YUROK TRIBE

190 Klamath Boulevard • Post Office Box 1027 • Klamath, CA 95548

Via Electronic Mail

January 29, 2016

State Water Resources Control Board
Division of Water Rights
Water Quality Certification Program
Attention: Mr. Parker Thaler
P.O. Box 2000
Sacramento, CA 95812-2000

E-mail: parker.thaler@waterboards.ca.gov

Re: Yurok Tribe Scoping Comments on the Klamath Hydroelectric Project EIR

Aiy-ye-kwee':

The Yurok Tribe (the Tribe) respectfully submits the following written comments to the State Water Resources Control Board (the Board) for consideration in its certification pursuant to Clean Water Act Section 401 of the Klamath Hydroelectric Project (KHP) relicensing by the Federal Energy Regulatory Commission (FERC).

The Yurok People have always been stewards of the Klamath Basin. Yurok culture is centered on maintaining the balance between the River and everything that depends on it. In the early 2000's as scientific information on the ongoing effects of the dams became more readily available, the Yurok Tribe began to advocate for complete facilities removal in a timely fashion. In 2006, when the first relicensing application and coinciding state water quality certification processes commenced, the Yurok Tribe formalized its position. Since 2006, the Yurok Tribe has strongly advocated for complete facilities removal as the only effective means of fully mitigating for the KHP. After more than ten years of exhaustive analysis, studies, and reports, there is no question that the presence of the dams has impaired the health of the Klamath River and downriver communities. Over the course of the last decade, state and federal agencies, and PacifiCorp itself have also acknowledged that dam removal is appropriate. The Tribe stays committed in its call for complete facilities removal to address water quality impacts caused by KHP.

In this current water quality certification process the Board is once again faced with the task of analyzing and prescribing mitigation for the wide range of negative water quality impacts of the KHP. The Tribe urges the Board, in its certification of the KHP relicensing,

fully analyze complete facilities removal as a comprehensive and long term solution to the ongoing water quality issues caused by the dams.

The following comments provide the Tribe's key issues and supporting data, which reinforce the need for dam removal, and which must be considered when assessing the water quality impacts of the KHP.

1. The Board is Obligated under CEQA to Evaluate Project Alternatives that Avoid and Mitigate Impacts to the Tribe's Cultural Resources

Since time immemorial Yurok people have lived along the Klamath River. The ancestral territory of the Yurok Tribe is centered on the Klamath River. Today, the Yurok Reservation is just a fraction of the Yurok ancestral territory, extending for a mile on each side of the Klamath River from the Pacific Ocean to just upstream of the confluence of the Klamath and Trinity Rivers. The Klamath River flows for 45 miles directly through the heart of the Yurok Reservation.

The importance of the Klamath River to the Yurok way of life cannot be overstated. The Tribe, its history, subsistence, culture, identity, spirituality and economic survival have always relied upon the Klamath River. The River is the central bloodline of the Yurok People and the health of the people are connected to the health of the River. Non-Indian settlement in the 1800s began a long history of land management decisions beyond the control of the Tribe that altered the River, its ecosystems, and the presence of the Yurok people on the surrounding lands. The Tribe had no say in the decision to construct the Klamath Project when it occurred and received no benefit from the power it produced, but is now suffering disproportionately from its consequences. The water quality conditions created by the dams have had devastating impacts on fish populations in the River, the focal point of Yurok subsistence, spirituality, ceremony, and economy. The increased presence of toxic algae in the River, caused by the lacustrine effect of the dams, occurs during the peak time for commercial and subsistence fishing and ceremonial practice for Yurok people, exposing those who practice these traditional activities to increased health risks. Yurok basket weavers collect materials (willow sticks and roots) in riparian areas of the Klamath River, traditionally using their teeth to help strip and clean the freshly harvested materials that have been continually exposed to the toxins in the River. Ceremonial bathing in the river following sweathouse cleansing places the practitioner at risk due to elevated toxin levels. It is unacceptable that because of water quality problems created by the KHP our people are now forced to compromise their health to practice their way of life.[1]

Yurok people have struggled to maintain cultural, economic, and spiritual ties to the Klamath River through ceremonial practices, subsistence and traditional uses of local natural resources, but that way of life we have fought so hard to preserve is at risk as long as the KHP continues to impact River health.

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[1] The Yurok Tribe Heritage Preservation Officer (THPO), Robert McConnell, has provided separate comments to the Board further explaining the significant cultural impacts of the KHP. They are incorporated herein by reference.

The State has expressed a commitment in adopting AB 52, an amendment to CEQA incorporating impacts to tribal cultural resources into its environmental review, to respect and protect tribal cultural resources like those of the Yurok Tribe in the Klamath Basin that have been too long overlooked by state and federal management decisions. The Tribe encourages the Board to honor this commitment by incorporating the devastating cultural impacts into its EIR for 401 certification. These impacts, when given weight, make the necessity of facilities removal very clear.

For an in-depth analysis of the connection between the River and the Yurok People please see the attached report, *Yurok and the Klamath River: Yurok Historical Context and Data for Assessing Current Conditions and the Effects of the Proposed Klamath Restoration Project on Yurok Tribal Trust Assets and Yurok Resources of Cultural and Religious Significance* (Sloan February 2011), which was compiled by Yurok Tribal staff for the 2011 Secretarial Determination EIS/EIR. The Tribe urges the Board to weigh the information in the report heavily in its assessment of impacts of the KHP to tribal cultural resources.

2. The Board Must Consider How KHP Water Quality Impacts Affect the Tribe's Federally Protected Rights to a Healthy Fishery

The Yurok people are totally reliant on the Klamath River salmon fishery for survival. The courts have acknowledged that the Klamath River Indian fishery is "not much less necessary to the existence of the [Yurok] Indians than the atmosphere they breathed."[2] Prior to the arrival of non-Indians in the 19th century, the Klamath River fishery provided significant economic value such that Yurok Indians were self-sufficient and considered to be people of wealth. In fact, noted anthropologist Alfred Kroeber labeled Yurok as "Salmon People of the Northwest Coast."

The fishing rights of the Yurok Tribe are well-established as a matter of federal law. The Yurok Reservation was created pursuant to an 1855 Act of Congress with the specific purpose of providing a territory in which the Tribe's fishing-based culture and way of life could persist. This fact has been recognized repeatedly since the Reservation was established, by the Department of the Interior, the United States Supreme Court, the lower federal courts and the California Courts.[3] The Ninth Circuit has confirmed that the Executive Orders that created the present-day Yurok Reservation vested the Yurok Tribe with "federally reserved fishing rights."[4]

The KHP has contributed to significant detrimental impacts to the Tribe's federally reserved fishing rights. It has blocked hundreds of miles of once viable salmon habitat, altered geomorphic and hydrologic processes in a manner that compromises downstream habitats, and deteriorated water quality to a point that threatens existing fish populations. In

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[2] *Mattz v. Arnett,* 633 F.2d 906, 909 (9th Cir. 1981), 412 U.S. 481 (*quoting United States v. Winans,* 198 U.S. 371, 381 (1905)).

[3] *See, e.g., United States v. Eberhardt*, 789 F.2d 1354 (9th Cir. 1986); *United States v. Wilson*, 611 F. Supp. 813 (N.D. Cal. 1985), *rev'd on other grounds sub. nom., Eberhardt*, 789 F.2d 1354; *Pacific Coast Federation of Fishermen's Assoc. v. Sec'y of Commerce,* 494 F. Supp. 626 (N.D. Cal. 1980); *Mattz v. Arnett*, 412 U.S. 481, 487 (1973); Memorandum Opinion of the Solicitor, John D. Leshy ("Solicitor's Opinion"), M-36979 (October 4, 1993).

[4] *Parravano v. Masten,* 70 F.3d 539, 541 (9th Cir. 1996), *cert. denied*, 518 U.S. 1016, (1996).

its review, the Board must carefully examine how KHP water quality impacts jeopardize the fishery that is central to Yurok existence.

3. The Tribe Largely Supports the Conclusions from the Secretarial Determination EIS/EIR with a Few Notable Exceptions the Board Should Address in its EIR

In general, we support the analyses and conclusions of the Klamath Facilities Removal EIS/EIR prepared for the Secretarial Determination of the KHSA and its analyses (SDFEIS), and urge the SWB to use this information as appropriate as a basis for the 401 water quality certification and associated EIR. There are, however, several substantial areas in the SDFEIS in which we believe the analyses were flawed or the SDFEIS understated the water quality impacts of the continued presence of the dams to fish. Many of the SDFEIS analyses contemplates all TMDL's being met in the near future, which may or may not be the case in this EIR process. This causes a systematic underestimation in the SDFEIS of the ongoing water quality impacts. However, many of the analyses contained in the SDFEIS are still useful.

a. The SDFEIS Understates Impacts of "No Action" Alternative on Fish Populations

A recurring theme in the SDFEIS is that under the "no action" alternative the status of the fisheries resources on the Klamath River would remain static and at current depressed levels. While we concur that the dams are depressing fish populations, we believe that the KHP has been contributing to the decline of the fishery for quite some time, and that it is possible for the fishery to decline further and for certain species (i.e. coho salmon) and runs (i.e. spring Chinook salmon) to descend to extinction. The Board must ensure that the analysis of the no action alternative in the current EIR reflects this possibility.

b. SDFEIS Overstates Worst-Case Impacts of Sediment Flush from Dam Removal

The SDFEIS makes an attempt to characterize "most likely" and "worst-case scenario" suspended sediment concentrations (SSC's), resulting from facilities removal, but this attempt is insufficient. The method used in the SDFEIS leads to erroneously overstated effects to the river from suspended sediments mobilized by dam removal. The method used runs each year of the 48 year period of record through a sediment model to estimate corresponding SSC's. Each day's results are then rank-ordered, and the top 10% is selected. Each day's 10 percentile flow is then used to construct a "worst case" estimate. Such an analysis is statistically indefensible. Using independently derived estimates of exceedance probabilities and joining them together is deeply flawed and is not scientifically defensible. Although it is useful to analyze a worst-case scenario, the analysis must be accurate, and in the SDFEIS, due to the statistical treatment of the data, the worst case scenario analysis is not accurate.

In addition, a "best case" scenario should be added if a "worst case" scenario is evaluated. This will allow for a proper risk-management decision. It is not proper to be "conservative" toward one outcome or another, but the document and analysis should simply present a range of possibilities and their likelihoods according to the best available information.

A remedy for this error might be to determine for each year in the period of record (for the sediment model output) the duration of SSI over a given threshold. From those durations, you could then calculate a 10% exceedance for time spent over that threshold. For example: calculate the number of days for every year in the modeled period of record that the river at point X spends over 1000 ppm. Sort the number of days over the threshold of interest in each year high to low, and from there, select the 10%, 50%, 80%, time durations over the threshold that would represent best, most likely, and worst-case scenarios. Repeat process for other thresholds of interest or relevant to sediment exposure model for fisheries.

The Yurok Tribe raised this point in the administrative draft of the SDFEIS and the public release draft, but no corrective action has been taken with regards to this point. The statistical analysis remains deeply flawed. We urge the Board to adopt a more defensible approach to assessing the impacts of dam removal. If SWB staff have questions on this important point, please contact the Yurok Tribe for clarification.

4. The Board must carefully evaluate the KHP Impacts on Toxic Algae, and the Unique Risk Faced by Tribal Members Because of Its Presence in the River

The Tribe urges the Board to carefully evaluate the impacts of the KHP on the presence of microcystin in the River, and more importantly the feasibility of suggested mitigation measures to remedy the problem. It is the Tribe's opinion that there are no alternatives, besides dam removal, that will effectively reduce the prevalence of toxic algae in the lower Klamath to meet water quality standards, and mitigate the health risk caused by its presence.

The concern that cyanobacterial diseases may be contributing to stress levels in adult fish and shellfish is addressed in the SDFEIS on page 3.3-45.

> *Algae produced in Upper Klamath Lake and the reservoirs in the Klamath Hydropower Reach (Copco 1 and Iron Gate Reservoirs) may be deleterious to the health of aquatic organisms in Upper Klamath Lake and the Klamath River. Some cyanobacteria species, such as M. aeruginosa, produce toxins that can cause irritation, sickness, or in extreme cases, death to exposed organisms (see Section 3.2.3.7 and Appendix C, Section C.6). While direct links to fish health are still somewhat unclear, recently collected data from the Klamath Basin indicates that algal toxins bioaccumulate in tissue from fish and mussels at concentrations that may be detrimental to the affected species (Fetcho 2011).*

For the Yurok People, it's not just the animals themselves, but the people who rely on them that are at risk. Samples collected in 2007 and again in 2009 indicate microcystin bioaccumulation in traditionally significant freshwater mussels from the Klamath River below Iron Gate at levels that exceed established public health advisory values for consumption. (Kann 2008, OEHHA 2008, Kann et al. 2010). Such bioaccumulation levels in the lower river occurred despite very low ambient microcystin concentrations, indicating that even when ambient concentrations do not exceed public health guidelines, shellfish may still be unsafe for consumption. Although only limited data are available regarding the concentrations of microcystin toxins in tissues of Klamath Basin salmonids, tissue samples collected by the Karuk Tribe also showed that Klamath River salmonids (chinook salmon

and steelhead) were exposed to microcystin and that bioaccumulation in liver tissue occurred with concentrations in several fish livers exceeding public health guideline values (Kann et al. 2013).

Yurok Tribal members face additional exposures and adverse impacts in ways not accounted for in most risk assessments, which model exposures largely received in mainstream, urban and suburban settings and do not consider the extent of tribal environmental contact through extended length of daily contact time and the cumulative exposure throughout their lifetime. Tribal members are at risk in all aspects of daily life: during recreational, subsistence, cultural, ceremonial and commercial fishing use of the River; from inadvertently inhaling aerosolized toxins; ingesting contaminated water; absorption of toxins through their skin and through the ingestion of contaminated fowl, fish, shellfish and other subsistence foods. Recent studies also indicate cyanotoxins can bioaccumulate in terrestrial plants (Corbel 2014), creating health risks for Tribal members harvesting riparian plant materials through traditional methods. Choosing not to go to the River or using river resources when toxins are present is simply not an option for the Yurok People.

With the goal of improving water quality within Copco and Iron Gate Reservoirs and the Klamath River downstream, PacifiCorp has conducted a series of interim measures under the Klamath Hydroelectric Settlement Agreement (KHSA) and developed a Reservoir Management Plan (RMP) (PacifiCorp 2014). These measures focus on issues external to the dam operations, rather than the significant contribution of the dams themselves in creating the lacustrine habitat required for the large and toxic cyanobacteria blooms that currently dominate. Despite the purpose of the RMP to help to improve water quality in the Klamath River below the Project reservoirs by reducing nutrient loads upstream (PacifiCorp 2015), no data or evidence are provided for how the proposed techniques will reduce toxic cyanobacteria blooms to meet water quality standards and public health thresholds.

The menu of experiments and water quality improvement measures fall far short of what would be needed to comply with California's water quality standards. Despite a decade of experimentation and study, PacifiCorp has yet to offer a specific plan for how a combination of techniques could be jointly implemented to actually meet water quality standards. There are no feasible means besides dam removal for mitigating toxic cyanobacterial blooms, one of the KHP's most consequential water quality impacts for Yurok Tribal members. The Board should take special consideration of the daily exposure risk of Yurok Tribal members when assessing the KHP impacts on toxic algae.

5. Additional Issues for the Board's Consideration

In addition to the issues identified above, the Board should incorporate the following issues into its environmental review:

a. KHP Impacts on Temperature

The KHP raises temperatures significantly at Iron Gate Dam, Copco 1 and Copco2 during the fall migration period for Chinook salmon due to the thermal inertia of the dams as they retain summer heat through the fall release period. One of the effects of raised

temperatures during the fall migration is a shift in run timing for fall-run Chinook salmon. A comparison of the peak of fall Chinook salmon entry timing into the Klamath River estuary from the 1920's until today (Yurok Tribal harvest data, Snyder 1931, Strange 2012) shows that the run currently peaks about three weeks later than it used to, which coincides nearly exactly with the phase shift of high temperatures due to the presence of the reservoirs.

