinations of the six race groups (White, Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, and Some other race). These detailed categories can be combined, if desired, to show the number of people with two races, the number with three races, and so forth.

The second approach, which also will be implemented in selected data products, is to show the number of times a respondent reports one of the six race categories either alone in or combination with the other five race categories. Thus, the tabulation category "Black or African American alone or in combination with one or more other races" will include all people who reported only Black or African American and people who reported Black or African American in combination with any of the other five race categories.

Question: Will people who report two or more races be counted twice?

Answer: No. Individuals will be counted only once. However, in tabulation approaches including the 6 race groups shown *alone or in combination* with one or more other races, respondents will be tallied in each of the race groups they have reported. For example, people who reported "Asian *and* Black or African American" would be counted both in the "Asian alone or in combination" population and also in the "Black or African American alone or in combination" population. Consequently, the total of the six alone or in combination groups will exceed the total population whenever some people in the group of interest reported more than one race.

Question: How will people who do not mark any check box in the question on race, but provide a write-in entry of "Black and White" be counted in the census?

Answer: These individuals will be counted in the category "Two or more races." In tabulations where specific combinations are shown, these individuals will be tabulated in the category "White *and* Black or African American."

Source: U.S. Census Bureau | Public Information Office | (301) 763-3030
Last Revised: May 28, 2010 at 10:32:57 AM

Occupations: 2000

Census 2000 Brief

Issued August 2003

C2KBR-25

By
Peter Fronczek
and
Patricia Johnson

"What do you do for a living?" is a question frequently asked in contexts ranging from social conversation to scientific research. A person's occupation has often been a defining characteristic, so much so that many of today's surnames reflect the occupation of a long ago relative.

Figure 1.
Reproduction of the Questions on Occupation from Census 2000

28 Occupation

a. What kind of work was this person doing?
(For example: registered nurse, personnel manager, supervisor of order department, auto mechanic, accountant)

b. What were this person's most important activities or duties? *(For example: patient care, directing hiring policies, supervising order clerks, repairing automobiles, reconciling financial records)*

Source: U.S. Census Bureau, Census 2000 questionnaire.

Census 2000 counted 281.4 million people in the United States on April 1, 2000, of whom 129.7 million were employed civilians aged 16 and over (Table 1).[1] The census classifies occupations at various levels, from the least-detailed summary level — six occupational groups — to the most detailed level — 509 occupation categories. This Census 2000 Sample Brief examines occupations of the employed civilian population 16 years old and older.

Census 2000 occupation classifications were based on the government-wide 2000 Standard Occupation Classification (SOC) system, whereas the 1990 census occupations were based on the 1980 SOC. The SOC was overhauled in 1998 (with additional revisions in 2000) to create a classification system that more accurately reflected the occupational structure in the United States at the time of the revisions. As a result, comparisons of occupation data from the 1990 census and Census 2000 are not recommended and therefore are not attempted in this report.

At the least-detailed summary level, the highest proportion of civilian workers 16 and older, 33.6 percent, were in

[1] The text of this report discusses data for the United States, including the 50 states and the District of Columbia. Data for the Commonwealth of Puerto Rico are shown in Table 6 and Figure 3 only.

U S C E N S U S B U R E A U

Helping You Make Informed Decisions

U.S. Department of Commerce
Economics and Statistics Administration
U.S. CENSUS BUREAU

United States Census 2000

Table 8.
Occupational Groups by Industry Groups for the United States: 2000

(Data based on a sample. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see *www.census.gov/prod/cen2000/doc/sf3.pdf*)

Industry groups	Occupational groups						
	Employed civilian population 16 years and over	Management, professional and related occupations	Service	Sales and office	Farming, fishing, and forestry	Construction, extraction, and maintenance	Production, transportation, and material moving
Totals	**129,721,512**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Agriculture, forestry, fishing and hunting, and mining	2,426,053	2.2	0.4	0.4	82.2	1.9	1.2
Construction	8,801,507	2.9	0.4	1.9	0.4	51.4	2.6
Manufacturing	18,286,005	10.3	1.6	7.5	2.9	10.6	50.5
Wholesale trade	4,666,757	1.9	0.3	6.8	6.2	2.3	5.7
Retail trade	15,221,716	4.1	2.9	30.0	2.4	6.1	9.0
Transportation and warehousing, and utilities	6,740,102	2.0	1.5	5.5	0.7	5.3	15.8
Information	3,996,564	4.5	0.4	3.9	0.0	3.3	1.0
Finance, insurance, real estate, and rental and leasing	8,934,972	8.0	1.6	13.8	0.0	1.6	0.7
Professional, scientific, management, administrative, and waste management services	12,061,865	14.3	9.9	8.5	2.3	2.3	3.6
Educational, health and social services	25,843,029	36.7	28.4	10.1	0.5	2.3	3.0
Arts, entertainment, recreation, accommodation and food services	10,210,295	4.2	33.5	4.0	0.6	1.2	2.0
Other services (except public administration)	6,320,632	3.3	9.7	3.0	0.3	9.9	4.0
Public administration	6,212,015	5.5	9.4	4.6	1.5	1.9	0.9

Source: United States Census 2000, Sample Edited Detail File.

areas in the ten highest had about 3 out of 10 workers employed in sales and office occupations.

Nine out of ten metropolitan areas with the highest percentage of construction, extraction, and maintenance workers were in the South.

Nine out of ten metropolitan areas with the highest percentage of workers in construction, extraction, and maintenance occupations were in the South in 2000. The only area not in the South was Casper, WY, which was in the West. All of the ten were relatively small, with none having more than 200,000 workers.

Similarly, each of the ten metropolitan areas with the highest percentage of workers in production, transportation, and material moving occupations in 2000 was small: only one had more than 100,000 workers. The leading metropolitan areas in this group were Hickory-Morganton-Lenoir, NC, and Elkhart-Goshen, IN, with 34.3 percent and 32.7 percent[14] of their workforce in production, transportation, and material moving occupations.

ADDITIONAL FINDINGS

How does occupation differ from industry?

People often confuse industry and occupation data. Industry refers to the kind of business conducted by a person's employing organization; occupation describes the kind of work that person does on the job.

Some occupation groups are related closely to certain industries. Operators of transportation equipment, farm operators and workers, and health care providers account for major portions of their respective industries of transportation, agriculture, and health care. However, the industry categories include people in other occupations. For example, people employed in agriculture include truck drivers and bookkeepers; people employed in transportation include mechanics, freight handlers, and payroll clerks; and people in the health care industry include occupations such as security guard and secretary.

The industry classification system used during Census 2000 was developed for the census and consists of 265 categories classified into 13 major industry groups. The Census 2000 industry classification was developed from the 1997

[14] The difference between these two metropolitan areas was not statistically significant.

North American Industry Classification System (NAICS), which is an industry description system that groups establishments into industries based on activities in which they are primarily engaged. Several census data products use the aggregation structure shown in this report, while others, such as Summary File 3 and Summary File 4, use more detail.

Some occupational groups have a closely related industry counterpart.

About 82.2 percent of farming, fishing, and forestry workers were employed in agriculture, forestry, fishing and hunting, and mining industries. A little more than half (51.4 percent) of construction, extraction, and maintenance occupation workers were in the construction industry. Similarly, over half (50.5 percent) of workers in production, transportation, and material moving occupations were in manufacturing industries. Service occupations was the only occupational group to have a substantial percent of workers in two industry areas — arts, entertainment, recreation, accommodation and food service, with 33.5 percent; and educational, health and social services, with 28.4 percent. More than one-third (36.7 percent) of workers in management, professional and related occupations worked in the educational, health and social services industries. About 30.0 percent of sales and office workers worked in retail trade industries.

ABOUT CENSUS 2000

Why Census 2000 asked about occupation.

The study of occupations is important because it facilitates a better understanding of the economy by tracking labor force trends and identifying new and emerging occupations, such as those related to computers or the Internet. It also provides a window on changes taking place in society, reflected by the work people do.

Specifically, information on occupations is used by a number of federal agencies to distribute funds, to develop policy, and to measure compliance with laws and regulations. For example, occupation data are required by the Bureau of Economic Analysis to develop state per capita income estimates, which are used in the allocation formulas or eligibility criteria of more than 20 federal programs. Data are used to help the Environmental Protection Agency, under the Toxic Substances Control Act, to identify occupations that expose people to harmful chemicals and that adversely affect the environment. They are also used by the Equal Employment Opportunity Commission, under the Civil Rights and Equal Pay Acts, to monitor compliance with federal law and to investigate complaints where employment discrimination is alleged. Occupation data are used by the Department of Labor to formulate policies and programs for employment, career development, and training.

Accuracy of the Estimates

The data contained in this product are based on the sample of households who reported to the Census 2000 long form. Nationally, approximately 1 out of every 6 housing units was included in this sample. As a result, the sample estimates may differ somewhat from the 100-percent figures that would have been obtained if all housing units, people within those housing units, and people living in group quarters had been enumerated using the same questionnaires, instructions, enumerators, and so forth. The sample estimates also differ from the values that would have been obtained from different samples of housing units, people within those housing units, and people living in group quarters. The deviation of a sample estimate from the average of all possible samples is called the sampling error.

In addition to the variability that arises from the sampling procedures, both sample data and 100-percent data are subject to nonsampling error. Nonsampling error may be introduced during any of the various complex operations used to collect and process census data. Such errors may include: not enumerating every household or every person in the population, failing to obtain all required information from the respondents, obtaining incorrect or inconsistent information, and recording information incorrectly. In addition, errors can occur during the field review of the enumerators' work, during clerical handling of

the census questionnaires, or during the electronic processing of the questionnaires.

Nonsampling error may affect the data in two ways: (1) errors that are introduced randomly will increase the variability of the data and, therefore, should be reflected in the standard errors; and (2) errors that tend to be consistent in one direction will bias both sample and 100-percent data in that direction. For example, if respondents consistently tend to underreport their incomes, then the resulting estimates of households or families by income category will tend to be understated for the higher income categories and overstated for the lower income categories. Such biases are not reflected in the standard errors.

While it is impossible to completely eliminate error from an operation as large and complex as the decennial census, the Census Bureau attempts to control the sources of such error during the data collection and processing operations. The primary sources of error and the programs instituted to control error in Census 2000 are described in detail in *Summary File 3 Technical Documentation* under Chapter 8, "Accuracy of the Data," located at *www.census.gov /prod/cen2000/doc/sf3.pdf.*

All statements in this Census 2000 Brief have undergone statistical testing and all comparisons are significant at the 90-percent confidence level, unless otherwise noted. The estimates in tables, maps, and other figures may vary from actual values due to sampling and nonsampling errors. As a result, estimates in one category may not be significantly different from estimates assigned to a different category. Further information on the accuracy of the data is located at *www.census.gov/prod /cen2000/doc/sf3.pdf.* For further information on the computation and use of standard errors, contact the Decennial Statistical Studies Division at 301-763-4242.

For More Information.

The Census 2000 Summary File 3 data are available from the American Factfinder on the Internet (*factfinder.census.gov*). They were released on a state-by-state basis during 2002. For information on confidentiality protection, nonsampling error, sampling error, and definitions, also see *www.census.gov/prod/cen2000 /doc/sf3.pdf* or contact the Customer Services Center at 301-763-INFO (4636).

Information on population and housing topics is presented in the Census 2000 Brief series, located on the Census Bureau's Web site at *www.census.gov/population/www /cen2000/briefs.html.* This series, which will be completed in 2003, presents information on race, Hispanic origin, age, sex, household type, housing tenure, and social, economic, and housing characteristics, such as ancestry, income, and housing costs.

For additional information on occupations in the United States, including reports and survey data, visit the Census Bureau's Internet site at *www.census.gov /hhes/www/occupation.html.*

To find information about the availability of data products, including reports, CD-ROMs, and DVDs, call the Customer Services Center at 301-763-INFO (4636), or e-mail *webmaster@census.gov.*

Poverty Thresholds 2000

(Use landscape & legal printer options to print this table)

Poverty Thresholds for 2000 by Size of Family and Number of Related Children Under 18 Years

Size of family unit	Weighted Average Thresholds	Related children under 18 years								
		None	One	Two	Three	Four	Five	Six	Seven	Eight or more
One person (unrelated individual).....	8,794									
Under 65 years.....	8,959	8,959								
65 years and over.....	8,259	8,259								
Two persons.....	11,239									
Householder under 65 years.....	11,590	11,531	11,869							
Householder 65 years and over.....	10,419	10,409	11,824							
Three persons.....	13,738	13,470	13,861	13,874						
Four persons.....	17,603	17,761	18,052	17,463	17,524					
Five persons.....	20,819	21,419	21,731	21,065	20,550	20,236				
Six persons.....	23,528	24,636	24,734	24,224	23,736	23,009	22,579			
Seven persons.....	26,754	28,347	28,524	27,914	27,489	26,696	25,772	24,758		
Eight persons.....	29,701	31,704	31,984	31,408	30,904	30,188	29,279	28,334	28,093	
Nine persons or more.....	35,060	38,138	38,322	37,813	37,385	36,682	35,716	34,841	34,625	33,291
Source: U.S. Census Bureau										

Source: U.S. Census Bureau | Poverty | Last Revised: September 16, 2010

Poverty Thresholds 2009

Poverty Thresholds for 2009 by Size of Family and Number of Related Children Under 18 Years

Size of Family Unit	Weighted Average Thresholds	Related children under 18 years								
		None	One	Two	Three	Four	Five	Six	Seven	Eight or more
One person (unrelated individual)	10,956									
Under 65 years	11,161	11,161								
65 years and over	10,289	10,289								
Two people	13,991									
Householder under 65 years	14,439	14,366	14,787							
Householder 65 years and over	12,982	12,968	14,731							
Three people	17,098	16,781	17,268	17,285						
Four people	21,954	22,128	22,490	21,756	21,832					
Five people	25,991	26,686	27,074	26,245	25,603	25,211				
Six people	29,405	30,693	30,815	30,180	29,571	28,666	28,130			
Seven people	33,372	35,316	35,537	34,777	34,247	33,260	32,108	30,845		
Eight people	37,252	39,498	39,847	39,130	38,501	37,610	36,478	35,300	35,000	
Nine people or more	44,366	47,514	47,744	47,109	46,576	45,701	44,497	43,408	43,138	41,476

Note: The poverty thresholds are updated each year using the change in the average annual Consumer Price Index for All Urban Consumers (CPI-U). Since the average annual CPI-U for 2009 was lower than the average annual CPI-U for 2008, poverty thresholds for 2009 are slightly lower than the corresponding thresholds for 2008.
Source:U.S. Census Bureau

Source: U.S. Census Bureau | Poverty | Last Revised: September 16, 2010

Attachment 5d

Bureau of Indian Affairs Labor Force Report Definitions

Service Population

The total 2005 Service Population of 1,731,178 represents an increase of 143,659 Indian residents or 9 percent over the 1,587,519 reported in the 2003 Labor Force Report.

The total 2005 Service Population represents an increase of 470,972 or 37 percent over the 1,260,206 total Service Population reported in 1995, and an increase of 996,283 or 136 percent over the total Service Population of 734,895 reported in 1982 (the earliest year for which historical data is available).

The 2005 increase in Service Population is attributed to increased record-keeping and improved data collection methods, as well as eligible Indian individuals and families who came to reside in a tribe's service area to benefit from opportunities and services unavailable to them in off-reservation communities. The trend, wherein enrolled Indians returned to reside on or near a reservation, continued in 2005.

Employment

Unemployment, as a percent of the available labor force, did not change between 2003 and 2005, remaining at 49 percent.

The total 2005 workforce (i.e., those available for work) of 872,483 increased by 71,955 individuals, a 9 percent increase over the total workforce of 800,528 reported in 2003. The total 2005 workforce increase is, in part, attributable to the increase of 84,771 reservation residents in the Service Population who were age 16 to 64, as well as the increase in the number of Indians who were available for work.

Between 2003 and 2005, private sector employment increased by 14 percent or 24,439 (from 178,692 in 2003 to 203,131 in 2005). During the same time period, public sector employment increased by 8 percent or 18,195 (from 227,131 in 2003 to 245,326 in 2005). Hence, the total number of employed Indians increased by 11 percent (from 405,823 to 450,511) over the two-year period.

In 2005, Indian individuals employed but earning wages below the poverty level increased by 494 or less than 1 percent between 2003 (131,728) and 2005 (132,222). Even so, the percentage of those employed below the poverty guidelines decreased from 32 percent in 2003 to 29 percent in 2005.

Since the total number of employed Indians increased by 11 percent, from 2003 to 2005, and the number of Indians who were employed under the poverty guidelines increased by less than 1 percent in the same two-year period, this yielded a slight net decrease (3 percent) in the proportion of the Indian reservation population who were employed below the poverty guideline.

Report Coverage

Each tribe that responded designated a tribal labor force coordinator who used a standardized survey reporting form to collect data and provide estimates on their enrolled members and members from other tribes who lived "on-or-near" the reservation and who were eligible to use the tribe's BIA-funded services. The aggregated total of those eligible to use the services constituted the tribe's Indian "Service Population." Excluded from each tribe's 2005 Service Population total and other report totals were members who, for example, were serving in the Armed Forces or attending post-secondary institutions and not residing on tribal lands. Members were also excluded from the tribe's Service Population if they had relocated for purposes of direct employment or were incarcerated or confined to a long-term treatment facility.

The data within the Regional section of this Report are provided by Tribe, by BIA Agency, and by BIA Region. The Navajo Nation is listed by BIA Agency under the BIA Navajo Region. Alaska Native entities are listed individually or grouped by consortium.