This shift in run timing in turn causes a "pause" in fish migration through the lower Klamath River in most years (Strange 2012). This pause in migration is hypothesized to lead to higher fish densities as later returning fish and Trinity River fish join in the lower river, which then leads to higher risk of fish disease outbreaks in the lower river. The risk of outbreaks of ich and columnaris such as happened during the catastrophic fish kill event of 2002, and again in 2014 and 2015, are thus increased due to the altered temperature regime in the area of Iron Gate Dam and its selective effect on migration rates.

In addition, because the fish now spawn later, they also hatch later, which leads to later outmigration and rearing. Juvenile salmonids, especially fall-run Chinook salmon, now outmigrate during a time of rapidly rising water temperatures. When combined with high spawning densities due to the migration barrier at Iron Gate Dam, overly stable geomorphology from the presence of the dams, and steady-state flow management, this creates the "perfect storm" for disease conditions on the Klamath River. It is very likely that the fall temperature increase leads to a "domino effect" situation which exacerbates an already serious disease condition on the Klamath.

PacifiCorp, in its FERC license application, determined that the cold water pool in Iron Gate Dam was insufficient to provide for cold water releases for any appreciable period of time, and that the deeper, colder water was deficient in dissolved oxygen. Thus there is no mitigation for the temperature-related water quality impact to the river, besides dam removal.

b. <u>KHP Impacts on Disease Below Iron Gate Dam</u>

Cold water fisheries are a beneficial use of the waters of the Klamath River below Iron Gate Dam. Therefore, the overall effects of the dams' presence on fisheries, including geomorphic effects, must be incorporated into the Board's water quality analysis. The presence of the dams contributes to a stable geomorphic environment with stable winter flows. Stable geomorphic conditions have led to an increase in the polychaete host for two diseases that affect Chinook and coho salmon, *Ceratonova shasta* and *Parvicapsula minibicornis.*

In 2015, over 90% of juvenile fish from the upper portion of the Klamath River were infected with these lethal diseases (Bartholomew 2016 unpublished data). The losses to the 2015 year class are not known exactly, but are presumed to be significant if not catastrophic.

We agree with FERC's assessment of the dam's contribution to the fish diseases in the mainstem Klamath River below Iron Gate Dam (FERC 2007 as quoted on page 3.3-44 of SDFEIS)

> *FERC (FERC 2007) concluded that Klamath Hydroelectric Project has likely contributed to conditions that foster disease losses in the Lower Klamath River by (1) increasing the density of*

spawning adult fall Chinook salmon downstream from Iron Gate Dam; (2) promoting the development of attached algae beds that provide favorable habitat for the polychaete alternate host for C. shasta, with P. minibicornis; and (3) contributing to water quality conditions that increase the stress level of juvenile and adult migrants and increase their susceptibility to disease. The water quality conditions that may increase stress levels include: (1) increased water temperatures in the late summer and fall; (2) elevated ammonia concentrations and swings in DO and pH associated with algal blooms in project reservoirs; and (3) effects of exposure to elevated levels of microcystin produced from microcystis blooms in Project reservoirs, which may also result in direct mortality.

As is the case for all issues raised in our comments, there is no mitigation measure available besides dam removal to adequately address the water quality impacts of the dams' effects on geomorphic conditions.

c. Climate Change

The Yurok Tribe is very concerned about the potential impacts of climate change on Yurok lands and the Klamath River and its resources, specifically to culturally significant species and the habitats and ecosystems that support them.

In spite of being located in a region that receives significant precipitation, changes in hydrology, temperatures and precipitation type (rain or snow), timing and intensity have the potential to disrupt the availability and reliability of key resources upon which many tribal members still rely for drinking water, subsistence foods, cultural and ceremonial activities. The lack of adequate infrastructure, and heavy reliance on Reservation surface waters and vulnerable aquatic resources, puts the Yurok Tribe at significant risk of adverse tribal health outcomes resulting from changes in temperature and water quality; changes that are exacerbated by KHP operations. Impacts include the potential loss of safe and reliable subsistence foods, exposures to water-borne pathogens through surface waters, increased exposure to toxic algae, and increased community health risks associated with an increase in extreme weather events such as floods, tidal surges, erosion from sea level rise, landslides, droughts and wildfire. The Yurok Tribe asks the Water Board to consider the effects of climate change on an ecosystem wide level as they relate to Klamath River water quality and meeting the objectives of prescribed beneficial uses.

For fisheries resources, dam removal is a key strategy to ensure the long term survival of the anadromous fish runs of the Klamath River. Substantial cold water resources lie upstream of Iron Gate Dam, including springs at Fall Creek, Copco, Big Springs near JC Boyle, Spencer Creek, Upper Klamath Lake, Wood River, the Williamson including Spring Creek, and more. These areas will remain cold during the summer period even as snowpack dwindles from the effects of climate change (Tague 2008). Access to these areas, and the ability for this cold water to make its way downriver without interceding reservoirs is crucial for the long term survival of the fisheries resources of the Klamath River.

6. Conclusion

The Tribe appreciates the opportunity to provide input on the Board's water quality certification of the KHP FERC relicensing, and looks forward to working with the Board to

fully mitigate the effects of the KHP to meet state water quality standards. The Tribe is happy to provide any additional data and information you may find useful in your review. If you have any questions please contact Rebecca McMahon, Deputy General Counsel for the Yurok Tribe at (707) 482-1350.

Wok-hlew',

James Dunlap,
Chairman

Water Quality & Other Relevant Reports

There are several reports the Tribe would like the Water Board to review while drafting their Environmental Review. Several have been included in these written comments as attachments. Relevant water quality documents from the Yurok Tribe can be found on YTEP's portion of the Tribal website at: http://www.yuroktribe.org/departments/ytep/index.htm, and on the Klamath Tribal Water Quality Consortium's website http://klamathwaterquality.com/documents.html. Any report listed below that is not attached or available online is available upon request of Yurok Tribal staff.

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Review

Cyanobacterial toxins: Modes of actions, fate in aquatic and soil ecosystems, phytotoxicity and bioaccumulation in agricultural crops

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HIGHLIGHTS

- Phytotoxic effects of cyanotoxins on agricultural plants have been updated.
- We report mechanisms of cyanotoxins and target molecules in vegetable organisms.
- The effects of cyanotoxins in the terrestrial environment is particularly scarce.
- We describe fate of cyanotoxins in aquatic and soil ecosystems.
- We examine bioaccumulation of cyanotoxins in vegetable foods.

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ABSTRACT

The occurrence of harmful cyanobacterial blooms in surface waters is often accompanied by the production of a variety of cyanotoxins. These toxins are designed to target in humans and animals specific organs on which they act: hepatotoxins (liver), neurotoxins (nervous system), cytotoxic alkaloids, and dermatotoxins (skin), but they often have important side effects too. When introduced into the soil ecosystem by spray irrigation of crops they may affect the same molecular pathways in plants having identical or similar target organs, tissues, cells or biomolecules. There are also several indications that terrestrial plants, including food crop plants, can bioaccumulate cyanotoxins and present, therefore, potential health hazards for human and animals. The number of publications concerned with phytotoxic effects of cyanotoxins on agricultural plants has increased recently. In this review, we first examine different cyanotoxins and their modes of actions in humans and mammals and occurrence of target biomolecules in vegetable organisms. Then we present environmental concentrations of cyanotoxins in freshwaters and their fate in aquatic and soil ecosystems. Finally, we highlight bioaccumulation of cyanotoxins in plants used for feed and food and its consequences on animals and human health. Overall, our review shows that the information on the effects of cyanotoxins on non-target organisms in the terrestrial environment is particularly scarce, and that there are still serious gaps in the knowledge about the fate in the soil ecosystems and phytotoxicity of these toxins.

Contents

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1. Introduction

In light of global climate change, and particularly measurable rises in global temperature, as well as increased fluxes of certain nutrients (i.e., nitrates, phosphates) brought either by agricultural run-off or by sewage treatment plants and other anthropogenic sources, it has been suggested that cyanobacteria, including toxin-producing taxa, may be increasing in abundance, and thus represent an emerging human and environmental health concern (For review see in O'Neil et al., 2012). The presence of such toxins has been reported throughout the world and it appears that liver-toxic microcystins are more commonly found in 40–75% cyanobacterial blooms (Sivonen and Jones, 1999). The contamination of surface waters by these cyanotoxins can cause water quality problems for fisheries, aquaculture, farming, and sanitary hazard for human and animals. Humans are exposed to cyanobacteria toxins through many routes, including drinking water, recreational contact, and health food products made from cyanobacteria, and food chain. In recent years, several cyanobacterial toxins were investigated in regard to their ability to enter the food chain *via* freshwater seafood (Ibelings and Chorus, 2007; Ettoumi et al., 2011), however, their ability to enter the food chain *via* agricultural crops has not been thoroughly investigated to date. Although no case of poisoning by these products has been reported in the literature, this eventuality must not be ignored. Indeed, a recent epidemiological study showed that the excessive incidence of amyotrophic lateral sclerosis in the population of the islands of Guam in the Pacific was linked to a consumption of the seeds of cycas contaminated by a neurotoxin, β-methylamino-L-alanine (BMAA), produced by a species of cyanobacteria of the genus *Nostoc* living in symbiosis in the roots of this plant (Banack and Cox, 2003; Cox et al., 2003; Murch et al., 2004; Steele and McGeer, 2008). This last cited fact is gaining importance since plants could in a direct or indirect manner contribute to food chain cyanotoxin's transfer, and by the way constitute a potent health risk source. Indeed, numerous studies reported that both submerged and emergent aquatic plants have been shown to absorb microcystins from low external concentrations (Pflugmacher et al., 1998, 2001; Yin et al., 2005; Saqrane et al., 2007). In terrestrial plants, Codd et al. (1999) reported that spray irrigation of commercial lettuce (*Lactuca sativa*) plants with water containing *Microcystis* resulted in colonies and single cells of the cyanobacterium being lodged on the leaves 10 d after the last irrigation. MC-LR was present at 2.5 mg kg^{-1} dry weight (DW) in the central leaves, 0.833 mg kg^{-1} (DW) in the distal zone of mature leaves, and 0.094 mg kg^{-1} (DW) in the basal zone of mature leaves. The last study indicated that toxins were absorbed by the plant as the central leaves would have been protected from irrigation. Similar conclusions were reached for rice (*Oryza sativa*) and rape (*Brassica napus*) by Chen et al. (2004). Therefore, the accumulation of cyanotoxins in the terrestrial food chain is at present remains more worrying and the proposed quality limits are rare, indeed, many aspects concerning these toxins are particularly scarce, notably those relative to the fate of cyanotoxins in the soil ecosystems and their toxicity and bioaccumulation on agricultural crops.

There have been several reviews of the intensification and global expansion of harmful cyanoabcterial blooms in terms of abundance, geographic extent, factors that may be promoting this expansion, and prevention and management of cyanobacteiral blooms and their toxins, as well as effects on aquatic ecosystem health and transfer on food webs (Wiegand and Pflugmacher, 2005; Ibelings and Chorus, 2007; Paerl and Huisman, 2009; Aráoz et al., 2010; Kinnear, 2010; Merel et al., 2010; Jančula and Maršálek, 2011; O'Neil et al., 2012). However, the purpose of this review is to: (1) Highlight important findings of the last decade of modes of actions of cyanotoxins in humans and mammals and occurrence of target biomolecules in vegetable organisms; (2) Describe the fate of cyanotoxins in aquatic and soil ecosystems and focus in their phytotoxicity; and (3) Emphasize bioaccumulation of these toxins in vegetable foods and its consequences on animals and human health.

2. Cyanotoxins and their producers

Recent research suggests that eutrophication and climate change are two processes they may promote the proliferation and expansion of harmful cyanobacterial blooms in freshwater, estuarine, and marine ecosystems. These microorganisms are known to biosynthesize a wide range of chemical classes of secondary metabolites such as peptides, macrolides, and glycosides (Patterson et al., 1994; Namikoshi and Rinehart, 1996) possessing a number of bioactivities: antiviral (Patterson et al., 1993, 1994), antifungal (Patterson et al., 1994), cytotoxic (Patterson et al., 1991), enzymatic inhibitor (Honkanen et al., 1995), antineoplastic (Moore, 1996), and allelopathic (Pushparaj et al., 1998). However, some of these cyanobacterial secondary metabolites encompass a diversity of alkaloid and peptide cyanotoxins which have been suggested to both pose threats to human and environmental health worldwide (Hawkins et al., 1985; Carmichael and Falconer, 1993; Kuiper-Goodman et al., 1999; Sivonen and Jones, 1999; Hitzfeld et al., 2000; Ettoumi et al., 2011). Toxic cyanobacteria that have been involved in such incidents belong essentially to the genera *Microcystis*, *Anabaena, Aphanizomenon, Planktothrix, Oscillatoria, Cylindrospermopsis* and less often *Gomphosphaeria*, *Coelosphaerium, Gloeotrichia*, *Nodularia* and *Nostoc* (Hawkins et al., 1985; Sivonen and Jones, 1999). The cyanotoxins are essentially endotoxins which can be released in the environment following a cellular lyse (Codd et al., 1989) or following treatment of cyanobacterial blooms with algaecides (Kenefick et al., 1993). They can be classified into four families according to the organs on which they act: neurotoxins (nervous system), hepatotoxins (liver), cytotoxins (several organs: liver, kidneys, adrenal glands, small intestine), and dermatotoxins (irritant toxins).

Cyanobacterial neurotoxins are divided in three groups: anatoxins (anatoxin-a, homoanatoxin-a, and anatoxin-a(s)), saxitoxins,

and the neurotoxic amino acid L-beta-N-methylamino-L-alanine (BMAA). Anatoxins and the BMAA are specific of cyanobacteria, while, saxitoxins are also synthesized by some marine dinoflagellates and associated with the human disease paralytic shellfish poisoning or PSP (Falconer, 1991; Carmichael, 1994; Kaebernick and Neilan, 2001). By contrast to the other neurotoxins which production depends on the phylogeny of the species, the BMAA can be produced by almost all groups of cyanobacteria from freshwater, brackish, and marine environments (Cox et al., 2005; Banack et al., 2007). Hepatotoxins are divided into two groups: Microcystins (MCs), cyclic heptapeptide hepatotoxins (MW 900–1200), that are regarded as the most frequently occurring and widespread of the cyanotoxins with more than 80 MC variants already reported (Sivonen and Jones, 1999; Cox et al., 2005; del Campo and Ouahid, 2010); and nodularins (MW 800–900) composed of five amino acids with only nine different natural analogs have been characterized (De Silva et al., 1992; Namikoshi et al., 1993; Rinehart et al., 1994; Codd et al., 2005). The hydrophilic alkaloid cytotoxin, cylindrospermopsin (MW 415) has been identified in the freshwater cyanobacteria *Cylindrospermopsis raciborskii* (Ohtani et al., 1992), *Umezakia natans* (Harada et al., 1994), *Aphanizomenon ovalisporum* (Sivonen and Jones, 1999), *Anabaena* sp. (Schembri et al., 2001), and *Raphidiopsis* sp. (Li et al., 2001). Today, only two congeners of cylindrospermopsin have been identified: 7-epicylindrospermopsin and deoxycylindrospermopsin. The freshwater cyanobacterial irritant toxins such as lipopolysaccharides (LPS), or endotoxins as they are commonly called, are major components of the cell wall in most Gram-negative bacteria including cyanobacteria (Jann and Jann, 1984; Mayer and Weckesser, 1984; Kaya, 1996; Stewart et al., 2006).

3. Modes of actions in humans and mammals and occurrence of target biomolecules in vegetable organisms

3.1. Neurotoxins

Anatoxin-a is a potent postsynaptic depolarizing neuromuscular blocking agent that affects both nicotinic and muscarinic acetyl cholineacetylcholine receptors (Carmichael et al., 1979; Spivak et al., 1980). It acts as a depolarizing neuromuscular blocking agent mimicking the action of acetylcholine. However, this neurotoxin is not degraded by the acetylcholinesterase, and consequently its action on the muscular cells does not stop and, due to being stimulated, these cells are blocked and thereby resulting to muscle paralysis (Carmichael, 1994; Lilleheil et al., 1997). When the respiratory muscles are affected, the insufficient oxygenation of the brain engenders convulsions and the oppression (Carmichael, 1994; Humpage et al., 1994). The LD_{50} (lethal dose resulting in 50% deaths) of this neurotoxin is 200 μg kg^{-1} (mouse, i.p.) (Carmichael et al., 1979; Skulberg et al., 1992). Homoanatoxin-a is a homologue of anatoxin-a, that was reported to be a potent nicotinic agonist (Wonnacott et al., 1992). It enhances the release of acetylcholine from peripheral cholinergic nerves through opening of endogenous voltage dependent neuronal L-type calcium channels (Aas et al., 1996; Lilleheil et al., 1997). Despite the similarity in their names, anatoxin-a(s) and anatoxin-a are not structurally related and exhibit different physiological properties. Anatoxin-a(s) belongs to the organophosphate class of neurotoxins and it acts as an irreversible inhibition of acetylcholinesterase at the nerve synapse (Mahmood and Carmichael, 1986, 1987). The LD_{50} (mouse, i.p.) of this toxin is about 20–40 μg kg^{-1} (Mahmood and Carmichael, 1987; Matsunaga et al., 1989; Carmichael et al., 1990). In animals, the mechanisms of action of PSP toxins (saxitoxins) are based on the blockage of sodium conductance in axons (Kao et al., 1967; Henderson et al., 1973). They so inhibit the transmission of the electric activity and prevent the liberation of the acetylcholine (Nishiyama, 1968). Their toxicity is more important than that of anatoxins with a LD_{50} (mouse, i.p.) in the same conditions for the saxitoxin of 10 μg kg^{-1} (Gorham and Carmichael, 1988). Saxitoxins can also bind to calcium (Ca^{+2}) and K^+ channels, interfering with the speed of opening and closing of these channels, which can in turn lead to alteration in the influx of ions to the cell (Wang et al., 2003; Su et al., 2004). In addition, the Na^+-channel blockage may alter the selective permeability of the membrane and may change the flow of ions, leading to damage to cellular homeostasis (Hille, 1992; Jablonski et al., 2007). Concerning the neurotoxic amino acid (BMAA), it acts in mammals as a glutamate agonist at AMPA, kainite and NMDA receptors (Spencer et al., 1986, 1987; Andersson et al., 1997; Seawright et al., 1999). Consequently, it increases the intracellular concentration of calcium in neurons and induces neuronal activity by hyperexcitation (Brownson et al., 2002). To our knowledge, no data regarding the toxicity of cyanobacterial neurotoxins in higher plants have been reported. However, interfering of some of them such as saxitoxins with the speed of opening and closing of Na^+, Ca^{2+} and K^+ channels could modify ions transport in plant cells. For example, a modification of sodium signals can modify osmotic pressure in cells or the assimilation of CO_2 for C4 plants (Brownell and Crossland, 1972). While sodium extrusion in animal cells and microorganisms (including yeast) is directly energized by ATP hydrolysis (Na^+-ATPases), these Na^+ pumps are absent from higher plants (Horie and Schroeder, 2004).

3.2. Hepatotoxins

Cyanobacterial hepatotoxins type microcystin-LR are generally not able to penetrate vertebrate cell membranes and therefore, require uptake via the bile acid transport system present in hepatocytes and cells lining the small intestine (Runnegar et al., 1991). As a result of this, toxicity of these cyanotoxins is restricted to organs expressing the organic anion transporter on their cell membranes such as the liver (Fischer et al., 2005). However, in vegetable cells one relatively unexplored question regarding these toxins concerns the mechanism of uptake, particularly the variants that would be predicted to be membrane impermeable based on polarity. They may cross cell membranes of plants by other mechanisms, including diffusion or by root absorption. Pflugmacher et al. (2001) have been reported that when the emergent reed plant *P. australis* was exposed to 0.5 μg of ^{14}C-labeled microcystin-LR L^{-1} for 3 d, it demonstrated a rapid uptake (since 0.5 h) of the toxin. The main uptake route appeared to be in the stem and rhizome, from which the toxin is transported into the higher parts of the plant to the leaves. Uptake directly through the leaves may also occur by direct contact of small plants or by the lowest leaves of a plant with surface water and with upper leaves by wave and spray contact (Pflugmacher et al., 2001). Once in both vertebrate and vegetable cells, microcystins and nodularins have been shown to be potent and specific inhibitors of protein phosphatases 1 and 2A, and this inhibition accounts for their extreme toxicity (MacKintosh et al., 1990; Kurki-Helasmo and Meriluoto, 1998; Hastie et al., 2005). Those proteins are involved in several physiological and molecular processes in higher plants (Sheen, 1993; Takeda et al., 1994). Indeed, numerous studies reported that microcystins have several perturbatory effects on plant physiology and metabolism, when sufficient levels of toxin enter the plant cells (MacKintosh et al., 1990; Siegl et al., 1990; Sheen, 1993; Yamasaki, 1993; Smith et al., 1994; Takeda et al., 1994; Abe et al., 1996; Smith, 1996; Kurki-Helasmo and Meriluoto, 1998; Weiss et al., 2000; McElhiney et al., 2001; Pflugmacher, 2002; Romanowska-Duda and Tarczyńska, 2002; Gehringer et al., 2003; Chen et al., 2004, 2011; Mitrovic et al., 2005; Saqrane et al., 2007, 2008; Stüven and Pflugmacher, 2007; Järvenpää et al.,

2007; Jang et al., 2007; Peuthert et al., 2008; Máthé et al., 2009; Huang et al., 2009; El Khalloufi et al., 2011, 2012; Jámbrik et al., 2011; Perron et al., 2012). On the other hand, several studies have also reported that these hepatotoxins induce oxidative stress in mammal cells (Žegura et al., 2003; Botha et al., 2004; Bouaïcha and Maatouk, 2004; Puerto et al., 2010). Therefore, their toxicity on aquatic plants seems to be also more linked to the induction of oxidative stress manifested by elevated reactive oxygen species (ROS) production and malondialdehyde (MDA) content (Lefevre et al., 1950; Pflugmacher, 2004; Hu et al., 2005; Leflaive and Ten-Hage, 2007).

3.3. Cytotoxins

The alkaloid cylindrospermopsin (CYN) is known as a general cytotoxin that blocks protein synthesis in mammal cells (Runnegar et al., 1995; Froscio et al., 2001, 2003). Implications of this effect can be also observed in vegetable cells. In fact, Froscio et al. (2008) reported that CYN was shown to inhibit the eukaryotic protein synthesis apparatus with similar potency in plant and mammalian cell extracts, IC50 of 334 nM in wheat germ extract and 110 nM in reticulocyte lysate. Metcalf et al. (2004) also showed that CYN inhibited pollen germination in tobacco plants (*Nicotiana tabacum*), with partial inhibition of protein production in the germinating pollen tubes following exposure to 138 μg mL^{-1} of toxin.

4. Environmental concentrations of cyanotoxins in freshwaters and fate in aquatic and soil ecosystems

4.1. Environmental concentrations of cyanotoxins

The occurrence of cyanobacterial toxins was reported throughout the world in surface waters, where hepatotoxic microcystins are more commonly found in 50–75% cyanobacterial blooms (Ettoumi et al., 2011). Data on environmental concentrations of cyanotoxins have been compiled and reviewed in numerous papers (Sivonen and Jones, 1999; Falconer and Humpage, 2006; Van Apeldoorn et al., 2007; Messineo et al., 2009). In this review, we give a summary on environmental concentrations focusing on irrigation waters with the ultimate aim to relate them to phytotoxicological data. Cyanotoxins are intracellular toxins contained within living cells, depending on both the nature of the toxin and the growth stage (Jungmann et al., 1996; Orr and Jones, 1998; Park et al., 1998a,b; Sivonen and Jones, 1999). They are only released into the water, to form dissolved toxin, during cell senescence or cell death and lysis or through water treatment processes such as algaecide application, rather than by continuous excretion (James and Fawell, 1991; Gupta et al., 2001; Babica et al., 2006). The highest total (intracellular plus dissolved) cyanotoxin levels have been found in blooms and scums. For example, total MC concentrations in surface waters vary from trace to several milligrams per liter, being strongly influenced by the occurrence of these forms of cyanobacterial biomass. In surface waters used as irrigation source, total MC concentrations of 4–50 μg L^{-1}, up to 6500 μg L^{-1}, have been reported in multiple locations, including but not limited to the Morocco (Oudra et al., 2001), Tunisia (El Herry et al., 2008), India (Prakash et al., 2009), Turkey (Gurbuz et al., 2009), and Finland (Spoof et al., 2003), but much higher levels up to 29 000 μg L^{-1} in Algeria (Nasri et al., 2008) (Table 1). It should be noted, however, that these very high concentrations of cyanotoxins would be from scums or from very dense cyanobacterial biomass. In the field, water samples with more than 1 μg L^{-1} total MCs, dissolved fraction did not comprise more than 10% of the combined intra and extracellular pool (Lindholm and Meriluoto, 1991; Jones and Orr, 1994; Tsuji et al., 1996; Ueno et al., 1996; Lahti et al., 1997). As well in some laboratory studies, where both intracellular and extracellular cyclic peptide toxins and STXs have been measured, it is generally the case that in healthy log phase cultures, less than 10–20% of the total toxin pool is dissolved in the culture medium (Sivonen et al., 1990; Lehtimaki et al., 1997; Negri et al., 1997; Rapala et al., 1997). On the contrary, CYN may often be found at higher levels in dissolved form than within cells, as it readily leaks from cells under normal growth conditions (Norris et al., 2001; Falconer and Humpage, 2006; Wörmer et al., 2008). For example, Shaw et al. (1999) found that in two instances of *A. ovalisporum* blooms around 80% of the total toxin content of the water was in free solution. Recently, Messineo et al. (2009) reported that in several Italian lakes of different characteristics and human uses, extracellular concentrations of total CYN varied from non-detectable values up to 126 μg L^{-1}. However, limited or no information is available about the proportion of dissolved form with respect to the total level for the cyanobacterial neurotoxins.

4.2. Fate in aquatic and soil ecosystems

Once they enter in aquatic and soil ecosystems, cyanotoxins can be removed according to various processes such as photochemical degradation by UV, adsorption in particles in suspension or onto sediments, and biodegradation (Tsuji et al., 1994; Rapala et al., 1994; Lahti et al., 1996; Chiswell et al., 1999; Welker and Steinberg, 1999; Kaebernick and Neilan, 2001; Mazur-Marzec et al., 2006; Wörmer et al., 2008; Burns et al., 2009; Klitzke et al., 2010, 2011; Thirumavalavan et al., 2012). However, the four groups of cyanotoxins: hepatotoxins, neurotoxins, cytotoxins, and dermatotoxins, exhibit quite different chemical stabilities in these ecosystems. Hepatotoxin cyclic peptide cyanotoxins, microcystins and nodularins, are extremely stable compounds and may persist in aquatic systems for weeks after being released from the cells (Jones and Orr, 1994; Chen et al., 2008; Edwards et al., 2008). According to other studies, these toxins in natural conditions could persist for several months or years (Harada et al., 1996; Sivonen and Jones, 1999). However, numerous studies reported that photochemical degradation by sunlight UV and exposure to degrading bacteria may speed up their removal from the water (Bourne et al., 1996; Heresztyn and Nicholson, 1997; Sivonen and Jones, 1999; Park et al., 2001; Song et al., 2009; Ho et al., 2012). The photodegradation of MCs in full sunlight can take as little as two weeks or longer than six weeks, depending on the presence of water-soluble cell pigments (Tsuji et al., 1994; Welker and Steinberg, 2000). More recently, Thirumavalavan et al. (2012) showed in a laboratory experiment that the presence of humic acid and turbidity affected the photo-degradation process. Additionally, in sea water the rate of nodularin photolysis can be accelerated by the presence of some cell components and humic substance (Welker and Steinberg, 1999). Conversely, during the benthic phase, the photodegradation of these cyanotoxins is expected to be almost negligible due to low radiation penetration (Wörmer et al., 2010). In fact, Welker and Steinberg (2000) found that the half-life of MCs in the deep lakes is longer than the season of cyanobacteria growth, what suggests that the photolysis is significant only for shallow lakes. The alkaloid cytotoxin, CYN, is relatively stable in the dark; however, in sunlight and in the presence of cell pigments degradation occurs quite rapidly with more than 90% within 2–3 d (Chiswell et al., 1999). The neurotoxin, anatoxin-a, is also relatively stable in the dark, but it undergoes rapid photochemical degradation in sunlight particularly in alkaline conditions, even in the absence of cell pigments (Stevens and Krieger, 1991; Smith and Sutton, 1993). However, no data are available for other cyanobacterial neurotoxins and LPS dermatotoxins.

Cyanotoxins can also be retained on suspended particles or onto sediments in aquatic systems. Wörmer et al. (2011) showed the

Table 1
Overview of some published cyanobacterial toxin concentrations from various countries. Concentrations are presented in μg g^{-1} dry weight (DW) or else in μg L^{-1} as indicated.