Definitions Used for the Report (from 25 CFR § 20.1)

Indian means any person who is a member of a federally recognized Indian tribe. Some tribes have enrollment criteria that allows their members to have a blood quantum less than the one-fourth specified in 25 CFR § 20.1.

Indian Tribes are tribes, bands, nations, rancherias, pueblos, colonies, communities, and Alaska Native groups recognized as eligible for funding and services from the BIA and included in the current list of tribal entities, pursuant to Section 104 of the Act of November 2, 1994 (Pub. L. 103-454; 108 Stat. 4791). The list was last published in the Federal Register on November 25, 2005.

Near Reservation means those areas or communities adjacent or contiguous to a reservation, which are designated by the Assistant Secretary upon recommendation of the local BIA Superintendent. The recommendation is based upon consultation with the tribal governing body of those reservations on the basis of such general criteria as:

- Number of Indian people native to the reservation residing in the area;
- A written designation by the tribal governing body that members of their tribe and family members who are Indians and residing in the area are socially, culturally, and economically affiliated with the tribe and the reservation;
- Geographic proximity of the area to the reservation; and
- Administrative feasibility of providing an adequate level of service.

For Alaska, the term includes the entire State, since Alaska Native tribes are typically isolated from each other and are not formed as reservations, except for the Metlakatla Indian Community on the Annette Island Reserve in southeast Alaska.

On Reservation means American Indians who live within present reservation boundaries and who are eligible for BIA-funded services.

Resident Indian means American Indians living on or near Federal reservations who are considered part of the tribe's service population.

Report Headings/Terms

Tribal Enrollment is the total number of tribal enrollees who are certified as being tribal members by their tribe's leader or designate. Pursuant to tribal governing documents, tribal enrollees may live on-reservation or anywhere outside the reservation – for example, in distant towns, cities, or foreign countries.

Total Service Population is the tribe's estimate of all American Indians and Alaska Natives, members and non-members, who are living on or near the tribe's reservation during the 2005 calendar year and who are eligible to use BIA-funded services. The aggregated sum of those reported as "Age Under 16", "Age 16-64", and "Age 65 and Over" sub-totals of a given tribe equals the tribe's "Total Service Population". Typically, Indians included in a tribe's Service Population live within a reasonable distance of the reservation from where they can access the tribe's services. Such Indians typically do not live in distant cities, towns, or foreign countries.

Not Available for Work is the total estimated number of individuals who were age 16 and over and who were included in a tribe's Service Population, but because of personal circumstances were unable to assume or sustain gainful employment.

Available for Work represents the tribe's 2005 "Total Work Force" and is the sum of the "Age 16-64" and "Age 65 and Over" sub-totals minus the number of individuals who were "Not Available for Work".

Number Employed is determined by aggregating the tribe's estimated subtotals of the number of individuals in its Service Population who were employed by either public, private, or tribal entities.

Number Not Employed is determined by subtracting the "Number Employed" from the tribe's number of individuals in the tribe who were "Available for Work".

Unemployed as a percent of the Labor Force is determined by dividing the "Number Not Employed" by the "Total Workforce" (also called the "Available for Work" total).

Employed, but Below Poverty Guidelines is determined by using the U.S. Department of Health and Human Services (DHHS) 2005 Poverty Guidelines. The tribe estimated the number of its employed workforce whose annual earned income was below the poverty guidelines. For example, for a family of two the poverty threshold of combined earned income was $12,830 and for a family of four the poverty threshold of combined earned income was $19,350 (for Alaska, $16,030 and $24,190, respectively). Additionally, the report tables show the percent of those employed below the "Poverty Guideline." This percent is derived by dividing the tribe's estimated total number of "Employed, but Below Poverty Guidelines" by the "Number Employed".

Description of Report Tables

State

This table provides information, by state, on the number of Indians who reside on or near a reservation in that state.

Regional

This series of tables provides information on those tribes which were under each BIA Region. In addition, a Self-Governance Table provides information on self-governing tribes.

Alphabetical

This table provides a quick reference tool to locate a specific tribe.

Report Participation

This table provides information on how current and complete the data are for this report. The data included in the 2005 biennial report are reasonably current in that 73 percent of the reporting entities submitted data for the 2005 reporting period and an additional 18 percent submitted data in 2003. Therefore, 91 percent of the data in the report are no older than the previous reporting period (2003). This report participation analysis was not preformed in prior reporting periods.

Additional Information

Any questions regarding a specific tribe's labor market information can be directed to the tribe's BIA Agency, Field Office, or Regional Office. The current BIA Tribal Leaders Directory, with contact information for BIA Regional and Agency offices and the federally recognized tribes, can be accessed at www.doi.gov/leaders.pdf. This report can be accessed at www.doi.gov/triballaborforce2005.pdf.

Note to Readers

The process for collecting data included in the *American Indian Population and Labor Force Report* has remained unchanged since 1999. Tribes are provided written instructions and technical assistance, if requested, to report the data. Data is certified by the tribe. In most cases, BIA reports data as reported by the tribes. An analysis of the data provided in this report, however, reveals problems in the population data reported by the tribes. Users of this report should also be aware that the unemployment data detailed in the report is calculated pursuant to the law that requires the report and that this definition of employment is not the same as that used by the Federal Bureau of Labor Statistics.

Population Data includes "Tribal Enrollment" and the "Total Eligible for Services" data reported by Tribes. Tribes are instructed to report "Tribal Enrollment" as well as the "Total [number of individuals] Eligible for Services" within the tribal domain. The distinction is made because services provided through BIA funding are only available to tribal members living on or near the reservation. The numbers differ because not all enrolled members live on or near the tribal reservation (because they are serving in the armed forces or attending colleges or live in another part of the country, for example.) Conversely, in many cases members of one tribe may live on or near another tribe's reservation (because of marriage, for example). These individuals are eligible for services provided through BIA funding from the tribe on whose reservation they live on or near.

A review of the reported population data indicates that many tribes do not report these numbers as instructed. For example, there are many cases where "Tribal Enrollment" and the "Total Eligible for Services" are identical, which while possible, is not probable, especially to the extent reported in this document. BIA believes that many of the reporting issues may be the result of misunderstandings of how to fill out the data submission form. To address this problem, as part of the 2007 data collection, the BIA will re-examine its data collection process and train the tribes on how to fill out the submission forms so that future Labor Force Reports reflect a truer depiction of Tribal enrollment and BIA service population in Indian Country.

Unemployment Data is calculated consistent with the methodology included in the Indian Employment, Training and Related Services Demonstration Act of 1992 (P. L. 102-477), which differs from the methodology used by the Federal Bureau of Labor Statistics. The BLS unemployment rates includes adults who do not have a job, are currently available for work, and who have actively looked for work in the last 4 weeks. The BIA definition includes the BLS definition plus those who would like a job but who are no longer actively looking for work. The difference in calculations generally leads to the Tribes reporting significantly higher unemployment rates than those reported by BLS for counties and states in proximity to the reservations.

Attachment 6

6a Indian Health Care Improvement Act Made Permanent by Health Care Reform Legislation

6b 90 Stat. 1400 1976

Attachment 6a

Indian Health Care Improvement Act Made Permanent by Health Care Reform Legislation

Indian Health Care Improvement Act Made Permanent By Health Care Reform Legislation

By Craig A. Conway, J.D., LL.M. (Health Law)
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Included in the recently-passed Patient Protection and Affordable Care Act[1] signed into law by President Obama was the reauthorization of the Indian Health Care Improvement Act (IHCIA)[2] – considered to be the cornerstone legal authority for the provision of progressive health care services to American Indians and Alaska Natives (AI/AN).[3] Viewed as a victory for individuals and tribes that have requested the legislation for the past ten years, the reauthorization of the IHCIA affirms the federal government's trust responsibility to provide health care to AI/ANs across the country.[4]

Background

During the 1890s, the federal government began to advocate the assimilation of Native Americans into mainstream American life.[5] As part of that assimilation process, the government sought to increase the tribes' dependence on medicine practiced by physicians of the West and decreased reliance on Tribal practices. The Bureau of Indian Affairs oversaw congressional appropriations used for health care programs offered to American Indians. Since that time, the responsibility for their health care oversight has bounced around and currently is placed with the Indian Health Service (IHS), a division of the U.S. Department of Health and Human Services.

The IHS provides health care services to 1.9 million of the estimated 3.3 million nationwide AI/ANs belonging to 562 federally-recognized tribes in 35 states.[6] The agency does this through a network of 63 health centers, 29 hospitals, and 28 health stations which are managed by 161 service units and 12 Area Offices.[7] Health care services are delivered in three ways: (1) directly through IHS services; (2) through tribal medical services; or (3) by contract with non-IHS service providers.[8]

Better quality and increased health care services provided to AI/ANs has been met with some success in the last 30 years. Life expectancy among the Indian people has

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[1] Patient Protection and Affordable Care Act, H.R. 3590, Pub. L. No. 111-148, 111th Cong. (2010).
[2] Indian Health Care Improvement Act, Pub. L. No. 94-437, 94th Cong. (Sept. 30, 1976).
[3] *See* Nat'l Indian Health Bd., Press Release, *America Reaffirms Health Care for Indian Country*, (Mar. 21, 2010), http://www.nihb.org/docs/03212010/PR-03.21.10%20FINAL.pdf.
[4] *Id.*
[5] Gary D. Sandefur, *Federal Policy Toward Minorities, 1787-1980*, 10 FOCUS 21 (1987), *available at* http://www.irp.wisc.edu/publications/focus/pdfs/foc102c.pdf.
[6] Indian Health Serv., *Indian Health Service Introduction*, http://www.ihs.gov/PublicInfo/PublicAffairs/Welcome_Info/IHSintro.asp (last accessed Apr. 3, 2010).
[7] Indian Health Serv., *IHS Year 2010 Profile*, http://info.ihs.gov/Profile2010.asp (last accessed Apr. 3, 2010).
[8] Indian Health Serv., *Quick Look*, http://info.ihs.gov/QuickLook2010.asp (last accessed Apr. 3, 2010). *See also* Holly T. Kuschell-Haworth, *Jumping Through Hoops: Traditional Healers And The Indian Health Care Improvement Act*, 4 DEPAUL J. OF HEALTH CARE L. 843 (Summer 1999).

increased by more than 9 years since 1973 while mortality rates have decreased for infant deaths, tuberculosis, pneumonia, influenza, homicide, suicide, and alcoholism.[9] However, disparities for each of those categories still exist compared with the U.S. general population. Indian life expectancy is still nearly 5 years less than the average American while death rates for various illnesses and other causes are significantly higher across the board.[10]

Federal Legislation Governing AI/AN Health Care

The duty of the federal government to provide health services to Indian Tribes derives from a number of different sources, including negotiated treaties to ceded lands, settlements, agreements, and legislation.[11] The principal legislation authorizing federal funds for health services to American Indians is the Synder Act of 1921.[12] That legislation authorized funds for "the relief of distress and conservation of health…[and]…for the employment of…physicians…for Indian Tribes throughout the United States."[13] Following the Synder Act, Congress created a patchwork process for transferring the responsibility of overseeing health programs to tribal governments in 1975.

By enacting the Indian Self-Determination and Education Assistance Act of 1975,[14] Congress sought to provide Indian Tribes with a greater role in governing their own health care and education programs. The 1975 Act contained two provisions: (1) the Indian Self-Determination Act, which established procedures by which Tribes could eventually administer their own education and social service programs, and (2) the Indian Education Assistance Act, which sought to increase parental involvement in Indian education.[15] Since 1975 the Act has been amended several times. The following year, Congress passed a health care-specific bill designed to provide the quality and quantity of health care services necessary to elevate the health status of AI/ANs to the highest possible health status and to provide existing Indian health services with all resources necessary to effect that policy.

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[9] *Id.*

[10] *Id.* For example, tuberculosis (500% higher), alcoholism (519% higher), diabetes (195% higher), unintentional injuries (149% higher), homicide (92% higher), and suicide (72% higher).

[11] Nat'l Indian Health Bd., *supra* note 3. *See also* Holly T. Kuschell-Haworth, *Jumping Through Hoops: Traditional Healers And The Indian Health Care Improvement Act*, 4 DEPAUL J. OF HEALTH CARE L. 843 (Summer 1999).

[12] Pub. L. No. 67-85, 42 Stat. 208 (Nov. 2, 1921), *codified at* 25 U.S.C. 1 *et seq.* (2001), *available at* http://www.ihs.gov/adminmngrresources/legislativeaffairs/legislative_affairs_web_files/key_acts/snyder_act.pdf.

[13] *Id. See also* Indian Health Serv., *Fact Sheet*, http://www.ihs.gov/PublicAffairs/Welcome_Info/ThisFacts.asp (last accessed Apr. 3, 2010).

[14] Pub. L. No. 93-638, 88 Stat. 2203 (1975), *codified as* 25 U.S.C. §§ 450a-450n, and as amended in scattered sections of 25 U.S.C, 42 U.S.C, and 50 U.S.C.).

[15] *Id. See also* GEORGE CASTILE, TO SHOW HEART: NATIVE AMERICAN SELF-DETERMINATION AND FEDERAL INDIAN POLICY, 1960–1975 (Univ. of Ariz. Press, 1998); THOMAS CLARKIN, FEDERAL INDIAN POLICY IN THE KENNEDY AND JOHNSON ADMINISTRATIONS, 1961–1969, (Univ. of N.M. Press, 2001).

In 1976, Congress found that many IHS facilities were "inadequate, outdated, inefficient, and undermanned," and enacted the Indian Health Care Improvement Act (IHCIA)[16] to "implement the Federal responsibility for the care and education of the Indian people by improving the services and facilities of Federal Indian health programs and encouraging maximum participation" in those programs.[17] Specific portions of the IHCIA contained language that would ensure that AI/ANs could obtain access to high-quality, comprehensive health care services when needed and also established procedures for the IHS to assist tribes in developing infrastructure to manage their health programs. Since 1976, the legislation has been amended numerous times,[18] including substantive changes in 1992 which extended the act's purpose of raising the health status of AI/ANs over a specified period of time to the level of the general U.S. population.[19]

During the late 1990s, the IHS worked closely with Indian Tribes and governments to draft amendments to IHCIA that would provide greater administrative capabilities to tribal health programs and increase quality of care given.[20] In 1999, a National Steering Committee was established to review those proposed recommendations and complete a final legislative draft. By late 1999, the Committee's final proposal was in the hands of the Congressional leadership as well as the White House. However, nothing ever materialized.

The IHCIA expired in 2000, but was extended through 2001 in the belief that Congress would reauthorize it shortly thereafter. Yet, since 2001 Congress has only held hearings on various proposals but enacted no substantive changes to the IHCIA until the recently-passed health care reform legislation was passed.

Reauthorization of IHCIA

The version of the IHCIA signed into law on March 23, 2010, differs in several ways from the original 1976 version. It includes many major changes and improvements to effectuate the delivery of health care services to AI/ANs, including:

- Enhances the authority of the IHS Director, including the responsibility to facilitate advocacy and promote consultation on matters relating to Indian health within the Department of Health and Human Services.

[16] Pub. L. No. 94-437, 90 Stat. 400, 94th Cong. (Sept. 30, 1976); *Ariz. Health Care Cost Containment Sys. v. McClellan*, 508 F.3d 1243, 1246 (9th Cir.2007).
[17] *Id.*
[18] Pub. L. No. 94-437, 90 Stat. 400, 94th Cong. (Sept. 30, 1976), as amended by Pub. L. No. 96-537 (Dec. 17, 1980), Pub. L. No. 100-579 (Oct. 31, 1988), Pub. L. No. 100-690 (Nov. 18, 1988), Pub. L. No. 100-713 (Nov. 23, 1988), Pub. L. No. 101-630 (Nov. 28, 1990), Pub. L. No. 102-573 (Oct. 29, 1992), Pub. L. No. 104-313 (Oct. 19, 1996), and Pub. L. No. 106-417 (Nov. 1, 2000). A copy of the marked-up legislation may be found at http://www.ihs.gov/adminmngrresources/ihcia/documents/ ihcia.pdf.
[19] *Id. See also* Holly T. Kuschell-Haworth, *supra* note 8.
[20] Indian Health Serv., *Indian Health Care Improvement Act*, http://info.ihs.gov/TreatiesLaws/Treaties3.pdf (last accessed Apr. 3, 2010).

- Provides authorization for hospice, assisted living, long-term, and home- and community-based care.

- Extends the ability to recover costs from third parties to tribally operated facilities.

- Updates current law regarding collection of reimbursements from Medicare, Medicaid, and CHIP (Children's Health Insurance Program) by Indian health facilities.

- Allows tribes and tribal organizations to purchase health benefits coverage for IHS beneficiaries.

- Authorizes IHS to enter into arrangements with the Departments of Veterans Affairs and Defense to share medical facilities and services.

- Allows a tribe or tribal organization carrying out a program under the Indian Self-Determination and Education Assistance Act and an urban Indian organization carrying out a program under Title V of IHCIA to purchase coverage for its employees from the Federal Employees Health Benefits Program.

- Authorizes the establishment of a Community Health Representative program for urban Indian organizations to train and employ Indians to provide health care services.

- Directs the IHS to establish comprehensive behavioral health, prevention, and treatment programs for Indians.[21]

The inclusion of the IHCIA in the reform legislation was hailed by the National Indian Health Board as a much-needed provision. "No one can deny the intense political climate that has been present in the debates regarding health care reform. However, there is one issue that has remained consistently agreed upon: Indian Country is in dire need of health care reform," said Reno Franklin, Chairman of the National Indian Health Board.[22] Adding to that sentiment, President Obama remarked after he signed the reform legislation that he "believes it is unacceptable that Native American communities still face gaping health care disparities."[23]

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[21] Pub. L. No. 94-437, 90 Stat. 400, 94th Cong. (Sept. 30, 1976); Patient Protection and Affordable Care Act, H.R. 3590, Pub. L. No. 111-148, 111th Cong. (2010) at Sec. 10221; U.S. Dep't of Health & Human Servs., Press Release, *Indian Health Care Improvement Act Made Permanent*, (Mar. 26, 2010), http://www.hhs.gov/news/press/2010pres/03/20100326a.html.

[22] Nat'l Indian Health Bd., Press Release, *America Reaffirms Health Care for Indian Country*, Mar. 21, 2010, http://www.nihb.org/docs/03212010/PR-03.21.10%20FINAL.pdf.

[23] The White House, Office of the Press Sec'y, *Statement by the President on the Reauthorization of the Indian Health Care Improvement Act*, Mar. 23, 2010, http://www.whitehouse.gov/the-press-office/statement-president-reauthorization-indian-health-care-improvement-act; U.S. Dep't of Health &

Conclusion

Federal funding for the IHCIA has contributed billions of dollars to improve the health status of Indian people, yet significant health care disparities still exist compared with the U.S. general population. Hopefully, the inclusion of the IHCIA in the reform legislation will be a significant step towards reducing those disparities.

Health Law Perspectives (April 2010)
Health Law & Policy Institute
University of Houston Law Center
http://www.law.uh.edu/healthlaw/perspectives/homepage.asp

Human Servs., Press Release, *Indian Health Care Improvement Act Made Permanent*, (Mar. 26, 2010), http://www.hhs.gov/news/press/2010pres/03/20100326a.html.

Attachment 6b

90 Stat. 1400 1976

Public Law 94-437
94th Congress

An Act

Sept. 30, 1976
[S. 522]

To implement the Federal responsibility for the care and education of the Indian people by improving the services and facilities of Federal Indian health programs and encouraging maximum participation of Indians in such programs, and for other purposes.

Indian Health Care Improvement Act
25 USC 1601 note.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Indian Health Care Improvement Act".

FINDINGS

25 USC 1601.

SEC. 2. The Congress finds that—

(a) Federal health services to maintain and improve the health of the Indians are consonant with and required by the Federal Government's historical and unique legal relationship with, and resulting responsibility to, the American Indian people.

(b) A major national goal of the United States is to provide the quantity and quality of health services which will permit the health status of Indians to be raised to the highest possible level and to encourage the maximum participation of Indians in the planning and management of those services.

(c) Federal health services to Indians have resulted in a reduction in the prevalence and incidence of preventable illnesses among, and unnecessary and premature deaths of, Indians.

(d) Despite such services, the unmet health needs of the American Indian people are severe and the health status of the Indians is far below that of the general population of the United States. For example, for Indians compared to all Americans in 1971, the tuberculosis death rate was over four and one-half times greater, the influenza and pneumonia death rate over one and one-half times greater, and the infant death rate approximately 20 per centum greater.

(e) All other Federal services and programs in fulfillment of the Federal responsibility to Indians are jeopardized by the low health status of the American Indian people.

(f) Further improvement in Indian health is imperiled by—

(1) inadequate, outdated, inefficient, and undermanned facilities. For example, only twenty-four of fifty-one Indian Health Service hospitals are accredited by the Joint Commission on Accreditation of Hospitals; only thirty-one meet national fire and safety codes; and fifty-two locations with Indian populations have been identified as requiring either new or replacement health centers and stations, or clinics remodeled for improved or additional service;

(2) shortage of personnel. For example, about one-half of the Service hospitals, four-fifths of the Service hospital outpatient clinics, and one-half of the Service health clinics meet only 80 per centum of staffing standards for their respective services;

(3) insufficient services in such areas as laboratory, hospital inpatient and outpatient, eye care and mental health services, and services available through contracts with private physicians, clinics, and agencies. For example, about 90 per centum of the surgical operations needed for otitis media have not been performed, over 57 per centum of required dental services remain to be provided, and about 98 per centum of hearing aid requirements are unmet;

(4) related support factors. For example, over seven hundred housing units are needed for staff at remote Service facilities;

(5) lack of access of Indians to health services due to remote residences, undeveloped or underdeveloped communication and transportation systems, and difficult, sometimes severe, climate conditions; and

(6) lack of safe water and sanitary waste disposal services. For example, over thirty-seven thousand four hundred existing and forty-eight thousand nine hundred and sixty planned replacement and renovated Indian housing units need new or upgraded water and sanitation facilities.

(g) The Indian people's growth of confidence in Federal Indian health services is revealed by their increasingly heavy use of such services. Progress toward the goal of better Indian health is dependent on this continued growth of confidence. Both such progress and such confidence are dependent on improved Federal Indian health services.

DECLARATION OF POLICY

SEC. 3. The Congress hereby declares that it is the policy of this Nation, in fulfillment of its special responsibilities and legal obligation to the American Indian people, to meet the national goal of providing the highest possible health status to Indians and to provide existing Indian health services with all resources necessary to effect that policy. **25 USC 1602.**

DEFINITIONS

25 USC 1603.

SEC. 4. For purposes of this Act—

(a) "Secretary", unless otherwise designated, means the Secretary of Health, Education, and Welfare.

(b) "Service" means the Indian Health Service.

(c) "Indians" or "Indian", unless otherwise designated, means any person who is a member of an Indian tribe, as defined in subsection (d) hereof, except that, for the purpose of sections 102, 103, and 201 (c)(5), such terms shall mean any individual who (1), irrespective of whether he or she lives on or near a reservation, is a member of a tribe, band, or other organized group of Indians, including those tribes, bands, or groups terminated since 1940 and those recognized now or in the future by the State in which they reside, or who is a descendant, in the first or second degree, of any such member, or (2) is an Eskimo or Aleut or other Alaska Native, or (3) is considered by the Secretary of the Interior to be an Indian for any purpose, or (4) is determined to be an Indian under regulations promulgated by the Secretary.

(d) "Indian tribe" means any Indian tribe, band, nation, or other organized group or community, including any Alaska Native village or group or regional or village corporation as defined in or established pursuant to the Alaska Native Claims Settlement Act (85 Stat. 688), which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

(e) "Tribal organization" means the elected governing body of any Indian tribe or any legally established organization of Indians which is controlled by one or more such bodies or by a board of directors elected or selected by one or more such bodies (or elected by the Indian population to be served by such organization) and which includes the maximum participation of Indians in all phases of its activities.

(f) "Urban Indian" means any individual who resides in an urban center, as defined in subsection (g) hereof, and who meets one or more of the four criteria in subsection (c) (1) through (4) of this section.

(g) " Urban center" means any community which has a sufficient urban Indian population with unmet health needs to warrant assistance under title V, as determined by the Secretary.

(h) "Urban Indian organization" means a nonprofit corporate body situated in an urban center, composed of urban Indians, and providing for the maximum participation of all interested Indian groups and individuals, which body is capable of legally cooperating with other public and private entities for the purpose of performing the activities described in section 503 (a).

TITLE I—INDIAN HEALTH MANPOWER

PURPOSE

25 USC 1611.

SEC. 101. The purpose of this title is to augment the inadequate number of health professionals serving Indians and remove the multiple barriers to the entrance of health professionals into the Service and private practice among Indians.

HEALTH PROFESSIONS RECRUITMENT PROGRAM FOR INDIANS

Grants.
25 USC 1612.

SEC. 102. (a) The Secretary, acting through the Service, shall make grants to public or nonprofit private health or educational entities or Indian tribes or tribal organizations to assist such entities in meeting the costs of—

(1) identifying Indians with a potential for education or training in the health professions and encouraging and assisting them (A) to enroll in schools of medicine, osteopathy, dentistry, veterinary medicine, optometry, podiatry, pharmacy, public health, nursing, or allied health professions; or (B), if they are not qualified to enroll in any such school, to undertake such postsecondary education or training as may be required to qualify them for enrollment;

(2) publicizing existing sources of financial aid available to Indians enrolled in any school referred to in clause (1)(A) of this subsection or who are undertaking training necessary to qualify them to enroll in any such school; or

(3) establishing other programs which the Secretary determines will enhance and facilitate the enrollment of Indians, and the subsequent pursuit and completion by them of courses of study, in any school referred to in clause (1)(A) of this subsection.

Application, submittal, and approval.

(b) (1) No grant may be made under this section unless an application therefore has been submitted to, and approved by, the Secretary. Such application shall be in such form, submitted in such manner, and contain such information, as the Secretary shall by regulation prescribe: *Provided*, That the Secretary shall give a preference to applications submitted by Indian tribes or tribal organizations.

Amount and payment.

(2) The amount of any grant under this section shall be determined by the Secretary. Payments pursuant to grants under this section may be made in advance or by way of reimbursement, and at such intervals and on such conditions as the Secretary finds necessary.

Appropriation authorization.

(c) For the purpose of making payments pursuant to grants under this section, there are authorized to be appropriated $900,000 for fiscal year 1978, $1,500,000 for fiscal year 1979, and $1,800,000 for fiscal year 1980. For fiscal years 1981, 1982, 1983, and 1984 there are authorized to be appropriated for such payments such sums as may be specifically authorized by an Act enacted after this Act.

HEALTH PROFESSIONS PREPARATORY SCHOLARSHIP PROGRAM FOR INDIANS

Scholarship grants, eligibility requirements.
25 USC 1613

SEC. 103. (a) The Secretary, acting through the Service, shall make scholarship grants available to Indians who—

(1) have successfully completed their high school education or high school equivalency; and

(2) have demonstrated the capability to successfully complete courses of study in schools of medicine, osteopathy, dentistry, veterinary medicine,

optometry, podiatry, pharmacy, public health, nursing, or allied health professions.

(b) Each scholarship grant made under this section shall be for a period not to exceed two academic years, which years shall be for compensatory preprofessional education of any grantee. **Two-year limitation.**

(c) Scholarship grants made under this section may cover costs of tuition, books, transportation, board, and other necessary related expenses.

(d) There are authorized to be appropriated for the purpose of this section: $800,000 for fiscal year 1978, $1,000,000 for fiscal year 1979, and $1,300,000 for fiscal year 1980. For fiscal years 1981, 1982, 1983, and 1984 there are authorized to be appropriated for the purpose of this section such sums as may be specifically authorized by an Act enacted after this Act. **Appropriation authorization.**

HEALTH PROFESSIONS SCHOLARSHIP PROGRAM

SEC. 104. Section 225(i) of the Public Health Service Act (42 U.S.C. 234(i)) is amended (1) by inserting "(1)" after "(i)", and (2) by adding at the end the following:

"(2)(A) In addition to the sums authorized to be appropriated under paragraph (1) to carry out the Program, there are authorized to be appropriated for the fiscal year ending September 30, 1978, $5,450,000; for the fiscal year ending September 30, 1979, $6,300,000; for the fiscal year ending September 30, 1980, $7,200,000; and for fiscal years 1981, 1982, 1983, and 1984 such sums as may be specifically authorized by an Act enacted after the Indian Health Care Improvement Act, to provide scholarships under the Program to provide physicians, osteopaths, dentists, veterinarians, nurses, optometrists, podiatrists, pharmacists, public health personnel, and allied health professionals to provide services to Indians. Such scholarships shall be designated Indian Health Scholarships and shall be made in accordance with this section except as provided in subparagraph (B). **Appropriation authorization.**

"(B)(i) The Secretary, acting through the Indian Health Service, shall determine the individuals who receive the Indian Health Scholarships, shall accord priority to applicants who are Indians, and shall determine the distribution of the scholarships on the basis of the relative needs of Indians for additional service in specific health professions. **Distribution.**

"(ii) The active duty service obligation prescribed by subsection (e) shall be met by the recipient of an Indian Health Scholarship by service in the Indian Health Service, in a program assisted under title V of the Indian Health Care Improvement Act, or in the private practice of his profession if, as determined by the Secretary in accordance with guidelines promulgated by him, such practice is situated in a physician or other health professional shortage area and addresses the health care needs of a substantial number of Indians. **Active duty service obligation.** ***Post*, p. 1410.**

"(C) For purposes of this paragraph, the term 'Indians' has the same meaning given that term by subsection (c) of section 4 of the Indian Health Care Improvement Act and includes individuals described in clauses (1) through (4) of that subsection." **"Indians."** ***Ante*, p. 1401.**

INDIAN HEALTH SERVICE EXTERN PROGRAMS

SEC. 105. (a) Any individual who receives a scholarship grant pursuant to section 104 shall be entitled to employment in the Service during any nonacademic period of the year. Periods of employment pursuant to this subsection shall not be counted in determining the fulfillment of the service obligation incurred as a condition of the scholarship grant. **25 USC 1614.**

(b) Any individual enrolled in a school of medicine, osteopathy, dentistry, veterinary medicine, optometry, podiatry, pharmacy, public health, nursing, or allied

health professions may be employed by the Service during any nonacademic period of the year. Any such employment shall not exceed one hundred and twenty days during any calendar year.

(c) Any employment pursuant to this section shall be made without regard to any competitive personnel system or agency personnel limitation and to a position which will enable the individual so employed to receive practical experience in the health profession in which he or she is engaged in study. Any individual so employed shall receive payment for his or her services comparable to the salary he or she would receive if he or she were employed in the competitive system. Any individual so employed shall not be counted against any employment ceiling affecting the Service or the Department of Health, Education, and Welfare.

Appropriation authorization.

(d) There are authorized to be appropriated for the purpose of this section: $600,000 for fiscal year 1978, $800,000 for fiscal year 1979, and $1,000,000 for fiscal year 1980. For fiscal years 1981, 1982, 1983, and 1984 there are authorized to be appropriated for the purpose of this section such sums as may be specifically authorized by an Act enacted after this Act.

CONTINUING EDUCATION ALLOWANCES

25 USC 1615.

Sec. 106. (a) In order to encourage physicians, dentists, and other health professionals to join or continue in the Service and to provide their services in the rural and remote areas where a significant portion of the Indian people resides, the Secretary, acting through the Service, may provide allowances to health professionals employed in the Service to enable them for a period of time each year prescribed by regulation of the Secretary to take leave of their duty stations for professional consultation and refresher training courses.

Appropriation authorization.

(b) There are authorized to be appropriated for the purpose of this section: $100,000 for fiscal year 1978, $200,000 for fiscal year 1979, and $250,000 for fiscal year 1980. For fiscal years 1981, 1982, 1983, and 1984 there are authorized to be appropriated for the purpose of this section such sums as may be specifically authorized by an Act enacted after this Act.

TITLE II—HEALTH SERVICES

HEALTH SERVICES

25 USC 1621.

SEC. 201. (a) For the purpose of eliminating backlogs in Indian health care services and to supply known, unmet medical, surgical, dental, optometrical, and other Indian health needs, the Secretary is authorized to expend, through the Service, over the seven-fiscal-year period beginning after the date of the enactment of this Act the amounts authorized to be appropriated by subsection (c). Funds appropriated pursuant to this section for each fiscal year shall not be used to offset or limit the appropriations required by the Service under other Federal laws to continue to serve the health needs of Indians during and subsequent to such seven-fiscal-year period, but shall be in addition to the level of appropriations provided to the Service under this Act and such other Federal laws in the preceding fiscal year plus an amount equal to the amount required to cover pay increases and employee benefits for personnel employed under this Act and such laws and increases in the costs of serving the health needs of Indians under this Act and such laws, which increases are caused by inflation.

Employment during seven-fiscal-year period.

(b) The Secretary, acting through the Service, is authorized to employ persons to implement the provisions of this section during the seven-fiscal-year period in accordance with the schedule provided in subsection (c). Such positions authorized each fiscal year pursuant to this section shall not be considered as offsetting or limiting the personnel required by the Service to serve the health needs of Indians

during and subsequent to such seven-fiscal-year period but shall be in addition to the positions authorized in the previous fiscal year.

(c) The following amounts and positions are authorized, in accordance with the provisions of subsections (a) and (b), for the specific purposes noted: **Appropriation authorization.**

(1) Patient care (direct and indirect): sums and positions as provided in subsection (e) for fiscal year 1978, $8,500,000 and two hundred and twenty-five positions for fiscal year 1979, and $16,200,000 and three hundred positions for fiscal year 1980.

(2) Field health, excluding dental care (direct and indirect): sums and positions as provided in subsection (e) for fiscal year 1978, $3,350,000 and eighty-five positions for fiscal year 1979, and $5,550,000 and one hundred and thirteen positions for fiscal year 1980.

(3) Dental care (direct and indirect): sums and positions as provided in subsection (e) for fiscal year 1978, $1,500,000 and eighty positions for fiscal year 1979, and $1,500,000 and fifty positions for fiscal year 1980.

(4) Mental health: (A) Community mental health services: sums and positions as provided in subsection (e) for fiscal year 1978, $1,300,000 and thirty positions for fiscal year 1979,'and $2,000,000 and thirty positions for fiscal year 1980.

(B) Inpatient mental health services: sums and positions as provided in subsection (e) for fiscal year 1978, $400,000 and fifteen positions for fiscal year 1979, and $600,000 and fifteen positions for fiscal year 1980.