Country	Location	Use	Type	Concentrations (μg L^{-1} or μg g^{-1} dw*)	Reference
Algeria	L. Oubeira	¤	microcystin-LR	3–29,163	Nasri et al. (2008)
Argentina	R. San Roque	$, £	microcystin-LR	920	Conti et al. (2005)
	–	–	microcystin-LR	48.6	Giannuzzi et al. (2011)
Australia	R. of drinking water	$	saxitoxin	30	Orr et al. (2004)
	L. Julius	$, £, ¤	cylindrospermospin	2×10^6	Saker and Griffiths (2001)
	R. Cania	$, £, ¤	cylindrospermospin	18.9	McGregor and Fabbro (2000)
	L. Cobaki Village	$, £, ¤	cylindrospermospin	101.4	Everson et al. (2011)
	Narrung Channel	$	nodularin-R	1.6	Heresztyn and Nicholson (1997)
	L. Coolmunda	£	microcystin-LR	12	Stewart et al. (2006)
	L. Wivenhoe	£	cylindrospermospin	1–2	
Brazil	L. Bolonha	$	microcystin	1.25	Vieira et al. (2005)
	Sao Paulo	$, £	microcystin	0.5–100	Nobre (1997)
	Parana	$	microcystin	0.2–6.6	Hirooka et al. (1999)
	D. Itaipu	£	microcystin	6,4–10	
	R. Tapacura	$	saxitoxin	52	Molica et al. (2005)
	R. Armando Ribeiro Goncalves	$	microcystin-LR	8.8	Costa et al., 2006
			saxitoxin	3.14	
China	R. Haimen	$	microcystin-LR	1,556	Ueno et al. (1996)
	L. Taihu	$, £, ¤	microcystin-LR	34.2	Liu et al. (2011)
Denmark	L. Knud so	–	homoanatoxin-a	2,300*	Henriksen (1996)
		–	homoanatoxin-a	800*	
		–	homoanatoxin-a	60*	
	L. Ravn so	–	homoanatoxin-a	2,300*	
	L. Salten Langso	–	homoanatoxin-a	20*	
	L. Agerso	–	saxitoxin	37*	Kaas and Henriksen (2000)
	L. Bastrup so	–	saxitoxin	6.4*	
	L. Hvideso	–	saxitoxin	85.1–182.5**	
	L. Vissiggaard so	–	saxitoxin	224.1*	
Finland	Prästträsket	$, £, ¤	microcystin-LR	42	Spoof et al. (2003)
	Södra Slemmern	$, £, ¤	nodularin-R	0.2	
	Högskär	$, £, ¤	nodularin-R	0.5	
France	La Loue	£	anatoxin-a	8,000*	Gugger et al. (2005)
	L. Champs-sur-marne	£	saxitoxin	4.8–6.7	Ledreux et al. (2010)
Germany	20 water bodies	£	anatoxin-a	0.39–6.7	Bumke-Vogt et al. (1999)
	55 water bodies	–	microcystin-LR	10	Fastner et al. (1999)
	–	£	microcystin-LR	36	Ueno et al. (1996)
	Berlin water bodies	£	microcystin-LR	0.14–119	Fromme et al. (2000)
Greece	33 water bodies	–	microcystin-LR	50–1,600*	Cook et al. (2004)
Ireland	L. Caragh	$, £	anatoxin-a	112–444	James et al. (1997)
		$	homoanatoxin-a	1.4	Furey et al. (2003b)
	L. Lough Sillan	$	homoanatoxin-a	24	Furey et al. (2003a,b)
	R. Innincarra	$	homoanatoxin-a	34	Furey et al. (2003b)
	L. Lough Key	$	homoanatoxin-a	12	
	L. Corbally	$, £	anatoxin-a	60–100*	James et al. (1997)
Italy	R. Monteleone	$	microcystin	226	Messineo et al. (2009)
	L. Albano	£	cylindrospermospin	126	
Japan	L. Inbanuma	$, £	microcystin	52	Ueno et al. (1996)
	L. Suwa	–	microcystin	3.61	Park et al. (1998a,b)
Kenya	L. Baringo	¤	anatoxin-a	0.05–0.21	Ballot et al., 2004
	L. Nakuru	–	anatoxin-a	5–223*	
	L. Baringo	¤	anatoxin-a	0.05–0.21*	Ballot et al. (2003)
	L. Bogoria	–	anatoxin-a	10–18*	Krienitz et al. (2003)
		–	anatoxin-a	0.3–9*	Ballot et al. (2004)
	L. Simbi	–	microcystin-LR	19.7–39	Ballot et al. (2005)
	L. Sonachi	–	microcystin-LR	1.6–12*	
	L. Norivasha	$, ¤	microcystin-LR	0.041	Krienitz et al. (2013)
Morocco	R. Lalla takerkoust	$, £, ¤	microcystin	73*	Oudra et al. (2001)
		¤	microcystin	95.4	El Ghazali et al. (2011)
Netherlands	L. 't Joppe	$, £	microcystin-LR	2.5	Kardinaal et al. (2007)
	L. Volkerak	$, £	microcystin-LR	7	
	L. Kinselmeer	$, £	microcystin-LR	18	
New Zealand	L. Waitawa	–	microcystin-LR	28,000	Wood et al. (2006b)
	L. Horowhenua	–	microcystin-LR	16,291	
	L. Ngaroto	–	microcystin-LR	1,535	
	L. Taupo	–	microcystin-LR	708	
	Neuma Pond	–	microcystin-LR	22,58	
	L. Rotoiti	¤	microcystin-LR	10–760	Wood et al. (2006a)
	L. Rotoehu	¤	microcystin-LR	23	
Portugal	–	$, £	microcystin	13.7	Ueno et al. (1996)
Poland	R. Sulejow	$, £	microcystin-LR	1.17	Gagala et al. (2010)
	L. Bninskie	£	microcystin-LR	1.87	
S. Africa	D. Nhanganzwane	–	microcystin	23,718	Oberholster et al. (2009b)
	D. Makhohlolo	–	microcystin	0.317	
	L. Krugersdrift	–	microcystin	43.7	Oberholster et al. (2009a)

(*continued on next page*)

Table 1 (*continued*)

Country	Location	Use	Type	Concentrations ($\mu g\ L^{-1}$ or $\mu g\ g^{-1}$ dw*)	Reference
S. Korea	R. Younglang	£	anatoxin-a	417*	Park et al. (1998b)
	Jangsong	$	anatoxin-a	1444*	
Serbia	L. Ludös	$, £	microcystin-LR	362.68	Svirčev et al. (2007)
	R. Celije		microcystin-LR	650	Svirčev et al. (2009)
Spain	R. Santillana	$	microcystin	9.99–55.02	Carrasco et al. (2006)
	R. Valmayor	$	microcystin	1.2	
	R. Picadas	$	microcystin	1.3	
	R. Oros	$, ¤	microcystin	1.6*	Aboal and Puig (2005)
	R. Cenajo	¤	microcystin	3*	
Tunisia	D. Lebna	¤	microcystin-LR	5.485	El Herry et al. (2008)
Turkey	L. Kovada	$, £, ¤	microcystin-LR	0.73–48.5	Gurbuz et al. (2009)
United States	L. Pinto	£	microcystin-LR	100	Miller et al. (2010)
	San Francisco estuary	¤	microcystin-LR	0.02	Lehman et al. (2007)
	L. Doctors	£	microcystin-LR	1	Stewart et al. (2006)
	L. Seminole	£	anatoxin-a	1	
	–	–	cylindrospermospin	100	Falconer and Humpage 2006
	St Johns river	£	microcystin-LR	0.1–31	Williams et al. (2007)
			cylindrospermospin	0.07–1.6	
	L. Bufalo Springs	£	microcystin-LR	0.41–1.78	Billam et al. (2006)
	L. Ransom Canyon	£	microcystin-LR	0.44–1.08	

About location: L. for lake, R. for reservoir, D. for dam. About use of water: ($) for drinking supply, (£) for recreational activities, and (¤) for agriculture (irrigation and pasture) and aquaculture. "–" absence of information.

* Concentrations are presented in $\mu g\ g^{-1}$ dry weight.

great importance of sedimentation processes in the fate of MCs in freshwaters with an amount of toxin associated to settling particles to be in the range of $mg\ d^{-1}\ m^{-2}$. But other studies reported that no more than 20% of toxins can be adsorbed on sediments (Rapala et al., 1993; Lahti et al., 1996). Furthermore, it was suggested that the removal of cyanotoxins in this process was the result of both adsorption and biodegradation (Lahti et al., 1996). Therefore, biodegradation would appear to be the main fate for most cyanotoxins in aquatic systems and the relative performance of this process would be very site specific and dependent upon local sediment characteristics and microbial activity. It was recently reported that the data generated in laboratory and field studies strongly indicate that, in shallow lakes, low persistence and natural eliminations of MCs are due to biodegradation; suggesting that sediments play a crucial role in biodegradation by continuously supplying toxin-degrading bacteria to the water column (Chen et al., 2008, 2010; Mazur-Marzec et al., 2009). However, in deep sediments, biodegradation might be limited due to anoxic conditions (Holst et al., 2003; Grützmacher et al., 2002, 2010) and sediments only bring nutrients for bacteria responsible of cyanotoxins biodegradation. Degradative heterotrophic bacteria of hepatotoxic cyanotoxins (MCs and NOD), and cytotoxins (CYN) have been found in various media, such as water columns (Jones and Orr, 1994; Cousins et al., 1996; Christoffersen et al., 2002; Hyenstrand et al., 2003; Lemes et al., 2008; Mazur-Marzec et al., 2009; Chen et al., 2010), sediments (Rapala et al., 1994; Holst et al., 2003), sewage effluents (Lam et al., 1995) or soils (Miller et al., 2001; Grützmacher et al., 2002), with specific enzymatic pathways well characterized (Bourne et al., 1996; Okano et al., 2009; Zhang et al., 2010). Several previous studies have been indicated that MCs can be degraded by aquatic bacteria identified as pertaining especially to the genus *Sphingomonas* (Bourne et al., 1996; Harada et al., 2004; Ishii et al., 2004; Maruyama et al., 2006; Manage et al., 2009). Therefore, a microcystin-degrading gene cluster, *mlr*A, B, C and D was identified in these microorganisms, sequenced and the degradation process was proposed (Bourne et al., 2001; Saito et al., 2003; Imanishi et al., 2005). In the last two decades, several other species of bacteria capable of degrading peptidic cyanotoxins were identified, *Sphingomonas* sp. strain ACM-3962 (Jones et al., 1994), *Paucibacter toxinivorans* (Rapala et al., 2005), *Sphingosinicella microcystinivorans* (Maruyama et al., 2006), *Burkholderia* sp. (Lemes et al., 2008). The most toxic congener, Microcystin-LR, was also found susceptible to breakdown by *Sphingomonas*, which initiated ring-opening and the production of a linear compound 200 times less toxic (Bourne et al., 1996). Recently, Ho et al. (2012) identified another bacterium strain (TT25) whose genome is similar to *Sphingopyxis* sp. that it is able to degrade MCs. The ability of these all species to degrade other congeners of MCs and NODs was investigated and revealed that peptides with the Adda–Arginine bond were successfully degraded while MC-LF, with Adda–Phenyalanine bond and 6(z)-Adda-MC-LR and 6(z)-Adda-MC-RR were not significantly degraded (Imanishi et al., 2005). Another Japanese *Sphingomonas* isolate, 7CY, was shown to degrade a wider range of MCs, including MC-LR, -RR, -LY, -LW, and -LF but it was unable to degrade NOD-Har a NOD analog where arginine is replaced by homoarginine (Ishii et al., 2004). Biodegradation has also been shown to be an important process for the removal of the alkaloid cytotoxin, CYN, from contaminated water (Chiswell et al., 1999; Senogles et al., 2002). By contrast, a laboratory study investigating biodegradation of CYN with bacterial communities from two water bodies in Spain, one having frequent exposure to CYN, the other rarely, has been shown that biodegradation of this toxin by an active microbial community does not take place during a 40-d (Wörmer et al., 2008). A recent study demonstrated that CYN was degraded by indigenous microbial flora in waters with a history of *Cylindrospermopsis* blooms (Smith et al., 2008). Despite isolation of many bacteria from CYN enriched cultures, only a single isolate (*Delftia* sp.) capable of degrading CYN has been obtained (Smith, 2005). However, for cyanobacterial neurotoxins there are few reports on their persistence and biodegradation compared to cyanobacterial heptotoxins, although the increasing occurrence of these toxins in surface waters. A recent study indicated that saxitoxins (STXs) are predisposed to bacterial degradation during passage through bioactive treatment plant (Kayal et al., 2008). However, this study showed that structural modification during the biological treatment resulted to decrease of the predominant C-toxins variants and an increase in GTX2 and GTX3 which are more toxic than the C-toxins. Early work by Kiviranta et al. (1991) reported the isolation of a *Pseudomonas* sp. capable of rapid degradation of anatoxin-a, with a rate of 6–30 $mg\ mL^{-1}$ per 3 d. A later study reported by Rapala et al. (1994) has been shown the removal of anatoxin-a by microbial populations isolated from water and sediments of a eutrophic, oligotrophic, and humic lake. In conclusion, the period of photodegradation of cyanotoxins is relatively long in

comparison to the degradation caused by the microbial activity. Recently, Hu et al. (2012) found that the *Bacillus* sp. strain EMB is able to completely remove 2.99 mg L^{-1} of MC-RR and 2.15 mg L^{-1} of MC-LR within 24 h. However, the biodegradation speed of cyanotoxins in aquatic ecosystems can be influenced by the initial concentration and nature of toxins (Edwards et al., 2008; Ho et al., 2012) and by additional factors such as the water temperature (Park et al., 2001; Ho et al., 2007a,b; Smith et al., 2008; Hoefel et al., 2009) and the bacterial community composition within the water body; not only the types of organisms present, but also their abundance (Hoefel et al., 2009; Ho et al., 2012). Hoefel et al. (2009) have demonstrated a direct relationship between the abundance of degrading organisms and the rate of degradation of MC-LR. Furthermore, although MCs are degraded by most of bacteria species, it seems that a lasting day's delay or weeks are necessary before the degradation is introduced. This result was in agreement with the conclusion of Hyenstrand et al. (2003) indicating that bacteria species have to adapt themselves at first to the cyanobacteria metabolites before the degradation of MCs becomes effective. Indeed, the results of this last study indicate a weaker degradation of the MC-LR in May compared with September where the occurrence of cyanobacteria is higher. Similarly, Smith et al. (2008) found that CYN was degraded by indigenous microbial flora in waters with a history of *Cylindrospermopsis* blooms.

The physicochemical fate and the environmental concentrations of cyanotoxins in soil have been the subject of a range of recent studies. Several classes of these toxins have been detected in field soils, and the sorption behavior and degradation and transfer to vegetables have been studied to a large extent (Morris et al., 2000; Miller et al., 2001; Chen et al., 2006b; Bibo et al., 2008; Sathishkumar et al., 2011). The use of water from sources containing cyanobacterial blooms and toxins for spray irrigation of terrestrial plants, including food crop plants presents both a harmful effect on growth and development of plants and on soil ecosystems and potential health hazards through several exposure routes, including uptake into the food chain and accumulation of toxins on the external surfaces of edible plant material. Questions, therefore, arise about the persistence of total cyanotoxins (dissolved and within the cyanobacterial cells) when reach the soil ecosystem to produce phytotoxic effects. Once reach the soil ecosystem, cyanotoxins persist in the environment, depending on the efficiency of degradation (i.e., photolysis, hydrolysis and bacterial degradation). Microcystins can persist in agriculture soils for relatively long times, with a half-life ranging between 6 and 17.8 d (Chen et al., 2006b). Jones et al. (1995) reported that scums of *M. aeruginosa* that dry on the shores of lakes may contain high concentrations of MCs for several months. Recently, Metcalf et al. (2012) found that MCs were detected in herbarium specimens of cyanobacteria which had been collected from aquatic and terrestrial environments in 11 countries throughout the world, dried, and stored at ambient temperatures in the dark for up to 170 years. Microcystins were also detected by HPLC and ELISA assays in desert crust samples from Qatar at concentrations between 1.5 and 53.7 ng g^{-1} dry weight (Metcalf et al., 2012). Thus, the persistence of these toxins within dried cyanobacterial cells for long period suggests that they will be released back into the soil when re-immersed by irrigation water, particularly when cyanobacterial blooms are used in some countries as an organic fertilizer (Chen et al., 2006a,b). However, as mentioned above for aquatic ecosystems, adsorption on sediments and specially exposure to degrading bacteria may also speed up their removal from the soil.

The information on the adsorption of cyanotoxins in agriculture soil ecosystems is particularly scarce. However, adsorption of cyanobacterial hepatotoxins was measured in several batch studies to determine the applicability of bank filtration as an efficient removal strategy of these toxins from drinking water. For example, in batch experiments Miller et al. (2001) studied the adsorption of cyanobacterial hepatotoxins, MC-LR and NOD, in five soils with different physicochemical properties collected from regions around South Australia. They found that the soils with the high clay and/or organic carbon contents had the higher toxins adsorption coefficients. In similar experiments, Miller and Fallowfield (2001) found that the soils with the highest organic carbon content (2.9%) and the highest clay content (16.1%) were the most effective at removing these toxins in batch experiments. However, the sandy soil (98.5% sand) was incapable of the removal of cyanotoxins. This finding was supported by Morris et al. (2000) who reported that the clay content and its quality may be more important for the adsorption than other soil characteristics. However, Eynard et al. (2000) suggested that soil was unable to protect groundwater from cyanotoxins that originated from surface waters. Thus, it seems that cyanotoxins sorption in soils is low and could potentially result in their high bioavailability to soil organisms and plants. In several studies, it seems that the major dissipation process for cyanotoxins in soil ecosystems is mainly via microbial degradation (Miller and Fallowfield, 2001; Chen et al., 2006b). In fact, numerous soil bacteria as *Arthrobacter* sp., *Brevibacterium* sp. and *Rhodococcus* sp. are able to breakdown MCs (Manage et al., 2009). Bourne et al. (2001) observed the same thing with *Sphingomonas* sp. that possesses a gene cluster involved in the degradation of MC-LR. Furthermore, Falconer et al. (1983) and Lambert et al. (1996) conclude that sand filtration alone is unable to remove dissolved cyanotoxins. However, slow sand filters can be expected to remove 99% of dissolved cyanotoxins (Keijola et al., 1988; Grützmacher et al., 2002). This can be explained by the formation of a biofilm on top of the filter that it allows for some biodegradation of cyanotoxins in slow sand filtration. No data are available for other cyanoabcterial toxins such as neurotoxins and dermatotoxins, but some degradation may be expected, again depending on the chemical conditions of soil. In conclusion, the scarce results on the fate of cyanotoxins in soil ecosystems are very variable, which do not allow affirming with certainty the necessary time for a complete disappearance of these toxins. This variability ensues partially from used methods (e.g. studies led in laboratory with non environmental concentrations of toxins and in free-soil systems). Therefore, the fate of cyanotoxins in soil ecosystems will require more studies before we are capable to formulate an opinion on their persistence and uptake into the food chain.