(C) Model dormitory mental health services: sums and positions as provided in subsection (e) for fiscal year 1978, $1,250,000 and fifty positions for fiscal year 1979, and $1,875,000 and fifty positions for fiscal year 1980.

(D) Therapeutic and residential treatment centers: sums and positions as provided in subsection (e) for fiscal year 1978, $300,000 and ten positions for fiscal year 1979, and $400,000 and five positions for fiscal year 1980.

(E) Training of traditional Indian practitioners in mental health: sums as provided in subsection (e) for fiscal year 1978, $150,000 for fiscal year 1979, and $200,000 for fiscal year 1980.

(5) Treatment and control of alcoholism among Indians: $4,000,000 for fiscal year 1978, $9,000,000 for fiscal year 1979, and $9,200,000 for fiscal year 1980.

(6) Maintenance and repair (direct and indirect): sums and positions as provided in subsection (e) for fiscal year 1978, $3,000,000 and twenty positions for fiscal year 1979, and $4,000,000 and thirty positions for fiscal year 1980.

(7) For fiscal years 1981, 1982, 1983, and 1984 there are authorized to be appropriated for the items referred to in the preceding paragraphs such sums as may be specifically authorized by an Act enacted after this Act. For such fiscal years, positions are authorized for such items (other than the items referred to in paragraphs (4)(E) and (5)) as may be specified in an Act enacted after the date of the enactment of this Act.

(d) The Secretary, acting through the Service, shall expend directly or by contract not less than 1 per centum of the funds appropriated under the authorizations in each of the clauses (1) through (5) of subsection (c) for research in each of the areas of Indian health care for which such funds are authorized to be appropriated. **Research funds.**

(e) For fiscal year 1978, the Secretary is authorized to apportion not to exceed a total of $10,025,000 and 425 positions for the programs enumerated in clauses (c)(1) through (4) and (c)(6) of this section. **Appropriation authorization.**

TITLE III—HEALTH FACILITIES

CONSTRUCTION AND RENOVATION OF SERVICE FACILITIES

25 USC 1631.

SEC. 301. (a) The Secretary, acting through the Service, is authorized to expend over the seven-fiscal-year period beginning after the date of the enactment of this Act the sums authorized by subsection (b) for the construction and renovation of hospitals, health centers, health stations, and other facilities of the Service.

Appropriation authorization.

(b) The following amounts are authorized to be appropriated for purposes of subsection (a):

(1) Hospitals: $67,180,000 for fiscal year 1978, $73,256,000 for fiscal year 1979, and $49,742,000 for fiscal year 1980. For fiscal years 1981, 1982, 1983, and 1984, there are authorized to be appropriated for hospitals such sums as may be specifically authorized by an Act enacted after this Act.

(2) Health centers and health stations: $6,960,000 for fiscal year 1978, $6,226,000 for fiscal year 1979, and $3,720,000 for fiscal year 1980. For fiscal years 1981, 1982, 1983, and 1984, there are authorized to be appropriated for health centers and health stations such sums as may be specifically authorized by an Act enacted after this Act.

(3) Staff housing:'$1,242,000 for fiscal year 1978, $21,725,000 for fiscal year 1979, and $4,116,000 for fiscal year 1980. For fiscal years 1981, 1982, 1983, and 1984, there are authorized to be appropriated for staff housing such sums as may be specifically authorized by an Act enacted after this Act.

(c) Prior to the expenditure of, or the making of any firm commitment to expend, any funds authorized in subsection (a), the Secretary, acting through the Service shall—

Consultation.

(1) consult with any Indian tribe to be significantly affected by any such expenditure for the purpose of determining and, wherever practicable, honoring tribal preferences concerning the size, location, type, and other characteristics of any facility on which such expenditure is to be made; and

(2) be assured that, wherever practicable, such facility, not later than one year after its construction or renovation, shall meet the standards of the Joint Committee on Accreditation of Hospitals.

CONSTRUCTION OF SAFE WATER AND SANITARY WASTE DISPOSAL FACILITIES

25 USC 1632.

SEC. 302. (a) During the seven-fiscal-year period beginning after the date of the enactment of this Act, the Secretary is authorized to expend under section 7 of the Act of August 5, 1954 (42 U.S.C. 2004a), the sums authorized under subsection (b) to supply unmet needs for safe water and sanitary waste disposal facilities in existing and new Indian homes and communities.

Appropriation authorization.

(b) For expenditures of the Secretary authorized by subsection (a) for facilities in existing Indian homes and communities there are authorized to be appropriated $43,000,000 for fiscal year 1978, $30,000,000 for fiscal year 1979, and $30,000,000 for fiscal year 1980. For expenditures of the Secretary authorized by subsection (a) for facilities in new Indian homes and communities there are authorized to be appropriated such sums as may be necessary for fiscal years 1978, 1979, and 1980. For fiscal years 1981, 1982, 1983, and 1984 for expenditures authorized by subsection (a) there are authorized to be appropriated such sums as may be specifically authorized in an Act enacted after this Act.

New York Indian tribes, eligibility for assistance.

(c) Former and currently federally recognized Indian tribes in the State of New York shall be eligible for assistance under this section.

PREFERENCE TO INDIANS AND INDIAN FIRMS

SEC. 303, (a) The Secretary, acting through the Service, may utilize the negotiating authority of the Act of June 25, 1910 (25 U.S.C. 47), to give preference to any Indian or any enterprise, partnership, corporation, or other type of business organization owned and controlled by an Indian or Indians including former or currently federally recognized Indian tribes in the State of New York (hereinafter referred to as an "Indian firm") in the construction and renovation of Service facilities pursuant to section 301 and in the construction of safe water and sanitary waste disposal facilities pursuant to section 302. Such preference may be accorded by the Secretary unless he finds, pursuant to rules and regulations promulgated by him, that the project or function to be contracted for will not be satisfactory or such project or function cannot be properly completed or maintained under the proposed contract. The Secretary, in arriving at his finding, shall consider whether the Indian or Indian firm will be deficient with respect to (1) ownership and control by Indians, (2) equipment, (3) bookkeeping and accounting procedures, (4) substantive knowledge of the project or function to be contracted for, (5) adequately trained personnel, or (6) other necessary components of contract performance. **25 USC 1633.**

(b) For the purpose of implementing the provisions of this title, the Secretary shall assure that the rates of pay for personnel engaged in the construction or renovation of facilities constructed or renovated in whole or in part by funds made available pursuant to this title are not less than the prevailing local wage rates for similar work as determined in accordance with the Act of March 3, 1931 (40 U.S.C. 276a-276a-5, known as the Davis-Bacon Act). **Construction personnel, pay rates.** **40 USC 276a, note.**

SOBOBA SANITATION FACILITIES

SEC. 304. The Act of December 17, 1970 (84 Stat. 1465), is hereby amended by adding the following new section 9 at the end thereof: "SEC. 9. Nothing in this Act shall preclude the Soboba Band of Mission Indians and the Soboba Indian Reservation from being provided with sanitation facilities and services under the authority of section 7 of the Act of August 5, 1954 (68 Stat. 674), as amended by the Act of July 31, 1959 (73 Stat. 267).". **42 USC 2004a.**

TITLE IV - ACCESS TO HEALTH SERVICES

ELIGIBILITY OF INDIAN HEALTH SERVICE FACILITIES UNDER MEDICARE PROGRAM

SEC. 401. (a) Sections 1814(c) and 1835(d) of the Social Security Act are each amended by striking out "No payment" and inserting in lieu thereof "Subject to section 1880, no payment". **42 USC 1395f, 1395n.**

(b) Part C of title XVIII of such Act is amended by adding at the end thereof the following new section: **42 USC 1395x.**

"INDIAN HEALTH SERVICE FACILITIES

"SEC. 1880, (a) A hospital or skilled nursing facility of the Indian Health Service, whether operated by such Service or by an Indian tribe or tribal organization (as those terms are defined in section 4 of the Indian Health Care Improvement Act), shall be eligible for payments under this title, notwithstanding sections 1814(c) and 1835 (d), if and for so long as it meets all of the conditions and requirements for such payments which are applicable generally to hospitals or skilled nursing facilities (as the case may be) under this title. **Hospital or skilled nursing facility, eligibility for payments.** **42 USC 1395qq.**

"(b) Notwithstanding subsection (a), a hospital or skilled nursing hospital or skilled facility of the Indian Health Service which does not meet all of the conditions

Ineligible hospital or skilled nursing facility, submittal of plan for compliance.

and requirements of this title which are applicable generally to hospitals or skilled nursing facilities (as the case may be), but which submits to the Secretary within six months after the date of the enactment of this section an acceptable plan for achieving compliance with such conditions and requirements, shall be deemed to meet such conditions and requirements (and to be eligible for payments under this title), without regard to the extent of its actual compliance with such conditions and requirements, during the first 12 months after the month in which such plan is submitted.

Fund for improvements.

"(c) Notwithstanding any other provision of this title, payments to which any hospital or skilled nursing facility of the Indian Health Service is entitled by reason of this section shall be placed in a special fund to be held by the Secretary and used by him (to such extent or in such amounts as are provided in appropriation Acts) exclusively for the purpose of making any improvements in the hospitals and skilled nursing facilities of such Service which may be necessary to achieve compliance with the applicable conditions and requirements of this title. The preceding sentence shall cease to apply when the Secretary determines and certifies that substantially all of the hospitals and skilled nursing facilities of such Service in the United States are in compliance with such conditions and requirements.

"(d) The annual report of the Secretary which is required by section 701 of the Indian Health Care Improvement Act shall include (along with the matters specified in section 403 of such Act) a detailed statement of the status of the hospitals and skilled nursing facilities of the Service in terms of their compliance with the applicable conditions and requirements of this title and of the progress being made by such hospitals and facilities (under plans submitted under subsection (b) and otherwise) toward the achievement of such compliance.".

***Post,* p. 1413.**
***Post,* p. 1410.**

42 USC 1395qq note.

(c) Any payments received for services provided to beneficiaries hereunder shall not be considered in determining appropriations for health care and services to Indians.

Services to an Indian beneficiary.
42 USC 1395qq note.

(d) Nothing herein authorizes the Secretary to provide services to an Indian beneficiary with coverage under title XVIII of the Social Indian Security Act, as amended, in preference to an Indian beneficiary without such coverage.

42 USC 1395.

SERVICES PROVIDED TO MEDICAID ELIGIBLE INDIANS

SEC. 402. (a) Title XIX of the Social Security Act is amended by adding at the end thereof the following new section:

"INDIAN HEALTH SERVICE FACILITIES

Eligibility for reimbursement.
42 USC 1396j.

"SEC. 1911. (a) A facility of the Indian Health Service (including a hospital, intermediate care facility, or skilled nursing facility), whether operated by such Service or by an Indian tribe or tribal organization (as those terms are defined in section 4 of the Indian Health Care Improvement Act), shall be eligible for reimbursement for medical assistance provided under a State plan if and for so long as it meets all of the conditions and requirements which are applicable generally to such facilities under this title.

***Ante,* p. 1401.**

Facilities, submittal of plan for compliance.
42 USC 1396j note.

"(b) Notwithstanding subsection (a), a facility of the Indian Health Service (including a hospital, intermediate care facility, or skilled nursing facility) which does not meet all of the conditions and requirements of this title which are applicable generally to such facility, but which submits to the Secretary within six months after the date of the enactment of this section an acceptable plan for achieving compliance with such conditions and requirements, shall be deemed to meet such conditions and requirements (and to be eligible for reimbursement under this title), without regard to the extent of its actual compliance with such conditions

and requirements, during the first twelve months after the month in which such plan is submitted.".

(b) The Secretary is authorized to enter into agreements with the appropriate State agency for the purpose of reimbursing such agency for health care and services provided in Service facilities to Indians who are eligible for medical assistance under title XIX of the Social Security Act, as amended. **25 USC 1396j note.**

25 USC 1396.

(c) Notwithstanding any other provision of law, payments to which any facility of the Indian Health Service (including a hospital, intermediate care facility, or skilled nursing facility) is entitled under a State plan approved under title XIX of the Social Security Act by reason of section 1911 of such Act shall be placed in a special fund to be held by the Secretary and used by him (to such extent or in such amounts as are provided in appropriation Acts) exclusively for the purpose of making any improvements in the facilities of such Service which may be necessary to achieve compliance with the applicable conditions and requirements of such title. The preceding sentence shall cease to apply when the Secretary determines and certifies that substantially all of the health facilities of such Service in the United States are in compliance with such conditions and requirements. ***Supra.***

(d) Any payments received for services provided recipients hereunder shall not be considered in determining appropriations for the provision of health care and services to Indians. **25 USC 1396j note.**

(e) Section 1905(b) of the Social Security Act is amended by inserting at the end thereof the following: "Notwithstanding the first sentence of this section, the Federal medical assistance percentage shall be 100 per centum with respect to amounts expended as medical assistance for services which are received through an Indian Health Service facility whether operated by the Indian Health Service or by an Indian tribe or tribal organization (as defined in section 4 of the Indian Health Care Improvement Act).". **Federal medical assistance percentage. 25 USC 1396d.**

***Ante*, p. 1401**

REPORT

SEC. 403. The Secretary shall include in his annual report required by section 701 an accounting on the amount and use of funds made available to the Service pursuant to this title as a result of reimbursements through titles XVIII and XIX of the Social Security Act, as amended. **25 USC 1671 note.**

42 USC 1395, 1396.

TITLE V—HEALTH SERVICES FOR URBAN INDIANS

PURPOSE

SEC. 501. The purpose of this title is to encourage the establishment of programs in urban areas to make health services more accessible to the urban Indian population. **25 USC 1651.**

CONTRACTS WITH URBAN INDIAN ORGANIZATIONS

SEC. 502. The Secretary, acting through the Service, shall enter into contracts with urban Indian organizations to assist such organizations to establish and administer, in the urban centers in which such organizations are situated, programs which meet the requirements set forth in sections 503 and 504. **25 USC 1652.**

CONTRACT ELIGIBILITY

SEC. 503. (a) The Secretary, acting through the Service, shall place such conditions as he deems necessary to effect the purpose of this title in any contract which he makes with any urban Indian organization pursuant to this title. Such conditions **25 USC 1653.**

shall include, but are not limited to, requirements that the organization successfully undertake the following activities:

(1) determine the population of urban Indians which are or could be recipients of health referral or care services;

(2) identify all public and private health service resources within the urban center in which the organization is situated which are or may be available to urban Indians;

(3) assist such resources in providing service to such urban Indians;

(4) assist such urban Indians in becoming familiar with and utilizing such resources;

(5) provide basic health education to such urban Indians;

(6) establish and implement manpower training programs to accomplish the referral and education tasks set forth in clauses (3) through (5) of this subsection;

(7) identify gaps between unmet health needs of urban Indians and the resources available to meet such needs;

(8) make recommendations to the Secretary and Federal, State, local, and other resource agencies on methods of improving health service programs to meet the needs of urban Indians; and

(9) where necessary, provide or contract for health care services to urban Indians.

Urban Indian organizations, selection criteria.

(b) The Secretary, acting through the Service, shall by regulation Urban Indian prescribe the criteria for selecting urban Indian organizations with organizations, which to contract pursuant to this title. Such criteria shall, among other factors, take into consideration:

(1) the extent of the unmet health care needs of urban Indians in the urban center involved;

(2) the size of the urban Indian population which is to receive assistance;

(3) the relative accessibility which such population has to health care services in such urban center;

(4) the extent, if any, to which the activities set forth in subsection (a) would duplicate any previous or current public or private health services project funded by another source in such urban center;

(5) the appropriateness and likely effectiveness of the activities set forth in subsection (a) in such urban center;

(6) the existence of an urban Indian organization capable of performing the activities set forth in subsection (a) and of entering into a contract with the Secretary pursuant to this title; and

(7) the extent of existing or likely future participation in the activities set forth in subsection (a) by appropriate health and health-related Federal, State, local, and other resource agencies.

OTHER CONTRACT REQUIREMENTS

25 USC 1654.

SEC. 504. (a) Contracts with urban Indian organizations pursuant to this title shall be in accordance with all Federal contracting laws and regulations except that, in the discretion of the Secretary, such contracts may be negotiated without advertising and need not conform to the provisions of the Act of August 24, 1935 (48 Stat. 793), as amended.

49 Stat. 793. 40 USC 270a-270d

(b) Payments under any contracts pursuant to this title may be made in advance or by way of reimbursement and in such installments and on such conditions as the Secretary deems necessary to carry out the purposes of this title.

Contract revision or amendment.

(c) Notwithstanding any provision of law to the contrary, the Secretary may, at the request or consent of an urban Indian organization, revise or amend any contract made by him with such organization pursuant to this title as necessary to carry out

the purposes of this title: Provided, however, That whenever an urban Indian organization requests retrocession of the Secretary for any contract entered into pursuant to this title, such retrocession shall become effective upon a date specified by the Secretary not more than one hundred and twenty days from the date of the request by the organization or at such later date as may be mutually agreed to by the Secretary and the organization.

(d) In connection with any contract made pursuant to this title, the Secretary may permit an urban Indian organization to utilize, in carrying out such contract, existing facilities owned by the Federal Government within his jurisdiction under such terms and conditions as may be agreed upon for their use and maintenance.

Government facilities, use.

(e) Contracts with urban Indian organizations and regulations adopted pursuant to this title shall include provisions to assure the fair and uniform provision to urban Indians of services and assistance under such contracts by such organizations.

REPORTS AND RECORDS

SEC. 505. For each fiscal year during which an urban Indian organization receives or expends funds pursuant to a contract under this title, such organization shall submit to the Secretary a report including information gathered pursuant to section 503(a)(7) and (8), information on activities conducted by the organization pursuant to the contract, an accounting of the amounts and purposes for which Federal funds were expended, and such other information as the Secretary may request. The reports and records of the urban Indian organization with respect to such contract shall be subject to audit by the Secretary and the Comptroller General of the United States.

Report to the Secretary of the Interior.
25 USC 1655.

Audit.

AUTHORIZATIONS

SEC. 506, There are authorized to be appropriated for the purpose of this title: $5,000,000 for fiscal year 1978, $10,000,000 for fiscal year 1979, and $15,000,000 for fiscal year 1980.

25 USC 1656.

REVIEW OF PROGRAM

SEC. 507. Within six months after the end of fiscal year 1979, the Secretary, acting through the Service and with the assistance of the urban Indian organizations which have entered into contracts pursuant to this title, shall review the program established under this title and submit to the Congress his assessment thereof and recommendations for any further legislative efforts he deems necessary to meet the purpose of this title.

Submittal to Congress. Legislative recommendations.
25 USC 1657.

RURAL HEALTH PROJECTS

SEC. 508. Not to exceed 1 per centum of the amounts authorized by section 506 shall be available for not to exceed two pilot projects providing outreach services to eligible Indians residing in rural communities near Indian reservations.

25 USC 1658.

TITLE VI—AMERICAN INDIAN SCHOOL OF MEDICINE; FEASIBILITY STUDY

FEASIBILITY STUDY

SEC. 601. The Secretary, in consultation with Indian tribes and appropriate Indian organizations, shall conduct a study to determine the need for, and the feasibility of, establishing a school of medicine to train Indians to provide health services for Indians. Within one year of the date of the enactment of this Act the Secretary shall

25 USC 1661.

Report to Congress.

complete such study and shall report to the Congress findings and recommendations based on such study.

TITLE VII—MISCELLANEOUS

REPORTS

Report to the President and Congress. 25 USC 1671.

SEC. 701. The Secretary shall report annually to the President and the Congress on progress made in effecting the purposes of this Act. Within three months after the end of fiscal year 1979, the Secretary shall review expenditures and progress made under this Act and make recommendations to the Congress concerning any additional authorizations for fiscal years 1981 through 1984 for programs authorized under this Act which he deems appropriate. In the event the Congress enacts legislation authorizing appropriations for programs under this Act for fiscal years 1981 through 1984, within three months after the end of fiscal year 1983, the Secretary shall review programs established or assisted pursuant to this Act and shall submit to the Congress his assessment and recommendations of additional programs or additional assistance necessary to, at a minimum, provide health services to Indians, and insure a health status for Indians, which are at a parity with the health services available to, and the health status, of the general population.

Program review, submittal to Congress.

REGULATIONS

Consultation. 25 USC 1672.

SEC. 702. (a)(1) Within six months from the date of enactment of this Act, the Secretary shall, to the extent practicable, consult with national and regional Indian organizations to consider and formulate appropriate rules and regulations to implement the provisions of this Act.

Publication in Federal Register.

(2) Within eight months from the date of enactment of this Act, the Secretary shall publish proposed rules and regulations in the Federal Register for the purpose of receiving comments from interested parties.

(3) Within ten months from the date of enactment of this Act, the Secretary shall promulgate rules and regulations to implement the provisions of this Act.

Rules or regulations, proposed revision or amendment; publication in Federal Register.

(b) The Secretary is authorized to revise and amend any rules or regulations promulgated pursuant to this Act: *Provided*, That, prior to any revision of or amendment to such rules or regulations, the Secretary shall, to the extent practicable, consult with appropriate national or regional Indian organizations and shall publish any proposed revision or amendment in the Federal Register not less than sixty days prior to the effective date of such revision or amendment in order to provide adequate notice to, and receive comments from, other interested parties.

PLAN OF IMPLEMENTATION

Submittal to Congress. 25 USC 1673.

SEC. 703. Within two hundred and forty days after enactment of this Act, a plan will be prepared by the Secretary and will be submitted to the Congress. The plan will explain the manner and schedule (including a schedule of appropriation requests), by title and section, by which the Secretary will implement the provisions of this Act.

LEASES WITH INDIAN TRIBES

25 USC 1674.

SEC. 704. Notwithstanding any other provision of law, the Secretary is authorized, in carrying out the purposes of this Act, to enter into leases with Indian tribes for periods not in excess of twenty years.

AVAILABILITY OF FUNDS

SEC. 705. The funds appropriated pursuant to this Act shall remain available until expended. **25 USC 1675.**

Approved September 30, 1976.

LEGISLATIVE HISTORY:
HOUSE REPORTS: No. 94-1026 pt. I and 94-1026 part IV (Comm. on Interior and Insular Affairs), No. 94-1026 pt. II (Comm. on Ways and Means), and No. 94-1026 pt. Ill (Comm. on Interstate and Foreign Commerce) all accompanying H.R. 2525.
SENATE REPORT No. 94-133 (Comm. on Interior and Insular Affairs).
CONGRESSIONAL RECORD:
Vol. 121 (1975): May 16, considered and passed Senate.
Vol. 122 (1976): July 30, considered and passed House, amended, in lieu of H.R. 2525.
Sept. 9, Senate concurred in House amendment with an amendment.
Sept. 16, House concurred in Senate amendment.
WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS:
Vol. 12, No. 40: Oct. 1, Presidential statement.

Attachment 7

Karuk Tribe Subsistence Species Impacts

Attachment 7

Karuk Tribe Aquatic Species Impacts

This summary was based primarily on the following sources for each species (full citations are listed in a bibliography at the end of this attachment and in the main report bibliography):

1. Expert panel reports (EP)
2. Final synthesis report (SR)
3. Klamath EIS/EIR (EIS/EIR)
4. DOI/BIA subteam Indian trust background report (DOI)

All native species are historically and presently important socially, economically, and culturally to area tribes, as are impacts to those species; however it is important to note that some species are federally protected trust resources and others are not which differs by tribe. (DOI, June 2011b). The first section of this attachment covers the No Action Alternative followed by the Action Alternative information.

No Action Alternative

The "Synthesis of the Effects to Fish Species of Two Management Scenarios for the Secretarial Determination on Removal of the Lower Four Dams on the Klamath River" (referred to here as the synthesis report, or biological subteam document) described some of the causes for the 2002 fish kill that occurred under current conditions:

> "The most noted fish health incident in the Klamath River was an adult fish die-off that occurred in September 2002 in the lower river. A minimum of 32,533 fall Chinook salmon, 629 steelhead, and 344 coho salmon perished during this event as a result of poor environmental conditions, high escapement, and an epizootic outbreak of columnaris (*Flavobacterium columnare*) and Ich (*Ichthyophthirius multifiliis*) (USDI Fish and Wildlife Service 2003b) (California Department of Fish and Game 2004b; USDI Fish and Wildlife Service 2003b). It is important to note that estimates from the Service mortality report 'should be viewed as a minimum number of fish killed' (USDI Fish and Wildlife Service 2003a)," (Hamilton, et. al., June 13, 2011, p. 98).

Table 7-1.—Summary of Projected No Action Conditions by Species

Coho Salmon (Threatened)	Summation: Coho would likely remain endangered and continuation depressed populations below IGD and unavailable in UB. EP: Marginal benefits and unavailable in UB. SR: Remain endangered and unavailable in UB. Below IGD, current populations may remain depressed. EIS/EIR: Continue downward trend. DOI: Continue downward trend.
Spring Chinook Salmon	Summation: Continue on current downward trajectory, remain unavailable in UB, and may become extinct/ESA listing. EP: Numerous negative factors listed. SR: Significantly lower than historic levels and some fishing restrictions; remain on current downward trajectory and unavailable in UB, may become extinct. EIS/EIR: Continued downward trend. DOI: Remain at low levels and high risk of ESA and CESA uplisting.
Fall Chinook Salmon	Summation: Continue current downward trajectory and remain unavailable in UB. EP: Numerous negative factors listed. SR: Significantly lower than historic levels; would remain unavailable in UB and would likely continue on current downward trajectory. EIS/EIR: Continuation of downward trend. DOI: Chinook would remain in a depleted state and unavailable in UB.
Pacific Lamprey	Summation: Pacific Lamprey would remain about the same or decline in Klamath River and remain unavailable in UB. EP: No change, unavailable in UB. SR: Remain the same or decline and continue to be unavailable in UB. EIS/EIR: Essentially no change. DOI: Unavailable in UB.
Steelhead Trout	Summation: May remain the same or improve slightly in Klamath River and remain unavailable in the UB. EP: Unsure, remain unavailable in UB, small improvement otherwise. SR: Somewhat uncertain, remain unavailable in UB, may decline. EIS/EIR: No change. DOI: Remain unavailable in UB.
Green Sturgeon (threatened)	Summation: Uncertain - range from low levels to may improve. EP: Not included/analyzed. SR: May improve. EIS/EIR: No change. DOI: Expected to remain at low levels.

Table 7-1.—Summary of Projected No Action Conditions by Species

Redband and Rainbow Trout	Summation: No change to downward trend in size and abundance. EP: No change. SR: Continued downward trend in size and abundance. EIS/EIR: Continued downward trend in size and abundance. BIA: Not included/analyzed.
Trout	Summation: There would essentially be no impacts since eulachon are likely extinct in California. EP: SR: EIS/EIR: DOI:
Crayfish (Benthic Macro invertebrates)	Summation: No change. EP and SR: Not included/analyzed. EIS/EIR: No change expected. DOI: Not included/analyzed, but stated importance of mussels to Karuk Tribe in DOI Tribal Reports (DOI, June 2011a and June 2011b).
Freshwater Mussels (Mollusks)	Summation: No change. EP and SR: Not included/analyzed. EIS/EIR: No change expected. DOI: Not included/analyzed, but stated importance of mussels to Karuk Tribe in DOI Tribal Background Report.

Acronyms: Expert panel reports (EP), biological subteam synthesis report (SR), Klamath EIS/EIR (EIS/EIR), and DOI/BIA background reports (DOI). Iron Gate Dam (IGD), Upper Basin (UB), Upper Klamath Basin (UKB), Upper Klamath Lake (UKL), hydroelectric reach (HR), Upper Klamath River (UKR), Endangered Species Act (ESA).

Salmon

Coho (endangered)[1]

In sum, coho salmon would continue to be unavailable in the Upper Klamath Basin during the project period, and are expected to remain endangered throughout the entire Klamath Basin during the project period.

Expert Panel Report (Dunne, et al., April 25, 2011).

No access to upstream habitats, and current trends would provide marginal benefits:

> "Coho salmon and steelhead will not have access to habitats upstream of Iron Gate Dam," (p. 40) [and] Continuation of current level of restoration activities and flow regulation will provide very small, probably undetectable, benefits for the two [coho and steelhead] species,"(p. 18).

Synthesis Report

Based on information in the synthesis report, Coho salmon would remain extirpated in the Upper Klamath Basin and likely remain endangered, and as such, are not expected to be at harvestable levels within the period of analysis despite efforts towards recovery (p. 49).

Klamath EIS/EIR

The Klamath Settlement EIS/EIR indicated no change from current downward trends:

> "The effect of the No Action/No Project Alternative would be no change from existing conditions for coho salmon critical habitat in the short and long term." (p. 3.3-60)

[1] "Coho salmon were once abundant in the Klamath River. Coho salmon in the Klamath River watershed are included within the SONCC coho salmon ESU and are currently listed as a threatened species under the Federal ESA. Historically, coho salmon inhabited an expansive range of the Klamath Basin, including habitat upstream of current dams - Iron Gate, Lewiston (Trinity River), and Dwinnell (Shasta River). Coho salmon populations within the Klamath River watershed have declined dramatically and currently exist only within a limited portion of their historical range. NMFS determined that coho salmon populations throughout the SONCC coho salmon ESU continue to be depressed relative to historical numbers, and strong indications exist that breeding groups have been lost from a significant percentage of streams within their historical range." (p. 86).

DOI/ BIA Background Report

[lower basin]"Under the No Action Alternative, it is expected that populations of these fishes will also continue to decline, particularly with anticipated changes in the climate, resulting in further reductions in tribal health. Coho salmon, steelhead, green sturgeon, and Pacific lamprey are expected to remain at low population levels, with low viability of Klamath River populations…[existing efforts] will help reduce the stress on the fishes, but will not be sufficient to bring the species to recovery," (DOI/BIA, p. 4-4).

Spring and Fall Chinook Salmon[2]

When project report sources are taken together, conclusions indicate that Chinook salmon would continue to be unavailable in the Upper Klamath Basin and Spring Chinook could possibly become extinct with Fall Chinook remaining low or its populations declining further.

Expert Panel Reports (Goodman, et. al., June 13, 2011; July 20, 2011).

The reports did not analyze the no action alternative per se, however aspects of current conditions were discussed. The TMDLs would be less likely to be met under current conditions, disease rates would remain relatively high, escapement rates are low, there are too many hatchery fish (Iron Gate Hatchery), predation is relatively high, and water supplies may be too low, at least at critical times depending on various factors (including climate change and agriculture).

Synthesis Report

The biological subgroup report asserted that spring and fall Chinook salmon would continue to be unavailable in the Upper Klamath Basin, remain a fraction of historical levels in the lower basin, and spring-run Chinook may become extinct:

> "Chinook salmon populations were extirpated [above Iron Gate Dam] with the construction of Project dams. Historically, the range of this species included tributaries to Upper Klamath Lake…[and] Under conditions with dams, Chinook salmon will remain extirpated in the Klamath River above IGD," (p. 42-43). [In general and below IGD] "Chinook salmon in the Klamath River Basin are not listed under the State or federal ESA, but low abundance predictions of Klamath River Fall Chinook salmon in recent years have forced restrictions to West Coast commercial and recreational fisheries. Klamath River

[2] The NMFS determined that there are modest genetic differences between the fall and spring runs, but Spring Chinook have higher fat content valued by Indians for greater subsistence value after winter rations were low and by non-Indians for better flavor.

fall-run Chinook salmon enter the Klamath River in August through October of each year, spawning shortly thereafter in the lower reaches of rivers and streams. These runs are substantially lower than historical levels." (p. 82).

Spring Chinook:[3]

> [In general and below Iron Gate Dam] "With minimal access to appropriate habitat, Spring Chinook runs will likely remain at a fraction of historical levels; it is possible that Klamath River spring run Chinook salmon runs will likely remain at a fraction of historical levels; it is possible that Klamath River spring-run Chinook salmon may become extinct over the period of analysis (Moyle et al. In press; Nehlsen et al. 1991)" (p. 83).

Fall Chinook:[4]

> [below Iron Gate Dam] Chinook salmon in the Klamath Basin are not listed under the state or federal ESA, but low abundance predictions of Klamath River Fall Chinook salmon in recent years have forced restrictions to West Coast commercial and recreational fisheries. Klamath River fall-run Chinook salmon enter the Klamath River in August through October of each year, spawning shortly thereafter in the lower reaches of rivers and streams. However, under conditions with dams, the status of naturally spawning fall-run Chinook salmon may continue on its current trajectory (R. Quiñones, USFS, pers. comm. (p. 82-83).

[3] [existing conditions: spring run]Spring-run Chinook salmon enter the Klamath River from April to June of each year before migrating to smaller headwater tributaries. Historically, populations may have returned earlier, perhaps as early as February and March (Klamath Republican articles in Fortune et al. 1966). They require cold, clear rivers and streams with deep pools to sustain them through the warm summer months (McCullough 1999). These areas have been greatly reduced in the basin due to dams and degradation of habitat. Naturally spawned spring-run Chinook salmon populations are now a remnant of their historical abundance and primarily occur in the South Fork Trinity River and Salmon River Basins.

[4] "[existing conditions: fall run]Chinook salmon in the Klamath Basin are not listed under the State or federal ESA, but low abundance predictions of Klamath River Fall Chinook salmon in recent years have forced restrictions to West Coast commercial and recreational fisheries. Klamath River fall-run Chinook salmon enter the Klamath River in August through October of each year, spawning shortly thereafter…These runs are substantially lower than historical levels. (p. 80)

Klamath Settlement EIS/EIR

Spring Chinook:

The Klamath EIS/EIR stated no change:

> "The effect of the No Action/No Project Alternative would be no change from existing conditions for spring-run Chinook salmon in the short and long term." (p. 3.3-64)

Fall Chinook:

The Klamath EIS/EIR stated no change:

> "The effect of the No Action/No Project Alternative would be no change from existing conditions for fall-run Chinook salmon in the short and long term." (p. 3.3-63)

Draft BIA/DOI Subteam Technical Report

Both Spring- and Fall-Run Chinook

> [upper basin] "Under the No Action Alternative, Chinook salmon, steelhead, and Pacific lamprey will continue to be precluded from waters within the Klamath Tribes' land," (p. 4-10).
>
> [lower Klamath River] "Under the No Action Alternative, Chinook salmon populations will continue to be affected by loss of habitat, warm water, and blockage of substrate movement negatively affecting spawning habitat….The Chinook salmon populations will remain in a depleted state…there will be long term degradation of habitat complexity and suitability…increased disease, and impaired geomorphologic functions in the river downstream from Iron Gate Dam," (p. 4-3 to 4-4).

Spring Chinook:

> [lower Klamath River] "Spring-run Chinook salmon will continue to remain at low population levels with a high risk of uplisting under the ESA and CESA,"

Pacific Lamprey

In sum, populations below IGD would remain about the same or continue declining.