5. Phytotoxicity effects of cyanotoxins

The information on the effects of cyanotoxins on non-target organisms in the terrestrial environment is particularly scarce. However, despite the impressive amount of information on their toxicity on mammals compiled during the last two decades, there are still serious gaps in the knowledge about the phytotoxicity of these toxins. The phytotoxic effects of cyanotoxins on higher plants were firstly focused on aquatic photoautotrophic organisms (algae and macrophytes) that are naturally exposed to cyanotoxins (Harper, 1992; Papke et al., 1997; Weiss et al., 2000; Yu et al., 2000; Ikawa et al., 2001; Pietsch et al., 2001; Mitrovic et al., 2004; Ha and Pflugmacher, 2013). Since few years, scientists were also interested by the effect of these toxins on terrestrial plants because, irrigation waters from sources containing cyanobacterial blooms and toxins are generally used without treatment for spraying agricultural crops and plants that might, therefore, induce a food chain contamination with a considerable health risk and potential economic losses.

5.1. Neurotoxins

The cyanobacterial neurotoxins have not received more research attention than have cyanobacterial hepatotoxins. This is a consequence of the many livestock deaths caused by cyanobacte-

rial species producing hepatotoxic microcystins and their more widespread occurrence rather than species producing neurotoxins (Ettoumi et al., 2011). In addition, the recent inclusion of microcystin-LR as a toxic chemical in the World Health Organisation (WHO) drinking water guidelines has further accelerated investigation of the toxic effects of microcystins on mammals and vegetables rather than cyanobacterial neurotoxins. Therefore, there are only few studies reported in the literature on the effects of cyanoabcterial neurotoxins on crops and plants. Mitrovic et al. (2004) were exposed the free-floating aquatic plant *L. minor* and the filamentous macroalga *Chladophora fracta* to anatoxin-a at 0.1–25 μg L^{-1} under laboratory conditions for 4–7 d. They found in both organisms significantly increase of peroxidase activity after 4 d exposure at 25 μg L^{-1} but not at lower concentrations. After 7 d exposure to this neurotoxin significant increase of GST activity and reduction of photosynthetic oxygen production were observed at 5 and 20 μg L^{-1} but not at lower concentrations in *L. minor*. In addition, Ha and Pflugmacher (2013) reported that this alkaloid neurotoxin at an environmentally relevant concentration (15 μg L^{-1}), induced phytotoxic effects on the submerged aquatic macrophyte *Ceratophyllum demersum*, mediated by oxidative stress. Recently, Esterhuizen-Londt et al. (2011) investigated in *in vitro* study the effect of BMAA at different environmentally concentrations (0.5, 1, 5, 50 and 100 μg L^{-1}) for 24 h on the oxidative stress responses of the macrophyte *C. demersum*. The most pronounced effects found were activity-inhibiting effects on all the oxidative stress response enzymes at all exposure concentrations. However, enzymes not related to oxidative stress response were not affected by the BMAA in these experiments. For other neurotoxins, the literature search did not yield any results.

5.2. Hepatotoxins

The effects of cyanoabcterial toxins on photoautotrophic organisms have been most intensively studied for MCs, in line with their abundance and their mode of action. First experiments were focused on the ability of these hepatotoxins to act as general allelopathic compounds against planktonic microalgae, macroalgae and macrophytes in aquatic ecosystems. The allelopathic effects of *Aphanizomenon* and other cyanobacteria bloom formers on chlorophyte species are early documented in several studies (Lefevre et al., 1950; Tassigny and Lefevre, 1971; Boyd, 1973). Subsequently, Ikawa et al. (2001) and Papke et al. (1997) observed that cyanobacterial metabolites can induce the growth inhibition of the green alga *Chlorella pyrenoidosa* and the photosynthesis of other cyanobacteria species, respectively. Similarly, Sukenik et al. (2002) found that *Microcystis* sp., a MCs producer, severely inhibited the growth of the freshwater dinoflagellate *Peridinium gatunense* in mixed laboratory cultures which was attributed to the excretion of allelopathic substances rather than to successful competition for nutrients. Hu et al. (2005) found that the growth of *Synechococcus elongatus* was reduced by 53.6% after 6 d of exposure to 100 μg L^{-1} of MC-RR suggesting that oxidative stress manifested by elevated ROS levels and MDA contents might be responsible for the toxicity of MC-RR to this species. Moreover, Singh et al. (2001) demonstrated that MCs are strongly algicidal and point to the possibility that they may have an important role in establishment and maintenance of toxic blooms of *M. aeruginosa* in freshwater ecosystems. Valdor and Aboal (2007) demonstrated the inhibitory effect of both cyanobacterial extracts and pure MCs on the growth of microalgae. Bártová et al. (2010) examined effects of semipurified *Microcystis* extract containing MCs (0.2–20 nM) on age-induced cell differentiation of the filamentous cyanobacterium *Trichormus variabilis* and they found that heterocyst and akinete formation was significantly decreased after exposure to extract containing 2 or 20 nM of MCs within 10 d of exposure. Recently, Perron et al. (2012) evaluated the effect of four microcystins standards (variants MC-LF, -LR, -RR, -YR) at different concentrations (0.01–10 μg mL^{-1}) and 0.01, 0.1, and 1 μg mL^{-1} equivalent microcystins extracted from *Microcystis aeruginosa* (CPCC299), which is known to produce mainly MC-LR, on the fluorescence of four green algae (*Scenedesmus obliquus* CPCC5, *Chlamydomonas reinhardtii* CC125, *Pseudokirchneriella subcapitata* CPCC37 and *Chlorella vulgaris* CPCC111) and how they can affect the flow of energy through photosystem II. Their results showed that MCs affect the photosynthetic efficiency and the flow of energy through photosystem II from 0.01 μg mL^{-1} within only 15 min and that MC-LF was the most potent variant, followed by MC-YR, -LR and -RR.

It was also noticed that in eutrophic freshwaters dominated by cyanobacteria, a decrease in species diversity and in the growth of macrophytes often occurs (Harper, 1992; Weiss et al., 2000; Yu et al., 2000; Pietsch et al., 2001). Casanova et al. (1999) found that the abundance and the variety of macrophytes are reduced in the presence of cyanobacterial blooms. In 1986, Kirpenko showed for the first time the inhibition growth of water plants *Elodea* and *Lemna* by MCs isolated from a natural bloom. This allelopathic action was recently confirmed by Weiss et al. (2000) further to the coculture of the plant *Lemna minor* with the cells of *M. aeruginosa.* Moreover, Pflugmacher (2002) revealed that MC-LR induces allelopathic effects on the aquatic macrophytes such as *C. demersum* and *Myriophyllum spicatum*, resulting in growth inhibition, reduction in photosynthetic oxygen production, and changes in pigment pattern. Jang et al. (2007) found by examining cyanobacterial toxin production in response to direct exposure to an axenically cultured aquatic plant (*Lemna japonica* Landolt) using two toxic monoclonal strains of *M. aeruginosa* Küzing (NIES strains 103 and 107) that reciprocal allelopathic responses have been observed between these two species *Microcystis* and *Lemna*. In several other studies, it occurred that MCs have the potential to exert toxic effects on growth and physiological processes, which all might be related to the inhibition of protein phosphatase activity or oxidative stress in aquatic moss (Wiegand et al., 2002) and in higher aquatic plants such as *Lemna gibba* (Saqrane et al., 2007), *Lemna genus* (Mitrovic et al., 2005), *L. japonica* (Jang et al., 2007), *Spirodela oligorrhiz* (Romanowska-Duda and Tarczyńska, 2002), *Phragmites australis* (Yamasaki, 1993; Máthé et al., 2009; Jámbrik et al., 2011), and *C. demersum* (Pflugmacher, 2004).

There are also several indications that terrestrial plants, including food crop plants, can be altered by MCs present in irrigation waters, resulting principally to their serine/threonine phosphatases inhibition and reactive oxygen species (ROS) production. Sheen (1993) found that the marine phycotoxin okadaic acid, a potent inhibitor of serine/threonine protein phosphatases like MCs, efficiently blocks chlorophyll accumulation induced by light in etiolated maize leaves. It seems also that this phycotoxin blocks root hair growth and alter cortical cell shape of *Arabidopsis thaliana* L. at 3 nM (Smith et al., 1994). Takeda et al. (1994) found that okadaic acid and MC-LR, inhibitors of protein phophatases type 1 and 2A block the sugar-inducible gene expression in petioles of sweet potato *Ipomoea batatas*. Similarly, Siegl et al. (1990) reported that in *in vivo* these toxins prevented the light-induced activation of sucrose-phosphate synthase (SPS) that is generally activated by dephosphorylating by protein phosphatase 2A, and decreased sucrose biosynthesis and CO_2 fixation in spinach leaves. Yin et al. (2005) reported that MC-LR at 5 mg L^{-1} is able to cause oxidative damage resulting in lipid peroxidation and decrease of glutathione GSH content and increases of superoxide dismutase (SOD) and catalase (CAT) activities on *A. thaliana* cells. Later, Stüven and Pflugmacher (2007) provide further evidence that cyanobacterial toxins as well as cyanobacterial crude extract containing MC-LR induce oxidative stress response in *Lepidium sativum* seedlings, manifested by lipid peroxidation, elevation of alpha- and beta-

tocopherol concentrations and elevated activities of antioxidative enzymes like the glutathione peroxidase, glutathione S-transferase and glutathione reductase. El Khalloufi et al. (2012) showed that 30 d exposure of *Lycopersicon esculentum* to a cyanobacterial crude extract containing 2.22–22.24 μg MCs mL^{-1} caused enhancement on peroxidase activity and phenolic content indicated that the extract caused an oxidative stress. The exposure of rice plants (*Oriza sativa*) to toxic *M. aeruginosa* cyanobacterial extracts containing 50 μg MC-LR L^{-1} resulted in a significant increase in the GST activity in leaves of this plant (Prieto et al., 2011). Therefore, by acting as protein phosphatase inhibitors and inducers of ROS production, MCs could be involved in several physiological and molecular processes in higher terrestrial plants.

5.3. Cytotoxic alkaloids

Cylindrospermopsin, a protein synthesis inhibitory cyanoabcterial cytotoxin also led to a clear growth inhibition and anatomy modification through the alteration of microtubules organization of the common reed *P. australis* at concentrations 0.5–40 μg mL^{-1} (Beyer et al., 2009). Previous study demonstrated that CYN inhibited the growth of *Sinapsis alba* mustard seedlings at 18.2 μg mL^{-1} (Vasas et al., 2002). Short term exposure of rice plants (*Oriza s.*) to toxic *A. ovalisporum* cyanobacterial extracts containing 0.13 μg CYN L^{-1} can lead to an increase of oxidative stress (increase in GST and GPx activities). Moreover, longer exposure periods can lead to tissue necrosis (loss of tissue fresh weight) concomitant with the oxidative stress. In addition, the plant exposure to a mixture of *A. ovalisporum* and *M. aeruginosa* cell extracts containing 0.13 μg CYN L^{-1} and 50 μg MC-LR L^{-1}, respectively, resulted in a significant increase in the GST and GPx activities, suggesting a synergistic effect of both extracts (Prieto et al., 2011).

6. Bioaccumulation of cyanotoxins in vegetable foods and consequences on animals and human health

In aquatic ecosystems, several studies have been reported the bioaccumulation of cyanotoxins in common aquatic vertebrates and invertebrates, including zooplankton, mollusks and crustaceans, and fish, which pose a potential risk to both animal and human health if such aquatic animals are consumed (Ibelings and Chorus, 2007; Ettoumi et al., 2011). However, their ability to enter the food chain *via* agricultural crops has not been thoroughly investigated to date. Questions, therefore, arise about the health significance of spray irrigation of crops with water from sources containing cyanobacterial blooms and toxins. Nevertheless, several studies have been shown the accumulation potential of cyanotoxins in aquatic vegetable organisms, suggesting that terrestrial plants, including food crop plants, can also take up these toxins. Mitrovic et al. (2005) reported that the filamentous alga *C. fracta* accumulates MC-LR at a rate of 8 ng g^{-1} d^{-1}. In addition, few amounts of MCs were detected in *C. vulgaris* and *Scenedesmus quadricauda* cells only during the first 3 d of exposure, but not during the remaining period of the experiment, suggesting a possible biotransformation of MCs in these algae (Mohamed, 2008). The emergent reed plant *P. australis* showed an apparent distribution of MC-LR in the different parts of the plant, after exposure to this toxin at 0.5 μg L^{-1} with highest uptake was detected in the stem and then the rhizome (Pflugmacher et al., 2001). In addition, *Lemna minor* has also been shown to accumulate MC-LR up to a concentration of 0.2887 ± 0.009 ng mg^{-1} wet wt plant material, after 5 d of exposure to this toxin at 20 μg L^{-1} with an accumulation rate equivalent to 58 ng g^{-1} d^{-1} (Mitrovic et al., 2005). However, Saqrane et al. (2007) reported that *L. gibba* could take up and biotransform microcystins. The chronic exposure of plant led to dose-dependent MCs accumulation which reached 2.24 μg g^{-1} dry weight after being exposed to 0.3 μg mL^{-1} of MCs (Saqrane et al., 2007). Recently, it has been shown that collected water chestnut (*Trapa natans*) from Lake Tai accumulated MCs at highest level up to 7.02 ng g^{-1} dw (Xiao et al., 2009).

Terrestrial plants could be exposed to cyanobacterial toxins via the use of eutrophic water that may contain cyanobacterial blooms and toxins from irrigation and, therefore, they can take up cyanotoxins. Peuthert et al. (2007) have been reported that MC-LR could be absorbed by roots and be translocated from roots to shoots in seedlings of eleven agricultural plants. A second study by Crush et al. (2008) that used different species too, revealed a high level of MCs accumulation in lettuce (*L. sativa*) exceeding the tolerable daily intake of 0.04 μg kg^{-1} of body weight d^{-1} recommended by the World Health Organization (Sivonen and Jones, 1999). However, the most of these studies have been performed in hydroponic conditions where the roots have been in direct contact with the toxin solutions and can, therefore, overestimate the bioaccumulation rate. In our knowledge the only study reported in the literature that was realized in soil showed that MC concentrations in roots did not exceed the tolerably limit, however, the concentration of MCs in aerial parts of the plant are not determined (Järvenpää et al., 2007). Both the roots and shoots of rice were reported to accumulate MC-LR in a laboratorial study (Chen et al., 2004). In addition, a recent study by Chen et al. (2012) reported for the first time the accumulation of MC-LR in rice grains harvested from Lake Taihu in China. However, the concentration of MC-LR detected in rice grains was very low and thus may not pose a threat to human health currently. In addition to the possibility of internal accumulation of MCs, irrigation may lead to accumulation of toxins on the external surfaces of edible plant materials when the contaminated water dries on the plant surface between irrigation periods or when the water becomes trapped in the centers of, for example, salad plants. In fact, Codd et al. (1999) have been reported that colonies and single cells of *M. aeruginosa* and microcystins were retained by salad lettuce after growth with spray irrigation water containing the microcystin-producing cyanobacteria. Recently, Kittler et al. (2012) reported that treatment of *Brassica oleracea* var. *sabellica*, *Brassica juncea*, and *S. alba* under varying experimental conditions showed significant CYN uptake, with CYN levels ranging from 10% to 21% in the leaves compared to the CYN concentration applied to the roots (18–35 μg L^{-1}). These results suggest that crop plants irrigated with CYN-containing water may represent a significant source of this toxin within the food chain. However, further research is needed into the uptake and fate of microcystins and other cyanobacterial toxins by food plants and the persistence of these toxins in the edible plant materials.