Final Expert Panel (Close, et. al., January 14, 2010)

The report stated it was uncertain whether Pacific lamprey were in the upper basin, and that there would likely continue to be no change (no Pacific Lamprey in the upper basin):

> [Upper Basin]"This area was historically accessible to anadromous fishes, but the historical occurrence by Pacific lamprey is unresolved… Nevertheless, improvements to fish passage scheduled for Keno Dam may open the upper Klamath Basin to Pacific lamprey irrespective of their historical occurrence (p. 46) [and] Pacific lamprey are currently extirpated above Iron Gate Dam; they are unable to pass the dam and the confirmed upstream limit in the mainstem Klamath River is Bogus Creek…" (p. 28).
>
> [Below IGD]"Other habitat improvements [under no action] are also planned in a general way that may gradually extend small areas of both spawning and rearing conditions for resident lamprey in the sediment-starved UKL Basin and spawning conditions in the Klamath River downstream of IGD….but since the Panel was provided with no concrete information about TMDL actions, it is not possible to assess whether such effects are likely to be recognizable downstream of UKL without more specific information about the TMDL actions." (p. 23).

Synthesis Report[5]

Synthesis report conclusions were that Pacific lamprey may have been in the upper basin, and they will be unable to access suitable habitat in reaches above IGD, and populations below IGD may remain the same or decline:

[5] "[existing conditions, below Iron Gate, synth rpt] There is little data on historical abundance or distribution of Pacific lamprey in the Klamath River Basin, however anecdotal evidence suggests stocks have been in decline since the late 1980's (Larson and Belchik 1998; (Moyle et al. 2009) and are currently on a status "Watch List" (Moyle et al. In review.). FERC believes this decline may be part of a coastwide trend (Federal Energy Regulatory Commission 2007). However, a lamprey distribution survey conducted by the Karuk Tribe in 2002 captured no lamprey ammocoetes in the reach below Iron Gate Dam to Cottonwood Creek (Karuk Tribal Fisheries 2010). Crews noted that "ideally suitable" habitat with substrate consisting of soft (easy to push your finger into) sand and fine silt material was almost entirely absent within the reach (Karuk Tribal Fisheries 2010). Lamprey ammocoetes were captured directly below Cottonwood Creek, one of the first sediment contributing tributaries below the dam (Karuk Tribal Fisheries 2010)." (p. 92-93).

> [above Iron Gate Dam] The historical upstream distribution of Pacific lamprey was likely to at least Spencer Creek above IGD, although there is some uncertainty in this regard (Administrative Law Judge 2006)…Under conditions with dams, Pacific lamprey will be unable to access suitable habitat for spawning and juvenile rearing within tributaries and stream reaches above IGD. TMDL implementation will benefit this species." (p. 51-52).
>
> [below Iron Gate Dam] "Under conditions with dams, anadromous Pacific lamprey populations may remain at status quo or continue to decline below IGD. TMDL implementation for the Klamath River will likely benefit Pacific lamprey," (p. 95).

Klamath Settlement EIS/EIR

The Klamath EIS/EIR stated no change:

> "The effect of the No Action/No Project Alternative would be no change from existing conditions for Pacific lamprey in the short and long term." (p. 3.3-69)

Draft BIA/DOI Subteam Technical Report

> [upper basin] "Under the No Action Alternative, Chinook salmon, steelhead, and Pacific lamprey will continue to be precluded from waters within the Klamath Tribes' land," (p. 4-10).

Steelhead Trout[6]

Overall, indications from the reports are that populations would likely continue declining.

Expert Panel Report (Dunne, et. al., April 25, 2011)

> "…steelhead will not have access to habitats upstream of Iron Gate Dam, [and] This alternative could result in small improvements in habitat for steelhead due to TMDLs, NMFS coho BO, and ongoing…restoration activities. However, these actions are not necessarily targeted for steelhead, and, without specific targeting for steelhead, their effectiveness…is unknown," (p. 40 and 46).

[6] Rainbow or redband trout that develop a more pointed head, migrate to the ocean, and become much larger than those that remain in fresh water.

Synthesis Report[7]

The report stated that steelhead used to be in the upper basin, but were extirpated with construction of the dams—a condition would remain unchanged under no action, and lower basin toward goal of recovery once TMDLs are implemented:

> [above Iron Gate Dam] "Steelhead populations in the Klamath River above IGD were extirpated with the construction of Project dams. Historically, the range of this species included the tributaries of Upper Klamath Lake…Under conditions with dams steelhead will remain extirpated in the Klamath River above Iron Gate Dam.(p. 50).
>
> [below Iron Gate Dam] "Under this scenario, considerable efforts to improve habitat are underway (National Marine Fisheries Service 2010b) toward the goal of recovery of salmon and steelhead stocks. Once implemented, TMDLs and associated Implementation Plans are expected to improve water quality, reduce stress on salmonids from pollution, and contribute to their recovery (National Marine Fisheries Service 2010b). (p. 93).

Klamath Settlement EIS/EIR

The Klamath EIS/EIR stated no change:

> "The effect of the No Action/No Project Alternative would be no change from existing conditions for steelhead in the short and long term." (p. 3.3-67)

Draft BIA/DOI Subteam Technical Report

> [upper basin] "Under the No Action Alternative, Chinook salmon, steelhead, and Pacific lamprey will continue to be precluded from waters within the Klamath Tribes' land," (p. 4-10). "Coho salmon, steelhead, green sturgeon, and Pacific lamprey are expected to remain at low population levels, with low viability of Klamath River populations…[existing efforts] will help reduce the stress on the fishes, but will not be sufficient to bring the species to recovery," (p. 4-4).

[7] "[Existing conditions below Iron Gate Dam] The limited data on summer steelhead abundance indicates this run is depressed, Steelhead are widely distributed throughout the Klamath River watershed below IGD. Populations, including summer, fall, and winter steelhead, are considered part of the Klamath Mountains Province ESU. Even though NMFS found that listing of the Klamath Mountain Province Steelhead Distinct Population Segment (DPS) was not warranted, NMFS expressed concerns about the status of steelhead within this DPS, and identified the DPS as a candidate species, which the agency would continue to monitor and re-assess (66 FR 17845).

Green Sturgeon

In sum, indications from the documents range from no change to possible improvement.

Expert Panel Reports - Not included/analyzed.

Synthesis Report[8]

> Green sturgeon spawn primarily in the mainstem Klamath Riverdownstream of Ishi Pishi Falls, in the Trinity River downstream of Grey's Falls, and potentially in the lower Salmon River...However, the Northern green sturgeon…is considered a Species of Concern (69 FR 19975)…. Under this scenario, considerable efforts to improve habitat are underway (National Marine Fisheries Service 2010b) toward the goal of recovery of salmon and steelhead stocks. Once implemented, TMDLs and associated Implementation Plans are expected to improve water quality, reduce stress on salmonids from pollution, and contribute to their recovery (National Marine Fisheries Service 2010b). These efforts may benefit green sturgeon as well." (p. 96)

Klamath Settlement EIS/EIR

The Klamath EIS/EIR stated no change:

> "The effect of the No Action/No Project Alternative would be no change from existing conditions for green sturgeon in the short and long term." (p. 3.3-70)

Draft BIA/DOI Subteam Technical Report

> "Coho salmon, steelhead, green sturgeon, and Pacific lamprey are expected to remain at low population levels, with low viability of

[8] "[existing conditions, below Iron Gate] Green sturgeon are long-lived, slow-growing fish and the most marine-oriented of the sturgeon species. Green sturgeon are believed to spend the majority of their lives in nearshore oceanic waters, bays, and estuaries. Early life-history stages reside in fresh water, with adults returning to freshwater to spawn when they are more than 15 years of age and more than 4 feet (1.3 m) in size. Green sturgeon are thought to spawn every two to four years (74 FR 52300). However, the Northern green sturgeon DPS is considered aSpecies of Concern (69 FR 19975). Green sturgeon populations in this DPS face a number of potential threats including concentration of spawning, lack of population data, harvest concerns, and loss of spawning habitat. The Klamath River drainage is thought to contain most of the total spawning population of green sturgeon (Adams et al. 2002). Green sturgeon are known to occupy the mainstem Klamath River to Ishi Pishi falls and the lower portions of the Salmon River. Green sturgeon also occupy the Trinity River. Each year juveniles are captured in outmigrant traps at Willow Creek. Green sturgeon are regularly harvested by Hoopa Valley Tribal members." (p. 93).

> Klamath River populations…[existing efforts] will help reduce the stress on the fishes, but will not be sufficient to bring the species to recovery," (p. 4-4).

Trout - Rainbow/Redband Trout[9]

In sum, distribution, abundance and/or sizes of redband/rainbow would possibly decline since, among other things, the dams impair migration.

Expert Panel Report

> "Under the current Conditions with Dams, distribution and abundance of Lake/River redband/rainbow trout is expected to remain stable," (p.72).

Synthesis Report

> "Redband trout need to migrate among habitats between the dams, mainstem tributaries and reservoirs…Under conditions with dams…[they] will continue to be blocked…by the lower three Klamath River dams and be greatly impaired in their movements by J.C. Boyle Dam (Jacobs et al. 2008)…Migration impairment and hydropower peaking has apparently altered redband trout life history and abundance and led to the decline in size and abundance…" (p. 59).

Klamath Settlement EIS/EIR

> "Reduced redband trout abundance and distribution upstream of Iron Gate Dam attributable to Four Facilities features and operations would continue under the No Action/No Project Alternative. Habitat connectivity and suitability are substantially reduced in some reaches, which also suppresses the full range of life-history options formerly available to them. Other features of the redband trout populations in these reaches would likely be sustained under the No Action/No Project Alternative, such as declines in size (Jacobs et al. 2008, as cited in Hamilton et al. 2011) and condition factor," (p.3.3-73).

[9] Redband trout is a name used for an inland subspecies of rainbow trout in certain areas in the U.S. Bull trout, threatened, do not occur below IGD.

Draft BIADOI Subteam Technical Report - Not included/analyzed.

Crayfish

Expert Panel Reports - Not included/analyzed.

Synthesis Report - Not included/analyzed.

Klamath Settlement EIS/EIR

The Klamath EIS/EIR stated no change:

> "Benthic Macroinvertebrates The effect of the No Action/No Project Alternative would be no change from existing conditions on macroinvertebrates in the short and long term." (p. 3.3-74)

Mussels

Expert Panel Reports - Not included/analyzed.

Synthesis Report - Not included/analyzed.

Klamath Settlement EIS/EIR

The Klamath EIS/EIR stated no change:

> "The effect of the No Action/No Project Alternative would be no change from existing conditions for freshwater mussels in the short and long term." (p. 3.3-74)

Action Alternative

Table 7-2.—Summary of Projected Action (KHSA and KBRA) Conditions by Species

Coho Salmon (Threatened)	Summation: Below IGD, significant negative short term impacts and long term effects range from marginal to beneficial. UB, uncertain whether they would reoccupy the area. EP: Adverse impacts in short run, minimal beneficial effects in long run, and additional habitat in the UB would be marginal. SR: Likely reestablish Coho above IGD in a short period of time which will improve overall population persistence in the long run. EIS/EIR: Populations/habitat restored in JC Boyle to IGD reach. Below IGD, short term impacts would be adverse/significant and long term impacts beneficial. Unclear whether they would be available in upper river/UB. DOI: Expected coho to benefit.
Spring Chinook Salmon	Summation: Below IGD, minimal short run impacts (about 2020) due to dam removal sediment, positive long run effects (roughly 2021-2060), although extent varies from minimal to more extensive. UB, Spring Chinook would reoccupy, possibly increase, but not to historic levels. EP: Abundance is exceptionally low therefore KBRA actions would have to be significant to improve survival of existing populations. SR: Short run, reduced abundance, long run slight benefits. Potential to increase population in UB, but not to historical levels. EIS/EIR Short run less than significant effects. In the Lower KR/downstream of IGD, short run, some adverse effects, but would be minimized. Long term, benefit species in the reach beginning in 2020. Additional access to UB – total increase of 420 miles of habitat. DOI: Short run suffer losses from up to 1.2 to 2.4 million tons of released sediment. Long run, quick recovery of the fall run and potentially spring run. Salmon would have access to UB habitat.

Table 7-2.—Summary of Projected Action (KHSA and KBRA) Conditions by Species

Fall Chinook Salmon	Summation: Estuarine habitat would not be affected. Negative short run impacts (around 2020) due to dam removal sediment, especially in the lower Klamath. Positive long run effects (about 2021-2060). Fall Chinook would reoccupy the UB, possibly substantial increase, particularly helpful in years when production is low. EP: Would experience a substantial increase in lower reaches and there could be significant adverse short term dame removal sediment impacts. SR: Below IGD, short run adverse impacts, but population expected to fully recover within 5 years, and in the long run, modeling shows substantially more spawners. Above IGD, greatest benefit would be in years production was low. EIS/EIR: In HR/JC Boyle to IGD reach, short run sediment effects would only last about 4 months, long run, establish a more favorable water temperatures and quality, decrease disease/toxins that would benefit species 2021 onward. In the Lower KR/downstream of IGD, short run, adverse effects would be minimized, long run beneficial. Additional access to UB for a total increase of habitat. DOI: Gain access to 350 miles of historic spawning habitat. Short run suffer losses from up to 1.2 to 2.4 million tons of released sediment. Long run, quick recovery of the fall run and potentially spring run. Salmon would have access to UB habitat.
Pacific Lamprey	Summation: Below IGD, short run, 2012-2020 no change and around 2020-2025/30 decline due to dam removal sediment could be severe, but would recover, especially UKR. Long run (about 2025/30 -2060), population would increase up to 10% (14% in the mainstem). Potential to occupy UB. EP: Below IGD their range would increase 1 – 10%. Mainstem increase capacity about 14% or more. Short term, 2012 to 2020, no change in harvest rates. 2020 to 2025/2030, short term decline due to sediment release. Long term, 2025/2030 to 2060, gradual increase (up to 10%) resulting from recolonization. IGD to Keno reach would see an increase in habitat quality and population. Potential to access and occupy UB. SR: Below IGD, short term, effects from sediment could be severe, but would recover quickly. Above IGD would quickly recolonize area between UKL and IGD, long term beneficial. EIS/EIR: Estuarine habitat would not be affected. Below IGD, short term, significant effects and long term benefits. Not expected to occupy UB. DOI: Expected to benefit/increase.

Table 7-2.—Summary of Projected Action (KHSA and KBRA) Conditions by Species

Steelhead Trout	Summation: Below IGD, short term, adverse sediment impacts (approximately 2020-2026), long term, increased numbers, possibly substantial. UB, reestablish and increase, possibly substantial. EP: Short term, sediment will be injurious to upstream migratory steelhead and coho. Long term, increased numbers. UB, assuming passage through Keno and UKL is successful, then increase in habitat and abundance, possibly substantial. SR: Increased habitat available above IGD would enable reestablishment. Below IGD, short term, reservoir drawdown would affect 6 year classes. Long term Action Alternative would be beneficial. EIS/EIR: Estuarine habitat would not be affected. Short term significant sediment effects. Long term restore connectivity of potentially useable habitat in UKB. Below IGD, substantial long term benefit. DOI: Expected to benefit/increase.
Green Sturgeon (threatened)	Summation: Short term minimal effects, long term benefit, possibly substantial. EP: Not included/analyzed. SR: Short term would have little influence on the population over the long term. Dam removal and KBRA would likely be beneficial. EIS/EIR: Estuarine habitat would not be affected. In the short term significant effects, long term they could benefit substantially. DOI: Expected to benefit/increase.
Redband and Rainbow Trout	Summation: Some short term impacts, long run increased abundance, potentially significant. EP: Short term adverse, long term beneficial SR: Mid to long term beneficial EIS/EIR: Mid to long term beneficial DOI: Same conclusions as other analyses.
Trout	Summation: Some short term impacts, long run increased abundance, potentially significant. EP: Short term adverse, long term beneficial SR: Mid to long term benficial EIS/EIR: Mid to long term benficial DOI: Not included/analyzed.

Table 7-2.—Summary of Projected Action (KHSA and KBRA) Conditions by Species

Crayfish (Benthic Macro invertebrates)	Summation: Short term significant adverse effects, long term benefit. EP and SR: Not included/analyzed. EIS/EIR: Would be a significant impact on crayfish populations in HR and mainstem Klamath River downstream of IGD, but recovery would be relatively fast. DOI: Not included/analyzed.
Mollusks, mainly Mussels	Summation: Significant adverse effects in HR and mainstem from about 2020-2030, longer term beneficial. EP: Not included/analyzed. SR: No change. EIS/EIR: Would be a significant impact on mussel populations in HR and mainstem Klamath River downstream of IGD since it would take up to a decade to recover. DOI: Not included/analyzed.

Sources and acronyms: Expert panel reports (EP), biological subteam synthesis report (SR), preliminary administrative draft EIS/EIR (EIS/EIR), and DOI Final Report (DOI/BIA). Acronyms: Iron Gate Dam (IGD), Upper Basin (UB), Upper Klamath Basin (UKB), Upper Klamath Lake (UKL), hydroelectric reach (HR), Upper Klamath River (UKR), Endangered Species Act (ESA).

Salmon

Coho

In sum, it appears that there would be adverse short term impacts to coho salmon populations, and positive long term impacts for the action alternative. It is unclear whether there would be Coho salmon in the Upper Klamath Basin.

Expert Panel Report (Dunne, April 25, 2011)

Changed from essentially no effect to small beneficial effect in all reaches except UKB where it is more uncertain, especially for Coho (as opposed to steelhead) Action Alternative would likely have small beneficial effects in the long run and would have some adverse impacts in the short term (dam removal sediment), and additional habitat in the Upper Klamath Basin might be inaccessible:

> "Short-term effects of dam removal on sediment transport will be injurious to upstream migrating coho and steelhead, but longer-term prospects…is an increase and expansion in spawning and rearing habitat…for coho probably slightly.(p. 18)
>
> "…the difference between the Proposed Action and Current Conditions is expected to be small, especially in the short-term

(0-10 years after dam removal). Larger (moderate) responses are possible under the Proposed Action if the KBRA is fully and effectively implemented and mortality caused by the pathogen C. shasta is reduced. The more likely small response will result from modest increases in habitat area usable by coho with dam removal, small changes in conditions in the mainstem, positive but unquantified changes in tributary habitats where most coho spawn and rear, and the potential risk for disease and low ocean survival to offset gains in production in the new habitat.…Improvements on the order of two to four times the current freshwater survival are likely needed to offset low marine survival. Nevertheless, colonization of the Project Reach between Keno and Iron Gate Dams by coho would likely lead to a small increase in abundance and spatial distribution of the ESU, which are key factors used by NMFS to assess viability of the ESU."(p. ii).

[concerning Upper Basin] "In the long-term, KBRA activities in the tributaries of Upper Klamath Lake will enhance flow and sedimentation and especially physical habitat quality, but will greatly benefit the fish only if the coho and steelhead can access the tributaries through Upper Klamath Lake. There is not strong evidence that coho previously migrated through Upper Klamath Lake." (Hamilton et al. 2005).(p. 19).

"The extent of new habitat for coho and steelhead upstream of Upper Klamath Lake will depend on the success of these fish to travel through the lake and establish populations in the tributaries. Thus, it will depend on the success of KBRA restoration activities." (p. 29)

"If both upstream and downstream passage through Keno Reservoir and Upper Klamath Lake are successful, then access to upstream habitat (above Upper Klamath Lake) could increase the abundance of steelhead (possibly substantially) and coho salmon if fish utilize the new habitat and can successfully complete their life cycles….However, recolonization of habitats above Upper Klamath Lake are uncertain because many factors may limit population success, especially for coho salmon." (p. 40).

Synthesis Report

Dam removal would benefit coho salmon by providing additional habitat and reestablish them above Iron Gate Dam, and the KBRA would accelerate TMDL water quality benefits with essentially negligible short term impacts since most would be out of the mainstem by November:

[short term below IGD] "The effect of dam removal on the coho salmon population is not expected to be significant, despite direct

mortality to a proportion of some life stages (Stillwater Sciences 2009a). A decrease in coho salmon production is likely for two year classes (Stillwater Sciences 2009a)." (p. 91).

[long term below IGD] "Over the long term, water quality and habitat would improve for coho salmon downstream from IGD with dam removal." (p. 91)

[short term above IGD] "Dam removal would result in an increase in habitat and likely reestablish coho salmon above Iron Gate Dam in a short period of time… From 2012 to 2020 sport, commercial, and Tribal harvest will be held at minimal levels to rebuild runs under KBRA. Consequently, incidental coho salmon harvest would be reduced. Afterward 2020 coho incidental harvest would likely increase due to the increase effort directed at Chinook salmon, "(p. 49-50).

[long term above IGD] "Dam removal would result in an increase in habitat and coho salmon would likely access these habitats above IGD in a short period of time, as observed after barrier removal at Landsburg Dam in Washington (Kiffney et al. 2008) and dam removal at Little Sandy Dam in Oregon (B. Strobel, Portland Water Bureau, pers. comm.). Assuming coho salmon distribution up to Spencer Creek after dam removal, coho salmon will have an additional 68 miles of habitat, including approximately 45 miles of habitat in the mainstem Klamath River and tributaries (National Marine Fisheries Service 2007a; U.S. Department of the Interior 2007), as well as an additional 23 miles of habitat currently inundated by the reservoirs (Cunanan 2009). From 2012 to 2020 sport, commercial, and Tribal harvest will be held at minimal levels to rebuild runs under KBRA20" Consequently, incidental coho salmon harvest would be reduced. After 2020 coho incidental harvest would likely increase due to the increased effort directed at Chinook salmon."(p. 49)

[long term below IGD] "Overall, dam removal and associated KBRA actions will accelerate TMDL potential water quality benefits to this species (USDI Secretarial Determination Water Quality SubGroup In Prep)…Access to habitat above IGD would provide connectivity across historically accessible habitats and allows fish to respond to changing environmental conditions… Thus, there would be less risk of extinction when more habitat is available across the ESU." (p. 90-91).

Klamath Settlement EIS/EIR

The Klamath Settlement EIS/EIR indicated that coho salmon would continue to be absent in the Upper Klamath Basin and that there would be adverse impacts in the short run to some portions of the populations with benefits in the long term due primarily to additional habitat and improved water quality and temperatures:

> [Overall Klamath River Reach - 9 coho population units total] "Based on increased habitat availability and improved habitat quality, the effect of the Proposed Action would be beneficial for the coho salmon from the Upper Klamath River, Mid-Klamath River, Lower Klamath River, Shasta River, Scott River, and Salmon River population units in the long term. Based on improved habitat quality, the effect of the Proposed Action on coho salmon from the three Trinity River population units would be less-than-significant for the long term." (p. 3.3-112).
>
> [Long term] "These [primarily as a result of dam removal] changes would result in more favorable water temperature for salmonids, and would improve water quality and reduce instances of disease and algal toxins. All of these changes would benefit coho salmon produced in the Hydroelectric Reach in 2020 and thereafter." (p. 3.3-107)
>
> [Upper Klamath River]"There is no historical evidence that coho salmon occurred upstream of J.C. Boyle Reservoir…"(p. 3.3-106). Based on substantial reduction in the abundance of a year class in the short term, the Proposed Action would have a significant effect on coho salmon from the Upper Klamath River, Mid-Klamath River, Shasta River, and Scott River population units after mitigation in the short term. (p. 3.3-111)
>
> [Hydroelectric Reach] "These changes would result in more favorable water temperature for salmonids, and would improve water quality and reduce instances of disease and algal toxins. All of these changes would benefit coho salmon produced in the Hydroelectric Reach in 2020 and thereafter."(p. 3.3-107)
>
> [Estuary]"The Proposed Action is not expected to substantially change or affect coho salmon estuarine habitat. Sediment, flow, and water temperature effects would likely not extend downstream to the estuary."(p. 3.3-110).

Draft DOI/BIA Subteam Technical Report

> "Coho salmon, steelhead, and Pacific lamprey populations are expected to increase in the Klamath River and its tributaries as a result of the Proposed Action," (p. 4-15).

Spring and Fall Chinook

Fall Chinook conclusions ranged from modest increase to a sizeable increase due primarily to improvements in water quality, temperature, and additional habitat. Short term impacts, although dam removal may have significant impacts, are not expected to last longer than five years at most. For Spring Chinook, mid to long term conclusions ranged essentially no change to significant improvement due primarily to improvements in water quality, temperature, and additional habitat. Short term impacts would be negligible since dam removal would occur in the fall.

Expert Panel Reports (Goodman, et. al., June 13, 2011; Goodman et al, July 20, 2011)

Conclusions indicate that fall Chinook would experience a substantial increase in lower reaches of the River and there may be significant adverse short term dam removal sediment impacts. Improvements in spring Chinook populations is expected to be minimal, although the conclusion involves unknowns. An increase in Chinook salmon upstream of Keno Dam is uncertain.

Addendum (Goodman, et. al., July 20, 2011)

Fall Chinook

> "The Panel concluded that a substantial [about 10 percent of the average number of natural spawners, or about 10,000 spawners] increase in Chinook salmon is possible in the reach between Iron Gate Dam and Keno Dam. An increase in Chinook salmon upstream of Keno Dam is less certain. Within the range of pertinent uncertainties, it is possible that the increase in Chinook salmon upstream of Keno Dam could be large, but the nature of the uncertainties precludes attaching a probability to the prediction by the methods and information available to the Panel. The principal uncertainties fall into four classes: the wide range of variability in salmon runs in near-pristine systems, lack of detail and specificity about KBRA, uncertainty about an institutional framework for implementing KBRA in an adaptive fashion, and outstanding ecological uncertainties in the Klamath system that appear not to have been resolved by the available studies to date." (p. i).

Spring Chinook

> "The prospects for the Proposed Action to provide a substantial positive effect for spring Chinook salmon is much more remote than for fall Chinook salmon. The present abundance of spring Chinook salmon is exceptionally low and spawning occurs in only a few

tributaries in the basin."(p. 25). Also stated that conditions would be more favorable under action verses no action concerning climate change.

Final Report (Goodman, et. al., June 13, 2011)

Fall Chinook

> [short term middle and lower River] "…sediments from Klamath project reservoirs may have significant effects on the survival of the run and brood present when the dams are removed."(p. 20-21).

> [Keno to Iron Gate Dam reach and LKR mid to long term] "…a substantial increase in Chinook salmon is possible in the reach between Iron Gate dam and Keno Dam." (p. i) [Dam removal/sediment]..the degree to which these persistent sands will reduce Chinook salmon spawning success in the lower mainstem Klamath River, relative to increase spawning success in the project area, is unknown."(p. 21)

> [Upstream of Keno Dam] "…An increase in Chinook salmon upstream of Keno Dam is less certain."(p. i)

Spring Chinook

> "The prospects for the Proposed Action to provide a substantial positive effect for spring Chinook salmon is much more remote than for fall Chinook salmon. The present abundance of spring Chinook salmon is exceptionally low and spawning occurs in only a few tributaries in the basin…Intervention would be needed to establish populations in the new habitats, at least initially….KBRA actions would need to greatly improve survival of existing populations…" (p. 25).

Synthesis Report

The mobility of Chinook salmon (and other anadromous species) require consideration of the entire Klamath River Basin when examining impacts for particular reaches or areas, as with commercial fisheries, described by the synthesis report:

> [above IGD]"….While this management scenario would not create a commercial fishery above IGD, anadromous salmonid access to habitat above IGD would benefit commercial salmon fisheries. (p. 69).

[below IGD] By truncating the range of flows that led to diverse life history strategies, changes in the annual hydrology have influenced populations of fish that have evolved under the natural flow regime. These changes included effects on the environmental cues used to trigger anadromous salmonid migrations (outmigration, spawning) and the availability and quality of habitat necessary to meet the life history needs of species (National Marine Fisheries Service 2002)." (p. 70)

Spring Chinook

[Entire River] "Dam removal provides an opportunity for spring-run Chinook salmon to become reestablished in the upper Klamath River," (p.47). "Restoration under KBRA provides considerable potential to increase spring run abundance. However, Huntington (2006) cautioned that the existing potential for Chinook salmon production within the basin above UKL is clearly much lower than his estimate of historical potential,"(p. 42).

[below Iron Gate Dam – short term] The overall effect of dam removal to the spring-run Chinook population is not anticipated to be considerable (Stillwater Sciences 2009a)," (p. 85).

[below Iron Gate Dam – long run] "Implementing either the KBRA type flows or the Hardy et al. (2006) Phase II flow recommendations was predicted to decrease the occurrence of poor production years in the future by 2/3. This would have significant positive consequences for Chinook salmon given their life cycle in the Klamath River (Hetrick et al. 2009). Overall, dam removal and associated KBRA actions will accelerate TMDL potential water quality benefits to this species (USDI Secretarial Determination Water Quality SubGroup In Prep). The restored temperature regime would mean varied and differing effects to anadromous fish below IGD,"(p. 85).

Fall Chinook

[Overall] "Modeling for fall-run Chinook salmon showed the chance of getting substantially more fall-run Chinook salmon spawners is much better with the dams removed than with the dams remaining, over a 50 year period (Oosterhout 2005)." (p. 88)

[above Iron Gate Dam]"A ranking level model comparison of fall run Chinook spawners in the upper watershed predicts that numbers will likely be higher with dam removal than under existing conditions…over a 50 year period (Oosterhout 2005)," (p. 46). "…conditions for fall-run Chinook migration appear favorable (at least through Upper Klamath Lake)," (p. 48). "KBRA flows are intended to benefit fall-run Chinook salmon. Hetrick's analysis of

KBRA type23 flows interim flows showed the greatest benefits of would be in years when production was low (Hetrick et al, 2009)," (p. 85).

[below Iron Gate Dam – short term] The reduction in the number of fall-run spawners that would occur under the worst-case scenario would be evident for three years of direct impact from a given sediment pulse (Stillwater Sciences 2009a)…Overall, it appears that the impacts on fall-run Chinook salmon due to suspended sediments will be short-term, and that the population will fully recover within five years after dam removal (Stillwater Sciences 2008)," (p. 85).

[middle Klamath River mid to long term] "KBRA flows are intended to benefit fall-run Chinook salmon. Hetrick's analysis of KBRA type23 flows interim flows showed the greatest benefits of would be in years when production was low (Hetrick et al, 2009). For years where modeled historical production was high, there was little difference from KBRA management…Implementing either the KBRA type flows or the Hardy et al. (2006) Phase II flow recommendations was predicted to decrease the occurrence of poor production years in the future by 2/3. This would have significant positive consequences for Chinook salmon given their life cycle in the Klamath River (Hetrick et al. 2009)." (p. 85).

[long term middle and lower Klamath River] "The miles of habitat below IGD with suitable temperatures for Chinook salmon migration during August 15 to September 15 would increase from 20 miles with dams in to more than 100 miles with dams out (Figure 12)… Dam removal would reestablish connectivity of resident and anadromous fish to habitat currently blocked by the dams (Burroughs et al. 2010)." (p. 85 and 87).

[below IGD long run] "Modeling for fall-run Chinook salmon shows the chance of getting substantially more fall-run Chinook salmon spawners is much better with the dams removed than with the dams remaining, over a 50 year period (Oosterhout 2005)." (p. 88).

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[Overall long run]"…Chinook salmon would gain access to more than 350 miles of historic spawning habitat," (p. 4-14).

[Short term] Chinook salmon are expected to suffer losses resulting from a release of up to 1.2 to 2.4 million tons of fine sediment, causing high suspended sediment loads and local, short-term sediment deposition," (p. 4-14).

[Long term] "…Improved temperatures (reduced by 7 degrees to 9 degrees Celsius) from October through November would create more ideal temperatures for adult migration and spawning. Implementation of the proposed action will directly affect Chinook salmon by accelerating the TMDL process, and thus improving water quality conditions at a more rapid rate…This life cycle change benefits the Klamath River Chinook salmon because it takes them closer to their historic conditions…These factors in combination will result in an anticipated quick recovery of the fall-run and potentially spring run, Chinook salmon populations," (p. 4-15.)

[UKB]"Chinook salmon would be able to access habitat in the Klamath River within the Tribes' reservation…[and] their numbers are expected to increase," (p. 4-19).

Klamath Settlement EIS/EIR

Spring Chinook

[short term] "Based on minimal reduction in the abundance of a year class in the short term, the effect of the Proposed Action would be less-than-significant for spring-run Chinook salmon in the short term. Based on minimal reduction in the abundance of a year class in the short term, the Proposed Action would be a less-than-significant effect on spring-run Chinook salmon after mitigation." (p. 3.3-105)

[long term] "Based on increased habitat availability and improved habitat quality, the effect of the Proposed Action would be beneficial for spring-run Chinook salmon in the long term." (p. 3.3-106).

[in the Upper Klamath River]…dam removal would allow…access to the Upper Klamath River upstream of J.C. Boyle Reservoir. The access would expand the…current habitat to include historic habitat along the mainstem Klamath river and upstream to the Sprague, Williamson, and Wood Rivers (Hamilton, et al, 2005)…a potential increase in access to 49 significant tributaries in the UKB, comprising 420 miles of additional potentially productive habitat…". The Proposed Action would not result in changes to suspended or bedload sediment, flow-related habitat, or algal toxins and disease." (p. 3.3-101).

[hydroelectric reach] "The Proposed Action would restore spring-run Chinook salmon access to the Hydroelectric Reach. Adults could first access this reach in spring 2021 after dam removal; thus, short-term gains in flow-related habitat or habitat expansion would be limited to later cohorts. The Proposed Action would eliminate the Four

Facilities and would establish a flow regime that more closely mimics natural conditions by increasing spring flow and by incorporating more variability in daily flows." (p. 3.3-102).

[lower Klamath] "The Proposed Action would release dam-stored sediment downstream to the lower Klamath River Reach in the short term, and would establish a flow regime that more closely mimics natural conditions in the long term. Adult spring-run Chinook salmon do not currently occur upstream of the Salmon River, and would not be expected to be able to use the mainstem Klamath River upstream of Iron Gate Dam until conditions in the Hydroelectric Reach are suitable." (p. 3.3-102).

[Estuary] "The Proposed Action is not expected to substantially change or affect spring-run Chinook salmon estuarine habitat." (p. 3.3-105).

Fall Chinook:

[short term] "Based on substantial reduction in the abundance of a year class in the short term, the effect of the Proposed Action would be significant for fall-run Chinook salmon in the short term. Based on minimal reduction in the abundance of a year class in the short term, the Proposed Action would be a less-than-significant effect on fall-run Chinook salmon after mitigation." (p. 3.3-100).