7. Conclusion and future directions

This review has established that cyanobacterial cells and toxins can be associated with crop plants after spray irrigation with water containing these agents. Therefore, the use of water from sources containing cyanobacterial blooms and toxins for spray irrigation of crop plants may not only inhibit growth of plants, but also can induce a food chain contamination with a considerable health risk and potential economic losses. Several studies have been shown that cyanotoxins could be absorbed by roots, transported to shoots, and then be translocated to grains and/or fruits. Nevertheless, the concentration of MC-LR detected, for example, in rice grains was very low and thus may not pose a threat to human health currently. Cyanotoxins could be partially metabolized during the long distance transportation from roots to grains or fruits, which may resulted in the lower level of cyanobacterial hepatotoxins type

microcystins detected in rice grains. In addition, MCs could bind to serine/threonine phosphatases during transport and thus could also affect their accumulation in grains and fruits. Therefore, further investigations are needed into the uptake and fate of microcystins and other cyanobacterial toxins by food plants during the totally period of vegetative and fruit development.

However, there are gaps remaining concerning information on the future of cyanotoxins in soil in term of speciation, persistence, mode of degradation and impact on biological life in soils. The results of many existing tests and particularly laboratory studies on phytotoxicity of cyanotoxins are done in soil-free systems and using non realistic environmental concentration of toxins. Therefore, they are difficult to compare to field studies because both abiotic (*e.g.*, soil conditions) as well as biotic (composition of the degrading biological community) factors can influence the outcome of such studies. In order to assess the relevance of phytotoxicity of cyanotoxins and their bioaccumulation in crop plants in the terrestrial environment, further research seems thus appropriate.

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Yurok and the Klamath River:

Yurok Historical Context and Data for Assessing Current Conditions and the Effects of the proposed Klamath Restoration Project on Yurok Tribal Trust Assets and Yurok Resources of Cultural and Religious Significance

Report Prepared for the
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Bureau of Indian Affairs
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I. Introduction: Purpose of Report

This report has been prepared under contract with the US Fish and Wildlife Service for the purpose of providing information to the Department of the Interior (DOI), the Secretary of the Interior, the Bureau of Indian Affairs (BIA) and all federal agencies involved in the Secretarial Determination and compliance with the National Environmental Policy Act (NEPA) and California Environmental Policy Act (CEQA) currently underway for the purposes of evaluating the proposed action of removing four Klamath River dams and implementing provisions set forth in the Klamath Basin Restoration Agreement (KBRA) and the Klamath Hydroelectric Settlement Agreement (KHSA). The primary focus of this report is the impact of the current conditions of continued operations of the Klamath Hydroelectric Project on Yurok trust resources and implications regarding the federal government's trust responsibility to the Yurok Tribe.

Much of the contents of this report are historical in nature due to the fact that historic context is required to adequately assess the direct and cumulative impacts of current conditions and current operations of the Klamath Hydroelectric Project on tribal trsut resources and the Klamath River ecosystem and its fishery.

The Yurok Tribe, its history, culture, identity, spirituality and economic survival have always relied upon the Klamath River. For Yurok people, the Klamath River is "the Bloodline: the life blood of the people". The dependence and interdependence of the Yurok on the River and its resources cannot be overstated. It has always been and remains the central feature in Yurok life, ceremony and traditions. Reliance on the Klamath River fishery is not simply for economics, but most importantly for subsistence and cultural survival. Prior to the arrival of non-Indians into the region, the Yurok Tribe was considered one of the most prosperous and wealthy tribes in the area. This wealth was a result of an abundant year-round fishery that provided the basis for the entire Klamath River tribal economic system. Fish were traded and sold to neighboring tribes for a range of resources used in daily and ceremonial life. Abundant food provided by the year-round fishery allowed for the development of a highly developed social and economic system that was reinforced through a highly structured ceremonial and cultural cycle that still persists today.

Klamath River fish are irreplaceable to the Yurok Tribe's culture, religion and economy. From time immemorial, Yurok people have depended on the Klamath River. The River is central to Yurok society by providing food, transportation, commercial trade, and numerous other activities essential to Yurok life. Throughout history and today, the identity of the Yurok people has been intricately woven into natural environment including the Klamath Basin watershed. Tribal religious and ceremonial practices focus on the health of the world; the Klamath River and its fisheries are a priority. The Yurok Tribe's obligation to protect the fishery has always been understood by Yurok people. The ancestral territory of the Yurok Tribe included coastal lagoons, marshes, ocean waters, tidal areas, redwood and other ancient forests, prairies and the Klamath River. The Preamble of the Constitution of the Yurok Tribe identifies:

Our people have always lived on this sacred and wondrous land along the Pacific Coast and inland on the Klamath River, since the Spirit People, *Wo'qe'* made things ready for us and the Creator, *Ko-won-no-ekc-on Ne ka-nup-ceo*, placed us here. From the beginning, we have followed all the laws of the Creator, which became the whole fabric of our tribal sovereignty. In times past and now Yurok people bless the deep river, the tall redwood trees, the rocks, the mounds, and the trails. We pray for the health of all the animals, and prudently harvest and manage the great salmon runs and herds of deer and elk. We never waste and use every bit of the salmon, deer, elk, sturgeon, eels, seaweed, mussels, candlefish, otters, sea lions, seals, whales, and other ocean and river animals. We also have practiced our stewardship of the land in the prairies and forests through controlled burns that improve wildlife habitat and enhance the health and growth of the tan oak acorns, hazelnuts, pepperwood nuts, berries, grasses and bushes, all of which are used and provide materials for baskets, fabrics, and utensils.

(Yurok Tribe Constitution 1993)

Because of the rivers' importance, one of the Tribe's highest priorities is to protect and preserve the resources of the rivers, and in particular, to restore the anadromous fish runs to levels that can sustain Yurok people. When the original Klamath Reservation was established in 1855, the rivers were filled with abundant stocks of salmon, steelhead, eulachon, lamprey, and green sturgeon. Today, the abundance of fish in the Klamath River and its tributaries are only a small fraction of their historic levels. Many species of fish have gone extinct, many other species, such as fall Chinook, are in serious trouble. Nonetheless, anadromous fish continue to form the core of the Yurok Tribal fishery. The Yurok Tribe is pursuing its fishery restoration goals through a fish management and regulatory program, participation in various forums to reach long term solutions to Basin problems and when necessary, litigation. The Tribe has devoted a large share of scarce funding resources to budgets for fishery management and regulation. The Tribe has enacted a fisheries ordinance to ensure that the fishery is managed responsibly and in a sustainable manner and has a longstanding record of resource protection. The Tribe's fisheries department is well respected and recognized as a knowledgeable and experienced fisheries entity in the Klamath Basin. The Yurok Tribal Council and the Tribal members they represent are well known for taking and supporting responsible actions to protect fisheries resources.

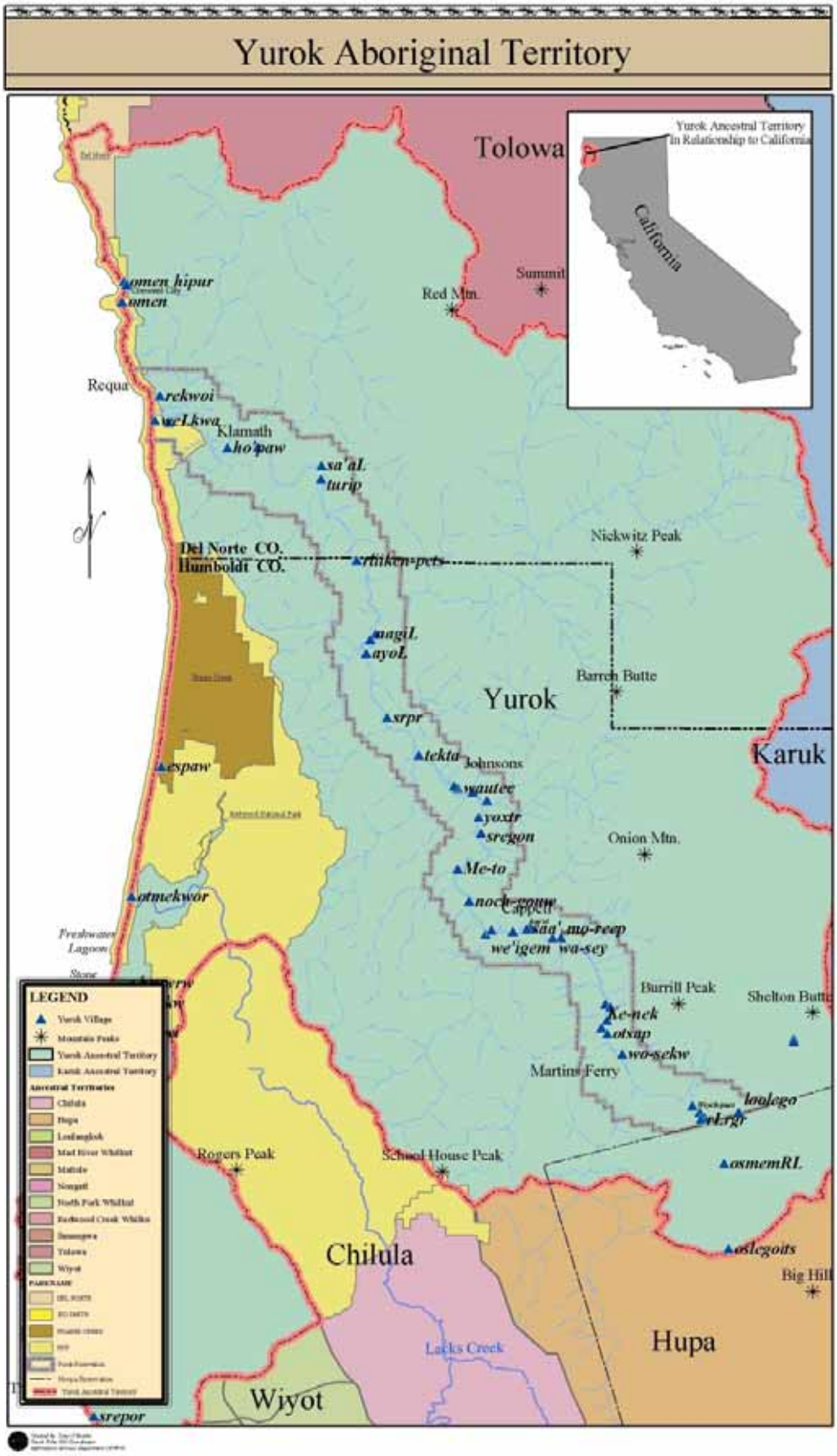
The management of the Klamath River and its ecosystem was radically altered due to historical events that led to the dispossession of lands and resources from Yurok and other Tribal people in the Basin during the settlement and expansionist era of American society, starting in the mid 1800s. Loss of lands and political autonomy resulted in the loss of management authority by Yurok and other Tribes over the River and the resources on which they relied upon since time immemorial. Subsequent management decisions regarding commercial fisheries, the establishment and abolition of canneries, and the construction of a series of dams in the upper basin have had a cumulative impact on tribal society, economy, culture and traditional lifeways. The Yurok Tribe had no say in these

decisions when they occurred, yet have born the disproportionate burden of the ecological and socio-economic impacts of these management decisions over time. During the Reservation Era, the Termination Era and prior to the Self-Determination Era the Tribe has suffered the consequences of these short-sighted management decisions by state and federal managers and agencies with regards to the Klamath River and its resources. These management decisions have resulted in extirpation of numerous runs and species of culturally significant anadromous and riverine species that were relied upon by Yurok and other tribes. Today, Candlefish (once an important subsistence food) no longer exist in the Klamath River. Coho Salmon and Green Sturgeon are on the Endangered Species list. Pacific Lamprey have experienced dramatic decreases and Chinook Salmon have declined to such numbers that only a short commercial fishing season can be practiced for the fall run, and all other runs have diminished to the extent that they are no longer viable for economic harvest.

Impairments to Klamath River water quality as a result of the ecological impacts of the Klamath River dams and their artificial reservoirs have resulted in recurring annual blooms of toxic blue green algae that exceed World Health Organization and state and county public health standards resulting in the posting of closures throughout the basin on an annual basis, always during the peak time for commercial and subsistence fishing and ceremonial practice for Yurok people. All of these adverse impacts not only effect the natural resources on which Yurok people rely, but also the cultural and ceremonial lifeways.

Numerous Yurok Trust Resources exist within the Klamath Basin and many are directly associated with the Klamath River ecosystem. These resources include fish and aquatic species: various species of salmon, pacific lamprey, sturgeon, candlefish, freshwater mussels, steelhead trout, amphibians and others. Additional resources include the water itself, waterfowl, plants and medicines, and numerous Traditional Cultural Properties including fishing places, prayer places, gathering places and cultural activity areas. All of these resources are resources of cultural and religious significance to the Tribe and its members. All of theses resources are Trust Resources and must be protected by the federal government as part of its Trust Responsibility to the Tribe and its members.

It is the opinion of the Yurok Tribe that the current conditions (ie: the current operations of the Klamath Hydroelectric Project and its dams) result in adverse and devastating impacts on these irreplaceable Yurok Trust Resources. It is also the opinion of the Yurok Tribe that only the removal of the four Klamath dams currently under review and the implementation of the Klamath Basin Restoration Agreement (KBRA) and Klamath Hydroelectric Settlement Agreement (KHSA) can restore and redress the longstanding issues and adverse impacts on these Yurok Trust Resources. These issues are, at their core, fundamental issues of Environmental Justice and must be adequately evaluated as such per Executive Order 12898. It is the responsibility of the Department of the Interior, the BIA, and all the federal agencies involved in the Secretarial Determination and the ongoing NEPA and CEQA process to acknowledge and resolve these Environmental Justice issues during this process.


Yurok Aboriginal Territory
Yurok Ancestral Territory In Relationship to California
California
Tolowa
Summit
Red Mtn.
Requa
Klamath
Del Norte CO.
Humboldt CO.
Nickwitz Peak
Barrel Butte
Yurok
Karuk
Johnsons
Onion Mtn.
Burrill Peak
Shelton Butte
Martins Ferry
Rogers Peak
School House Peak
Chilula
Lacks Creek
Hupa
Wiyot
Big Hill
Freshwater Lagoon
LEGEND
Yurok Village
Mountain Peaks
Yurok Ancestral Territory
Karuk Ancestral Territory
Ancestral Territories
Chilula
Hupa
Lodmaglok
Mad River Whilkut
Matilde
Nongatl
North Fork Whilkut
Redwood Creek Whilkut
Tsnungwe
Tolowa
Wiyot

Yurok Tribe – Overview of Yurok History

"The Ach (the People) are river people. Have been since time began. If the river dies, we are no more. Without salmon in the river, I don't believe our culture can survive."
(Yurok Tribal Member Survey Respondent 2006)

Yurok Overview

The Yurok Tribe Dependence on Klamath River Basin Fish

Klamath River fish are irreplaceable to the Yurok Tribe's culture, religion and economy. From time immemorial, Yurok people have depended on the Klamath River. The River is central to Yurok society by providing food, transportation, commercial trade, and numerous other activities essential to Yurok life. Throughout history and today, the identity of the Yurok people has been intricately woven into natural environment including the Klamath Basin watershed. Tribal religious and ceremonial practices focus on the health of the world; the Klamath River and its fisheries are a priority. The Yurok Tribe's obligation to protect the fishery has always been understood by Yurok people. The ancestral territory of the Yurok Tribe included coastal lagoons, marshes, ocean waters, tidal areas, redwood and other ancient forests, prairies and the Klamath River.

Yurok people have resided within their ancestral lands, including the Lower Klamath River since time immemorial. Yurok people have always utilized a large and diverse cultural landscape that extended along the northern California coast and inland up the Klamath River and surrounding mountains.

The traditional names for the Yurok people living on the upper region of the Klamath River, lower region of the Klamath River, and the coast within Yurok Ancestral Territory are the Petch-ik-lah, Pohlik-la, and Nr'r'nr people, respectively. However, they have come to be known as the Yurok, which is the Karuk name meaning "downriver." The ancestral territory of the Yurok people is comprised of a narrow strip along the Pacific Ocean stretching north from the village on the Little River (Me'tsko or Srepor) in Humboldt County to the mouth of Damnation Creek in Del Norte County.