[long term] "Based on increased habitat availability and improved habitat quality, the effect of the Proposed Action would be beneficial for fall-run Chinook salmon in the long term." (p. 3.3-101).

[in the Upper Klamath River]"…removal of the four dams would allow fall-run Chinook salmon to gain access to the upper Klamath River upstream of J.C. Boyle Reservoir. The access would expand the Chinook salmon's current habitat to include historic habitat along the mainstem Klamath River, upstream to the Sprague, Williamson, and Wood Rivers (Hamilton et al. 2005)…a potential increase in access to 49 significant tributaries in the UKB, comprising 420 miles of additional potentially productive habitat…"(p. 3.3-95)

[hydroelectric reach] "The Proposed Action would restore fall-run Chinook salmon access to the Hydroelectric Reach. Adults could first access this reach in fall 2020 after dam removal. Because of this they would not exposed to the elevated SSCs that would occur during dam removal." (p. 3.3-96).

[downstream of Iron Gate Dam] "The Proposed Action would establish a flow regime that more closely mimics natural conditions in the lower Klamath River. Flows under the Proposed Action are intended to benefit fall-run Chinook salmon." (p. 3.3-99).

[Estuary] The Proposed Action would not substantially change or affect estuarine habitat used by fall-run Chinook salmon." (p. 3.3-99).

Pacific Lamprey

In sum, there could be a total increase in their range of 1 to 10 percent below Iron Gate dam and increased capacity in the mainstem of about 14 percent or more. From about 2010 to 2020, there would be no change, and from 2020 to about 2025 to 2030 there is expected to be a short term decline due to sediment release, and from 2030 to 2060, there is would likely be a gradual increase.

Final Expert Panel (January 14, 2010)

From about 2012 to 2020, there would be no change in harvest rates, and from roughly 2020 to anywhere from about 2025 to 2030, a short term decline due to sediment issues associated with dam removal, and from about 2030 to 2060, there is expected to be a gradual increase and there is the potential for Pacific Lamprey to exist in the Upper Klamath Basin:

"Increased extent of habitat (capacity) for Pacific lamprey…was estimated approximately at 14 percent (Section 5.2.1). However, larval habitat quality in the reach between Iron Gate Dam and Keno Dam will be less desirable than in downstream reaches currently available to anadromous lamprey, making the increase in lamprey production as the result of dam removal and KBRA in this reach alone less than 14 percent. …Conditions without Dams and with the KBRA might lead to an increase in productivity below Iron Gate Dam also (due to a potential increase in spawning habitat upstream of Iron Gate Dam and reestablishment of natural sediment dynamics downstream of Iron Gate Dam), the Panel then roughly estimated that there might be a total increase of production of outmigrant lamprey (and hence harvest potential) in the range of 1 to 10 percent relative to conditions with Dams. Within the range of 1 to 10 percent, the production of lamprey in this extended range downstream of Keno Dam will depend on the survival of adults in the ocean and the success of the KBRA."(p. 45-46).

[hydroelectric reach] "Dam removal will put an end to rapid fluctuations of flow for peaking of power production in the impounded reach. Halting of this practice will remove the frequent alternation of hours of high flow velocities followed by rapid dewatering of channel margins" (p. 25).

[below Iron Gate Dam]"…might be a total increase of production of outmigrant lamprey (and hence harvest potential) in the range of 1 to 10 percent relative to Conditions with Dams. Within the range of 1 to 10 percent, the production of lamprey in this extended range downstream of Keno Dam will depend on survival of adults in the ocean and the success of the KBRA,"(p. 46).

[mainstem] "Dam removal would then increase the extent of potential mainstem habitat by approximately 14 percent," (p. 29). "Capacity for Pacific Lamprey in the Klamath River system is predicted to increase by a maximum of 14 percent (based on analysis of mainstem habitat), with potentially more if habitat in the upper Klamath River Basin is accessible and suitable,"(p. 32).

[above IGD] "Pacific lamprey are currently extirpated above Iron Gate Dam; they are unable to pass the dam and the confirmed upstream limit in the mainstem Klamath River is Bogus Creek…Hamilton e. al. (2010) estimated that an additional 69 miles of Pacific lamprey habitat will be opened up by removal of the four lower Klamath River dams." (p. 28-29).

Synthesis Report

Dam removal is expected to expand their range and Pacific lamprey would recolonize the Upper Klamath Basin and benefit mid to long term despite negative short term impacts:

[below IGD short term] "… nearly half of the escapement returns to the Trinity River and its tributaries…where effects would be less severe because of dilution….With few ammocoetes directly below IGD, effects are unlikely to impact the Pacific lamprey population as a whole. Due to their wide spatial distribution in the Klamath basin, straying behavior, and high fecundity, Pacific lamprey are anticipated to recover relatively quickly from dam removal impacts (Stillwater Sciences 2009a)." (p. 95).

[Below IGD mid to long term] "…increased habitat availability and reestablishment of natural sediment dynamics following dam removal are likely to help reduce the impacts of dam removal for any Pacific lamprey in the mainstem that survive initial sediment releases (Stillwater Sciences 2009a)…Overall, dam removal and associated KBRA actions will accelerate TMDL water quality benefits to this species (USDI Secretarial Determination Water Quality SubGroup In Prep)," (p. 95).

[above Iron Gate Dam]"…dam removal would be more conducive to the reestablishment of anadromous Pacific lamprey above IGD… Capacity for Pacific lamprey in the Klamath River system is predicted

to increase by a maximum of 14 percent (based on analysis of mainstem habitat), with potentially more if habitat in the upper Klamath River Basin is accessible and suitable (Close et al. 2010). Full implementation of KBRA could potentially increase the capacity of Pacific lamprey habitat upstream from Keno Dam (Close et al. 2010). (p. 52).

Overall, dam removal and associated KBRA actions will accelerate water quality improvements (Dunne et al. 2011) and TMDL water quality benefits to this species… (p. 52).

Klamath Settlement EIS/EIR

[short term] "Based on substantial reduction in the abundance of a year class in the short term, the effect of the Proposed Action would be significant for Pacific lamprey in the short term [and] after mitigation." (p. 3.3-123).

[Long run] "Based on increased habitat availability and improved habitat quality, the effect of the Proposed Action would be beneficial for Pacific lamprey in the long term." (p. 3.3-123)

[in the Upper Klamath River]"…removal of the four dams would allow fall-run Chinook salmon to gain access to the upper Klamath River upstream of J.C. Boyle Reservoir. The access would expand the Chinook salmon's current habitat to include historic habitat along the mainstem Klamath River, upstream to the Sprague, Williamson, and Wood Rivers (Hamilton et al. 2005)…a potential increase in access to 49 significant tributaries in the UKB, comprising 420 miles of additional potentially productive habitat…"(p. 3.3-95)

[hydroelectric reach] "The Proposed Action would provide Pacific lamprey with access to the Hydroelectric Reach and tributaries…Most sediment released from the reservoirs would likely be eroded within the first five months after dam removal (by May 2020), returning sections of river currently inundated by reservoirs and riverine sections between reservoirs to a pool-riffle morphology. After erosion of dam-stored sediment, the Hydroelectric Reach would likely contain gravel suitable for lamprey spawning and rearing. The Proposed Action would also eliminate the reservoirs and establish a flow regime that more closely mimics natural conditions." (p. 3.3-120).

[downstream of Iron Gate Dam] "The Proposed Action would release dam-stored sediment and reduce dissolved oxygen downstream to the lower Klamath River in the short term, and restore a flow regime that more closely mimics natural conditions in the long term." (p. 3.3-121).

[Estuary] "The Proposed Action would not substantially change or affect Pacific lamprey estuarine habitat used by fall-run Chinook salmon." (p. 3.3-121).

Draft DOI/BIA Subteam Technical Report

"Coho salmon, steelhead, and Pacific lamprey populations are expected to increase in the Klamath River and its tributaries as a result of the Proposed Action," (p. 4-15).

Steelhead Trout

Short term effects of dam removal would be negative, but short-lived, and positive in the long term, primarily due to many more miles of habitat available.

Expert Panel Report (Dunne, et. al., April 25, 2011)

> [short term] "Short-term effects of dam removal on sediment transport will be injurious to upstream migrating coho and steelhead, but longer-term prospects of dam removal with KBRA is an increase and expansion in spawning and rearing habitat – for steelhead probably considerably, and for coho probably slightly." (p. 18).
>
> "…effects of dam removal on sediment transport will be injurious to upstream migrating coho and steelhead, but longer-term prospects of dam removal with KBRA is an increase and expansion in spawning and rearing habitat - for steelhead probably considerably, and for coho probably slightly." (p. 18).
>
> "the Proposed Action could result in increased spatial distribution and numbers of steelhead, and in the long-term (decades), increased numbers relative to those under Current Conditions." (p. ii).
>
> [concerning Upper Basin] "In the long-term, KBRA activities in the tributaries of Upper Klamath Lake will enhance flow and sedimentation and especially physical habitat quality, but will greatly benefit the fish only if the coho and steelhead can access the tributaries through Upper Klamath Lake. There is not strong evidence that coho previously migrated through Upper Klamath Lake." (Hamilton et al. 2005). (p. 19).
>
> "The extent of new habitat for coho and steelhead upstream of Upper Klamath Lake will depend on the success of these fish to travel through the lake and establish populations in the tributaries. Thus, it will depend on the success of KBRA restoration activities." (p. 29)

"If both upstream and downstream passage through Keno Reservoir and Upper Klamath Lake are successful, then access to upstream habitat (above Upper Klamath Lake) could increase the abundance of steelhead (possibly substantially) and coho salmon if fish utilize the new habitat and can successfully complete their life cycles…. However, recolonization of habitats above Upper Klamath Lake are uncertain because many factors may limit population success, especially for coho salmon." (p. 40).

Synthesis Report

"Overall, dam removal and associated KBRA actions will accelerate TMDL potential water quality benefits to this species (USDI Secretarial Determination Water Quality SubGroup In Review)." (p. 94).

[below Iron Gate Dam] "Summer and winter steelhead are currently distributed throughout the Klamath River downstream of IGD and its tributaries, spawning primarily in tributaries such as Trinity, Scott, Shasta, and Salmon rivers. Reservoir draw down impacts are predicted to be greatest for the portion of the steelhead adults migrating to spawn in tributaries upstream of the Trinity River confluence, and are anticipated to affect at least six year classes of this group (Stillwater Sciences 2009a)….Access to additional habitat in the upper Klamath River watershed would benefit steelhead runs. In general, dam removal with KBRA would likely result in the restoration of more reproducing populations, higher genetic diversity, and the opportunity for variable life histories and use of new habitats." (p. 93)

[above Iron Gate Dam] Steelhead populations in the Klamath River above IGD were extirpated with the construction of Project dams. "Conditions without dams would enable reestablishment of steelhead above Iron Gate Dam and result in an increase in the amount of habitat for this species…Because of their ability to navigate steeper gradient channels and spawn in smaller and intermittent streams (Platts and Partridge 1978), steelhead would realize the extent of anadromous habitat gain to a greater degree than other species."(p. 50-51).

Overall, dam removal and associated KBRA actions will accelerate TMDL potential water quality benefits to this species…," (Hamilton et. al., November 23, 2010, p. 50-51).

Klamath Settlement EIS/EIR

> [short term] "Based on substantial reduction in the abundance of a year class in the short term, the effect of the Proposed Action would be significant for summer and winter steelhead in the short term…[and] after mitigation" (p. 3.3-119)
>
> [long term] "Based on increased habitat availability and improved habitat quality, the effect of the Proposed Action would be beneficial for summer and winter steelhead in the long term." (p. 3.3-119-120)
>
> [Upper Klamath] "Under the Proposed Action, dam removal would allow steelhead to gain access to the upper Klamath River upstream of J.C. Boyle Reservoir. This would expand the population's distribution to include historical habitat along the mainstem Klamath River upstream to the Sprague, Williamson, and Wood Rivers (Hamilton et al. 2005)." (p. 3.3-112).
>
> [hydroelectric Reach] "The Proposed Action would restore steelhead access to the Hydroelectric Reach [beginning in] fall 2020 (winter steelhead) or winter 2021 (summer steelhead) after dam removal (summer steelhead spawning typically does not begin until December). Elevated suspended sediment concentrations resulting from dam removal would likely have returned to background levels similar to existing conditions. The Proposed Action would also…establish a flow regime that more closely mimics natural conditions by increasing spring flow and by incorporating more variability in daily flows." (p. 3.3-112 to 3.3-113).
>
> [Lower Klamath] "The Proposed Action would release dam-stored sediment downstream to the lower Klamath River in the short term, and restore a flow regime that more closely mimics natural conditions in the long term." (p. 3.3-113).

Draft DOI DOI/BIA Subteam Technical Report

> "Coho salmon, steelhead, and Pacific lamprey populations are expected to increase in the Klamath River and its tributaries as a result of the Proposed Action," (p. 4-15).

Green Sturgeon

Green sturgeon only occur in the lower Klamath River. Short term sediment would impact sturgeon, possibly severely, much of the spawning and rearing occurs away from areas most impacted. Improved water quality, temperature, and flow regimes would have beneficial mid to long term effects.

Expert Panel Reports - Not included/analyzed.

Synthesis Report

> "Although green sturgeon in the mainstem Klamath River at the time of dam removal could be severely affected, much of the spawning and rearing habitat occurs downstream of the Trinity River confluence where sediment concentrations are predicted to be lower. Any impacts to green sturgeon life stages in the mainstem Klamath River during dam removal will have little influence on the population as a whole over time (Stillwater Sciences 2009a). The return to a temperature and flow regime that more closely mimic historical patterns would likely benefit green sturgeon. Overall, dam removal and associated KBRA actions will accelerate TMDL potential water quality benefits to this species (USDI Secretarial Determination Water Quality SubGroup In Review)," (p. 97).

Klamath Settlement EIS/EIR

> [short term] "Based on substantial reduction in the abundance of a year class in the short term, the effect of the Proposed Action would be significant for green sturgeon in the short term [and] after mitigation." (p. 3.3-126).
>
> [long term] "Based on improvements in habitat quality within part of their range, the effect of the Proposed Action would be less-than-significant for green sturgeon in the long term." (p.3.3-126).
>
> [lower Klamath River] "The Proposed Action would release dam-stored sediment downstream to the lower Klamath River in the short term, and restore a flow regime that more closely mimics natural seasonal flow patterns in the long term." (p. 3.3-123).
>
> [Estuary] "The Proposed Action is not expected to substantially change or affect estuarine habitat. Sediment, flow, and water temperature effects resulting from the Proposed Action would likely not extend downstream to the estuary."(p. 3.3-124).

Draft DOI/BIA Subteam Technical Report - Not included/analyzed.

Trout - Redband/Rainbow

In sum, since redband trout need to migrate from various areas, dam removal would facilitate movement, would halt mortality related to turbines, improve water temperatures and related conditions which would improve populations, probably substantially.

Expert Panels

> [short run] "While there would be short-term adverse impacts from dam removal…the Proposed Action would likely create significant increases in size, abundance, and distribution of resident trout in the 43 mi…of the Klamath River between J.C. Boyle Reservoir and Iron Gate Dam." (p. 73).
>
> [long run] "It is expected that eventually the entire reach downstream of Keno Dam would be capable of supporting a resident redband/rainbow trout fishery after the removal of the four dams. It is possible that the trophy fishery will expand seven times from below Keno Dam to the Iron Gate reach….Recreational fishing opportunities would be expected to increase in proportion to the increase in trout abundance in all areas." (p. 74-75).

Synthesis Report

> Under dam removal and KBRA, redband trout would be able to migrate volitionally, as observed after a similar dam removal…Removal of J.C. Boyle Dam and restoration of a more nature flow regime would likely reverse the decline in abundance and size of adult redband trout migrating….With dam removal and no power generation, redband trout would no longer be entrained in turbines… Effective habitat…would be increased in the reach from the J.C. Boyle powerhouse to the California state line under the flows associated with dam removal and KBRA."(p. 61).

Klamath Settlement EIS/EIR

> "Since construction of Copco 1 Dam and Iron Gate Dam, resident trout upstream of Iron Gate Dam are considered redband trout, and resident trout downstream of Iron Gate Dam are considered coastal rainbow trout (FERC 2007)…. Redband trout need to migrate among habitats, mainstem, tributaries, and reservoirs to meet their life-history requirements." (p. 3.3-12 to 3.3-13)"

Draft DOI/BIA Subteam Technical Report - Not included/analyzed.

Crayfish (Benthic Macro invertebrates)

Expert Panels - Not included/analyzed.

Synthesis Report - Not included/analyzed.

Klamath Settlement EIS/EIR

> [short term] "Based on substantial reduction in the abundance of a year class in the short term, the effect of the Proposed Action would be significant for macroinvertebrates in the short term." (p. 3.3-134)
>
> [long term] "Based on increased habitat availability and improved habitat quality, the effect of the Proposed Action on macroinvertebrates would be beneficial in the long term." (p. 3.3-134)

Mussels (Mollusks)

Expert Panels - Not included/analyzed.

Synthesis Report - Not included/analyzed.

Klamath Settlement EIS/EIR

> [short term] "Based on substantial reduction in the abundance of multiple year classes in the short term and the slow recovery time of freshwater mussels, the effect of the Proposed Action would be significant for mussels in the short term.. [and]…after mitigation. (p. 3.3-132 to 3.3-133).
>
> [long term] "Based on increased habitat availability and habitat quality in the long term, the effect of the Proposed Action would be beneficial for mussels in the long term." (p. 3.3-133)

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