In addition to the Yurok coastal lands, Yurok ancestral territory extends inland along the Klamath River from the mouth of the river at Requa (Re'kwoi) to the confluence of Slate Creek and the Klamath River (Constitution of the Yurok Tribe Art. 1, Sec. 1). Within this ancestral territory there are approximately seventy known villages, which are situated along the banks of the Klamath or along the ocean streams and lagoons (Kroeber 1925:8, Waterman 1920, Pilling 1978). Many of these villages were permanent settlements, particularly the villages where ceremonial dances were held while others were only temporarily inhabited. Each village had its own geographical boundaries, as well as its own leaders who governed various sites and activities within the village. These sites

included fishing and hunting spots, permanent home sites, seasonal sites, gathering areas, training grounds, and spiritual power sites (Lindgren 1991).

Although there were villages all along the river and coast, a village of great importance would have several other villages in close proximity in a concentrated area. An example of this is at the confluence of the Klamath and Trinity Rivers where there were three villages, which in the 1850s had a population of about 200 (Bearss 1969:1). The largest of these three villages was We'itspus, meaning "confluence." This village was of extreme importance because it held a World Renewal Ceremony, also known as the White Deerskin Dance. This is one of several important ceremonial dances in the Yurok religion because its purpose is to renew or maintain the health of the world. The location of the village of We'itspus is on the north bank of the Klamath River and directly across from We'itspus, on the other side of the river was the village of Rlrgr. The third village in this close proximity was located across the Trinity River from Rlrgr and that village was known as Pek-tul.

Similarly in the middle course of the river is the village of Pecwan, located just downstream of Pecwan Creek from where the creek flows into the Klamath River. This is a village of great importance and wealth because Pecwan was a location for another major ceremony, the Jump Dance, which continues to be performed there today. The other villages in close proximity to Pecwan moving downstream on the northern bank are Qo'tep, Woxtek, and Woxhkero.

The final example of a concentration of villages is at the mouth of the Klamath River. On the northern slope of the hill ascending above the mouth is the largest Yurok settlement of Re'kwoi. In 1852, Re'kwoi had 116 residents and is another location for a Jump Dance (Bearss 1969:2). Just across the river on the southern side is the village of Welkwa. This village is the site of the annual Salmon Ceremony, which is performed to remove the effect of the taboo on the run of spring salmon (Waterman 1920:228). The last village in close proximity to the village of Re'kwoi is Tse'kwel.

There are many other Yurok villages residing along the Klamath River, which provides a means for transportation. Redwood dugout canoes are used on the River to access the villages lining the riverbanks. The river is also a primary source of sustenance, providing salmon, sturgeon, eels, and steelhead. Salmon, or nepū'i, meaning "that which is eaten" is one of the primary food sources for the Yurok, the other being acorns. Salmon is obtained during the annual runs by erecting a fish weir across the river, which provides salmon for people in surrounding villages. One location where fish weirs are erected include near the village of Kepel. The other primary food source for the Yurok is acorns. Acorn gathering grounds are found throughout the hills surrounding the villages. Acorns are processed into a soup-like mush, which is cooked in large baskets with hot stones.

Although the river was the primary means of transportation, an elaborate trail system was also utilized. Trails were to be treated with respect and travelers were to stay within the trail. Heavily utilized trails or trails deemed important had many resting spots where one

may stop and catch their breath. If a traveler stopped somewhere along the trail other than the resting place, they could bring themselves bad luck (Waterman 1920:185).

Redwood canoes were primarily used on the river, however, they were also used in the ocean to gather mussels and hunt sea lions. The Yurok, however, primarily stay away from open water. Other ocean food sources include surf fish and smelt, which are caught from the beach with throw nets. Seaweed, eels, and abalone are also important food sources for Yurok people. The latter is also used for regalia for ceremonial purposes.

The villages on the coast are primarily concentrated around lagoons and ocean streams. A prime example of such a concentration is the many villages that are located around Big Lagoon. Beginning to the north and continuing south along the eastern shore of the lagoon were the villages of Pa'ar, Oslokw, Keihkem, Maats, Pinpa, and Opyuweg, which is sometimes referred to as Ok'eto. Opyuweg means, "where they dance" because this is another village where a Jump Dance was held (Waterman 1920:266).

Although all the villages within Yurok Ancestral Territory are culturally and jurisdictionally Yurok, there is a distinction between those Yuroks residing within river villages and those along the coast. Coastal Yuroks living south of the mouth of Redwood Creek (Orek) are commonly referred to as Nr'r'nr, which describes a slight difference in dialect extending from Redwood Creek in the north to Tsurai and Me'tsko in the south. The other villages that comprise the Nr'r'nr area, beginning to the north are Orek, Orau, Tsahpekw, Hergwer, Tsotskwi, Pa'ar, Oslokw, Keikem, Ma'ats, Opyuweg, Pinpa, and Sumeg. Prehistorically, the largest concentration of occupants were located in the villages along the river, while the total number of houses in the coast villages were approximately one-third the number in river villages (Waterman 1920:184).

Historical documents record that the coastal Yurok had initial contact with Europeans as a result of Spanish expeditions spanning the mid 1500s to the late 1700s (McBeth 1950:2; Bearss 1969). Various Spanish-led expeditions and ships came up to northern California along the coast, followed later by American vessels as early as 1803 and 1805 (McBeth 1950:2: Bearss 1969). By 1828, the Klamath River had been documented and visited by ships from Britain, Spain, Russia and America (McBeth 1950:3; Bearss 1969).

First contact between Europeans and Yurok people on the upper Klamath River was documented to have occurred in 1827 when traders for the Hudson's Bay Company traveled downriver in search of furs and trade (Murray 1943:21-24; Bearss 1969). First contact within the project vicinity occurred in February 1827, when men from Peter Skene Odgen's party encountered Yurok in the Martins Ferry area. While these are the first documented encounters by non-Indians within the upriver areas of Yurok territory, the Hudson's Bay Company party documented the presence of European trade goods being used and sought by Yurok people, indicating prior interaction through trade or travel by Yurok people (Murray 1943:21-24; Bearss 1969; Pilling 1978:140).

In 1828, Jedediah Smith led an American party of beaver trapping men down the Trinity River, to the Klamath and the up the Pacific Coast (Goddard 1904; Bearss 1969). As a

result of the discovery of gold in the Trinity River, gold prospectors inundated the region by 1848. Upriver Yurok settlements were severely impacted by the incursion of gold prospectors in the 1850s, resulting in displacement and relocation away from some Yurok traditional villages along the Klamath River (Bearss 1969; Pilling 1978:140).

In 1851 a "Treaty of Peace and Friendship" was signed between the United States Government and the Klamath River Indians under the direction of U.S. Indian Agent Col. Reddick McKee (See Appendix A). The United States Congress did not ratify this treaty. Non-Indian incursions and resultant conflict continued and an Indian Agency and military fort were established on the River to mediate the conflict. The Agency was located on the south bank of the Klamath River, in the area known as *Waukel* (also spelled *Wo'kel* and Waukell) across the River from the military fort, Fort Terwer. In spite of the creation of these government posts, gold prospectors, miners, farmers, and settlers continued to encroach on Indian lands, often resulting in conflicts and violence. On November 16, 1855, the Klamath River Reserve (also known as the Klamath Indian Reservation) was created by Executive Order (pursuant to the Act of March 3, 1853, 10 Stat 226,238). This Order designated the reservation lands from the mouth of the Klamath River, one mile on each side extending approximately 20 miles upriver to Tectah Creek. The Klamath Reserve was established for several tribes because the treaty of 1851 was not ratified and the military was increasingly called to intervene between miners, settlers and Indians. It was the U.S. intent to move the Tolowa and Yurok onto it, but the Tolowa left soon after they were relocated (Bearss 1969).

The United States' original recognition of the central importance of rivers and fish to the Indian people of the Klamath-Trinity region is exemplified by the very shape and location of the lands first set aside for their reservations. The Secretary of Interior's own instructions at the time were, "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." In 1855, Indian Agent S. Whipple's, when speaking of the Yurok, noted that "The river is abundantly supplied with Salmon. A fine large fish quite easily taken by the Indians and which is very properly regarded by the Indian as his staff of life."

In the letter was written to the Commissioner of Indian Affairs by Special Agent Whipple, the first Indian Agent on the Klamath River Reserve. This letter is important because it clearly describes several aspects of Yurok land use and their relationship to the River. In recommending the reservation boundaries extend five miles away from the River, Whipple recognized the Yurok use of the entire watershed associated with the River. He also describes the Lower Klamath as the best salmon fishing grounds in northern California. Whipple describes large alluvial terraces along the floodplain of the River that were used to gather a wide variety of plants, roots, and berries for food and supplies (Whipple 1855).

In that same year, President Pierce established the Klamath River Reservation. The Reservation (not to be confused with the Klamath Reservation in Oregon) was designated as a strip of territory commencing at the Pacific Ocean and extending one mile in width

on each side of the Klamath River for a distance of approximately 20 miles. This reservation lied entirely within the aboriginal territory of the Yurok.

While it was the Federal Government's intent to eventually move all the region's Indians onto the Klamath River Reservation, only the Yurok and some Tolowa did so. Both Fort Terwer and the Indian Agency at Waukel were destroyed in the floods of 1861 and 1862. Flooding along the Klamath River in 1862 led to the closing of the area's Indian Bureau office and the erroneous belief that the Reservation had been "abandoned", though it was still occupied by the Yurok. The Smith River Reservation, occupied primarily by Tolowa, was created in 1862 to supplement the loss of agricultural lands as a result of the floods. In 1865 the Hoopa Valley Indian Reservation was established with the intent of relocating all northwestern California Indians to this reservation (Bearss 1969).

Escalating conflict between Indians and non-Indians over encroachment onto the Klamath Indian Reserve resulted in the gradual displacement of Lower Klamath Indians further upriver during the 1860s and 1870s (Bearss 1969; McBeth 1950:44). In spite of the area being within the boundaries of the Klamath River Reserve, the area was occupied by non-Indians in defiance of the 1855 Executive Order and an 1877 order by the Department of the Interior that explicitly ordered non-Indian settlers off the reservation (McBeth 1950:46; Bearss 1969). Squatters resisted government attempts to remove them from the reservation and even when evicted by United States soldiers under orders in 1879, they quickly returned to the homes and farms they had established on Indian lands (McBeth 1950:53; Bearss 1969).

Soon after, on August 21, 1864, the Federal Government issued a proclamation and instructions from the Interior Department that established the Hoopa Valley Reservation on the Trinity River. The Trinity River flows north through Hoopa Valley to its confluence with the Klamath River. The Reservation is 12 miles square and is bisected by the last 12 miles of the Trinity River (it has often be called the Square or the 12 mile Square). In 1876 President Grant issued an Executive Order formally establishing the boundaries of the Hoopa Valley Reservation and provided that the land contained within those boundaries, "be withdrawn from public sale, and set apart in California by act of Congress approved April 8, 1864."

Efforts soon began to provide a single contiguous homeland for the region's Indian people by connecting the Klamath River Reservation (considered "abandoned" but not formally "extinguished") to the Hoopa Valley Reservation. Paris Folsom, a Special Agent for Interior proposed that the two reservations be connected in his "Report of Special Agent on Conditions and Needs of Non-Reservation Klamath Indians," sent to the Commissioner of Indian Affairs in 1885. In that report Mr. Folsom wrote:

> "Nature seems to have done her best here to fashion a perfect paradise for these Indians .... She filled the mouth of the Klamath river with a sand-bar and huge rocks, rendering ordinary navigation impossible, and pitched the mountains on either side into such steep and amazing confusion that the river has a hard struggle to drive its way through the wonderful gorges ... Tremendous bowlders (sic) and

> cragged points jut into the river and change its course, forming innumerable eddies and back currents, where salmon seek to rest, to be taken in large numbers by means of Indian nets" (Folsom 1885).

Nonetheless, it was not for another six years, until 1891, that the Klamath River Reservation was extended 20 miles up River to connect with the Hoopa Valley Reservation and made part of that Reservation in "an effort to better protect the region's Indians." By that time, as a result of the Dawes act of 1887, much of the Klamath River Reservation and extension lands (the 20 mile strip which connected the two reservations is commonly referred to as the "Connecting Strip" or "Extension") not already claimed as allotments by resident Indians had been opened up to non-Indian settlement. This led to checkerboard ownership of the Yurok portions of both the Extension and former Klamath River Reservation. Through various means, several timber companies had quickly consolidated and heavily logged much of this land.

In 1891, President Harrison issued an order to expand the existing Hoopa Valley Indian Reservation to include lands one mile on either side of the Klamath River from the Pacific Ocean to the Hoopa Valley, thereby including the Klamath Indian Reserve (Bearss 1969). In order to do this, he created the "extension", extending the Klamath River Reserve upriver until it reached the Hoopa Square. The "extension" was established in relation to the Dawes Act as a ploy to open up much of the land that was not claimed as allotments by resident Indians. Thus began the history of checkerboard ownerships of the Yurok portions of the Klamath Reservation and Extension. The result of Harrison's order was the essentially the creation of a new reservation by combining two existing ones. The new reservation consisted of the old Klamath River Reserve, the "extension", and the Hoopa Square and was referred to in its entirety as the Hoopa Valley Indian Reservation. On June 25, 1892, President Harrison singed a bill passed by Congress to open the reservation for non-Indian settlement. The bill declared all surplus lands open to settlers, "reserving to the Indians only such land as they require for village purposes" (McBeth 1950:48; Bearss 1969). The process of assigning Indian allotments within the reservation took two years. After decades of conflict, the Klamath Indian Reservation was legally opened up for non-Indian settlement on May 21, 1894 for homesteading (McBeth 1950:48; Bearss 1969). As a result, many Yurok people were displaced from their traditional villages along the Klamath River. Many Yurok relocated to the Hoopa Valley Indian Reservation and continue to live there today.

In the early 1900s the commercial fishery was overtaken by non-Indians and numerous canneries were established within Yurok territory near or at the mouth of the Klamath River. The resulting over harvest resulted in a complete closure of the Lower Klamath fishery by California Department of Fish and Game in the 1933. During this time, Yurok and other Indians were prohibited from fishing for subsistence or commercial purposes. The recreational fishery was restored for non-Indians in subsequent years, but the practice of subsistence and commercial fishing by Yurok people was prohibited and criminalized. Nonetheless, Yurok continued to fish the river as they always have, but the activity was deemed by state regulators as a criminal act, rather than a subsistence right.

In the 1970s enforcement actions for these unjust policies by the State of California Department of Fish and Game resulted in what is commonly referred to as the "Fish Wars" on the Klamath River. During this time Yurok fishers engaged in acts of civil disobedience, known as "Fish Ins" often resulting in the battery and arrest of those participating in these peaceful acts. After escalating violence and confrontations over Yurok exercising their fishing rights, one Yurok fisherman, Raymond Mattz was arrested and charged by the California Department of Fish and Game. The result was a court battle the went all the way to the US Supreme Court and the now-famous ruling that affirmed Yurok fishing rights: Mattz vs Arnett, 412 US 481 decided in 1973 (See Appendix B).

From 1891 through 1988 the Hoopa Valley Reservation was comprised of the Hoopa Valley Square, the Extension and the original Klamath River Reservation. In 1988 Congress, under the Hupa-Yurok Settlement Act, separated the Hoopa Valley Reservation into the present Yurok Reservation (a combination of the original Klamath River Reservation and Extension) and Hoopa Valley Reservation (the Reservation as proclaimed in 1864).

After decades of struggle to regain their traditional homelands, the Yurok Tribe was re-organized and granted its own reservation in 1988. As a result of the 1988 Hoopa-Yurok Settlement Act (PL-100-580), the Yurok Indian Reservation was established, comprised of the old Klamath Reserve of 1855 and the "extension" of 1891. The current reservation is comprised of trust land, tribal allotments, fee land, and privately owned land.

In 1993, the Department of the Interior further clarified Yurok fishing rights in the Solicitor's Opinion (See Appendix C). In this opinion, the Solicitor concluded that the Yurok Tribe has a reserved right to "harvest quantities of fish on their reservations sufficient to support a moderate standard of living" with an entitlement of 50% of the harvest in any given year. This decision enabled the Yurok Tribe to resume its traditional commercial harvest for economic purposes.

In spite of the restored rights for subsistence and commercial fishing, Yurok people continued to suffer the cultural and economic impacts of a declining fishery. The reasons for the decline are complex and a result of cumulative impacts of numerous management decisions within the Klamath Basin, but the dams and water diversions in the upper Basin have had a direct and adverse effect on the water quality and the health of the fishery throughout the Klamath watershed. In 2002, a drought, low flows and water diversions for agriculture in the upper Basin resulted in dire consequences on the Lower Klamath. Increased water temperatures and low flows resulted in the mass die off of over 30,000 adult returning Fall Chinook salmon within the Yurok Reservation. This tragedy is known as the "Klamath Fish Kill". The effect was devastating to Yurok people and resulted in the determination by the Yurok Tribe to save the fishery and actively engage in negotiations and efforts to protect their resources, their River and their salmon for not only this generation, but future generations of Yurok People.

***"Never in our time have we, the elders of the Yurok Culture Committee, seen such a mass destruction of our salmon resource."* (October 2, 2002)**

In 2006, the Yurok Tribe entered into a Cooperative Agreement with the Department of the Interior for the Cooperative Management of the Klamath River with federal agencies.(See Appendix D) The Agreement was the result of a settlement agreement with the Tribe over the 2002 Klamath Fish Kill. It is important to note that the Yurok Tribe refused to take a financial settlement for this loss of an irreplaceable resource, consistent with a Yurok philosophy of refusing to assign a dollar value to a resource that is irreplaceable.

COOPERATIVE AGREEMENT
between
UNITED STATES DEPARTMENT OF THE INTERIOR
and
YUROK TRIBE
for the
COOPERATIVE MANAGEMENT OF TRIBAL AND FEDERAL LANDS AND RESOURCES IN THE KLAMATH RIVER BASIN OF CALIFORNIA

I. STATEMENT OF JOINT OBJECTIVES:

A. Purpose. This Cooperative Agreement (Agreement) is made and entered into between the United States Department of the Interior (DOI) and the Yurok Tribe (Tribe) to coordinate and cooperatively manage Federal and Tribal lands and resources within the Klamath Basin in California, both within the Yurok Reservation as well as the related basin, upstream river, and Pacific Ocean resources subject to the jurisdiction or authorities of various DOI agencies and bureaus. This Agreement will provide more consistent, economical, effective, and collaborative management of Federal and Tribal lands and natural resources while furthering the Trust relationship that exists between DOI and the Tribe. This Agreement will also greatly expand the resources available to address the shared goals of DOI and the Tribe to improve our collective understanding of the river system and its dynamics, improve the health and vitality of the fishery, and identify and develop programs for natural resource management and service delivery in order to provide long-term benefits to the Tribe, local communities, and the general public and to improve the condition of the basin's natural resources. DOI and the Tribe anticipate that this Agreement will be the foundation for subsequent, continuing, and specific collaborative programs in natural resource management, including but not limited to land and water management, fisheries management, water quality monitoring, land use planning, data gap analysis, interpretation and outreach, and Tribal-interagency management initiatives which will enhance the opportunity to identify and resolve issues critical to the success and survival of a healthy river-based ecosystem in the lower Klamath Basin.

B. Objective. DOI and the Tribe intend to establish an ongoing collaborative government-to-government relationship for management of land, water and other natural resources which will inure to the benefit of DOI, the Tribe, and the communities, as well as the ecosystem and economy of the Klamath River Basin. This Agreement provides a

mechanism to coordinate natural resource management programs, develop joint planning and management initiatives, and coordinate program and budget priorities through the cooperative allocation of resources and the development of long-term resource management and programmatic goals between the signatories. The Agreement will improve DOI and Tribal services to the Tribal and local communities and the general public by improving Klamath River resources management, addressing the health of the fishery, and establishing related programs for restoration and management of natural resources. The Agreement will provide an opportunity for the Tribe to bring to bear its acknowledged scientific expertise, its knowledge of the basin, and the wealth of its culture and traditions to its collaborative relationship with DOI. The Agreement will provide a mechanism by which the Tribe and DOI may further the protection and preservation of Tribal cultural values and practices while collaborating on management of basin natural resources. The Agreement will accomplish these objectives by developing mechanisms for increasing the potential contribution and participation in federal programs by the Tribe while also realizing broader benefits to Klamath Basin communities, the general public, federal agencies and the scientific community.

Under re-organization the Yurok tribe has emerged as the largest tribe in California, with over 5,600 enrolled tribal members, and over 200 tribal government employees. The Yurok Tribe has a growing tribal population and is actively pursuing economic development and resource management both on the reservation and Yurok ancestral lands. The Yurok Tribe has a Natural Resources Department with the largest governmental fisheries program in the state of California. Other programs include the Yurok Tribe Watershed Restoration Program, devoted to restoring fish habitat, the Yurok Tribe Environmental Program, devoted to establishing and monitoring clean air, water, and land, and the Yurok Tribe Culture Department devoted to preserving Yurok culture. These departments assist the Tribal Council in its work to protect and maintain Yurok values as articulated in the Preamble Objectives of the Yurok Constitution (Yurok Tribe 1993). The River continues to be the foundation of Yurok culture, economy, and tradition.

Yurok Timeline – Contact to Present

- **1775** – Spanish explorer Juan Francisco de Bodega arrives in Trinidad Bay at Patrick's Point in order to lay claim to Spanish territory for the King of Spain.
- **1822** – Peter Skeene Ogden a fur trapper from the Hudson Bay Company arrives in Weitchpec.
- **June 8, 1828** – Jedidiah Smith on his intended exploration of the Sacramento River ended up in the Pacific Northwest. After hitting the south fork of the Trinity River, Smith and his men followed the river through the reported rough terrain to the Pacific Ocean at the mouth of Wilson Creek in Requa.
- **1848** – Josiah Gregg on a botanical expedition to collect specimens entered the Klamath River territory.
- **1849** – The beginning of the Gold Rush; settlers and miners first enter the Klamath River area for its rich natural resources (redwoods, fish etc.). These miners and settlers, in seeking the Klamath's resources, tried to force the Yuroks out of their ancestral land through practices such as hunting them down, ridicule, rape or enslavement. They would attack villages and in some cases slaughter men, women and even infants. Upon their return, the men would be treated as heroes and would also be paid by the state's government for their successful work.
- **September 4, 1851** – California became the 31st state.
- **1851** – Klamath River Peace Treaty was made at Camp Klamath at the junction of the Klamath and Trinity Rivers. The treaty was between Indian Agent Redick McKee and the tribes of the Yurok (Poh-lik or Lower Klamath), as well as the Hupa (Hoo-pah) and Karuk (Pen-tsick or Upper Klamath). For the tribes that agreed and acknowledged to keep peace under the U.S. government, they were to have a large Reservation set aside for them; the tribes requested that they be allowed to stay within their traditional territories. The treaty was never fully ratified by Congress due to the political pressure from the non-Indian residents of California and California's Governor James Douglas and Lieutenant Governor John Bigler. Almost all of the villages along the Klamath had been burned by miners; those villages that did survive were infested by disease outbreaks such as small pox, measles and tuberculosis.
- **November 16, 1855** – President Franklin Pierce, acting pursuant to the Act of March 3, 1853, amended on March 3, 1855, authorizing the creation of the Klamath River Military Reserve. The reservation started at the Pacific Ocean and extended one mile in width on each side of the Klamath River for a distance of approximately 20 miles, positioned about 25 miles north of the Klamath-Trinity confluence, setting aside a total of 25,000 acres.
- **1857** – Fort Terwer was established at Terwer Creek to keep peace between the Indians and the growing number of miners and traders trying to move onto the Klamath River Military Reserve.
- **1861** – The Klamath River Military Reserve was flooded and many of the homes were destroyed included Fort Terwer.
- **1864** – Congress enacted legislation that authorized the President to establish 4 Reservations in California, 13 Stat. 39. The Hoopa Valley Reservation was

provisionally created and became the supervising agency over the Lower Klamath River Indians. Indian Superintendent Wiley negotiated a "treaty" with Hupa and other tribes to establish a reservation that encompassed the Square. This "treaty" was never submitted to Congress and was never ratified. Nevertheless "The Yuroks were beneficiaries of the 1864 Treaty (never ratified) that called for the creation of the Reservation".

- **June 23, 1876** – An Executive Order was approved by Ulysses S. Grant, establishing the Hoopa Valley Reservation and it's boundaries for sixteen local area tribes and bands in their ancestral territories; including the Lower Klamath River people. The Hoopa Valley Reservation encompassed the Square and was established "in part for the Yuroks".
- **Fall 1876** – Martin V. Jones and George Richardson came to the Klamath to engage in the business of catching and salting for the first fishery market on the Klamath River
- **November 21, 1877** – By order from the Department of Interior… "All the WHITE men living on the KLAMATH RIVER MILITARY RESERVE have been ordered to move off, forthwith." War Department, General Irwin McDowell ordered Captain Parker to notify the settlers on the reservation to leave immediately. The evicted settlers left their homes, but returned as soon as the soldiers left the lower Klamath and returned to Fort Gaston in Humboldt County.
- **June 3, 1878** – The Timber and Stone Act allowed settlers to receive a timber lot which was to be used in conjunction with homesteading. It was only to be applied to unoccupied, unimproved, unreserved, surveyed, non-mineral lands unfit for cultivation with the maximum allowable of 160 acres per person. It was widely abused, particularly in dealing with the Redwood forests by various lumber companies in the 1880's.
- **March 3, 1883** – 22 Stat. 582 provided that the proceeds of timber sales should go into the treasury for the benefit of the members of the tribe.
- **1885** – Commercial and sports fisheries started to flourish due to the Klamath-Trinity salmon runs. R.D. Hume's "floating cannery" entered the mouth of the Klamath and began harvesting the salmon that the Yurok's relied on for subsistence.
- **February 8, 1887** – 24 Stat. 388-391 The Dawes or General Allotment Act allowed for the breakup of tribal lands into parcels or allotments. These allotments were to be held by individual allottees that were then granted citizenship upon receiving their allotments. Allotments allowed the Indian land to be held in trust with the U.S. Government for a period of 25 years. Allotment trust land could neither be taxed nor alienated. At the end of the 25 year period, the land was to be delivered to the allottees in fee patent (i.e. become private property) free of any encumbrance.
- **June 1889** – Nearly all the soldiers on the Lower Klamath had been removed. Squatters were appearing on the Klamath; nearly every foot of land from the mouth inland for twenty miles had been settled on.
- **1890's** – Four Klamath allotments were used for a cannery established by A. Bomhoff near the mouth at Requa. In exchange for the land, he agreed to hire only Indian fishermen and workers in the cannery.

- **October 16, 1891** – By Executive Order, President Harrison extended the Hoopa Valley Reservation to include the tract of land one mile in width on each side of the Klamath River from the confluence of the Trinity River to the mouth at the Pacific Ocean. The extension included not only the Klamath River Military Reserve but also the connecting strip between the Klamath River Military Reserve and the Hoopa Valley Reservation, known as the "addition" or "extension", creating an enlarged single Reservation of approximately 155,000 acres.
- **June 17, 1892** – Pursuant to the Dawes Act, Congress allowed for "surplus" unoccupied land upon the Reservation to be sold to the general public.
- **1892** – Congress enacted allotment legislation affecting only the former Klamath reserve portion of the Reservation. Ambrose H. Hill was appointed to make the individual allotments on the original Klamath River Military Reserve. Each Indian was to be allotted either 80 acres of agricultural land or 160 acres of grazing land. Indians on the Lower Klamath Reservation had to apply for these lands, while those on the "connecting "strip" received their allotments automatically.
- **February 13, 1893** – Ambrose H. Hill submitted a schedule of 161 allotments on the original Klamath River Military Reserve. These allotments varied from 8 to 160 acres, averaging 60 acres and totaling 9,762 acres. Three traditional villages of Requa, Hoppaw and Scaath totaling 70 acres, were set aside as reserves for the Klamath People. The remaining 15,321 acres of the Klamath River Military Reserve were returned to public domain for disposal via homesteading or sale under the Timber and Stone Act. Other lands were threatened for removal under the authority of Congress' Swamp Act of 1850 which enabled states to reclaim lands that were considered "swamp land" and could be traversed by a flat bottom boat.
- **February 1894** – Charles W. Turpin took over and completed the allotment process. Hill had made 246 allotments on the **"**connecting strip**"** while Turpin had made the final 253 allotments upon the "connecting strip". The allotments ranged from 5 to 160 acres, averaging 40 acres and totaling 19,330 acres.
- **April 1894** – Public notice was published:

  TO WHOM IT MAY CONCERN
  "The Klamath Indian Reservation opened
  May 21, 1894, at 9 a.m. Now prepared
  to receive application for homesteads."
- **June 23, 1898** – Within the "connecting strip" the Hill schedule had been approved for 9,215 acres and the Turpin schedule was approved for 10,115 acres four days later. The total allotted acres for the whole Klamath River Military Reserve was then 29,095 acres, containing approximately 641 separate allotments. About 320 acres on the "connecting strip" were for Village Reserves at Notchko, Mettah, Waseck, Kanick, Mareep, Moreck, Cawtep, Surgone, Wauteck, Pecwan, Cappell and Weitchpec.
- **May 8, 1906** – 43 Stat. 182 - The Burke Act authorized the Secretary "whenever he shall be satisfied that any Indian allottees is competent and capable of managing his or her own affairs" to issue a patent in fee simple to such allottees

and it allowed the trust period to be extended for those Indians found to be "not competent".

- **1910** – There was an estimated 688 Klamath River Indians, a decrease of about 73% of their original population in 1848 before white contact.
- **June 25, 1910** – 36 Stat., 885 authorized the Secretary of the Interior to sell land of allottees who died before their 25 year expiration of their trust period without the consent of all their heirs, upon showing that one or more of the heirs were deemed "incompetent" to manage their own affairs. 307 parcels were sold in this manner with only 213 cases that had obtained consent from all of the owners. An Indian was seen as competent if they had greater than one-half white blood, had received a year or more of white schooling or if they were able to read or write English and were 21 years of age or older.
- **October 8, 1910** – Bids for allotted Indian lands were advertised and were opened up for sale on September 30th, 1910. They were advertised in the *Blue Lake Advocate*, a local Humboldt County newspaper.
- **March 28, 1914** – H.R. 10848 – A bill was re-introduced to Congress after having first been introduced in 1911, to allow for the disposition of $25,000 in funds resulting from the sale of "surplus" Indian lands on the Lower Klamath Reservation. The funds from the sale of lands were originally to be used for the "maintenance and education of the Indians now residing on said lands and their children". H.R. 10848 provided for the $25,000 to be used to build a road along the Klamath River, connecting a road from Requa to the "extension" portion of the reservation.
- **1917** – The Trinidad Rancheria was established for landless Indians in the Trinidad area including Indians from three local tribes of the Yurok, Wiyot and Tolowa.
- **October 15, 1917** – Commissioner of Indian Affairs announced the "policy of greater liberalism". This allowed the Secretary of Interior to issue fee patents to allottees, resulting in allotted lands being removed from trust status whether the allottees had requested the removal or not. Subsequently, many allotments taken out of trust were subject to taxation by Humboldt and Del Norte Counties. Shortly thereafter, allottees began losing allotments for non-payment of back taxes, real estate fraud and the need for cash.
- **1918** – Copco 1 Dam was created on the Klamath River. It permanently blocked more than 75 miles of steelhead and salmon habitat in the main stem of the Upper Klamath and its tributaries. In 1925 Copco 2 Dam was constructed a quarter-mile downstream to regulate flows from Copco 1 Dam.
- **July 10, 1918** – The Big Lagoon Rancheria was established by Executive Authority by the Secretary of the Interior.
- **March 7, 1919** – A large number of allotments go out of trust along the Klamath River due to the pressures from white settlers and timber interests. The competency Commissioner had instructed the Superintendents of the various Indian reservations to submit a list of those allottees who were deemed competent along with a description of their allotments, resulting in 6,278 acres or 22% of the allotted lands passing into fee status.

- **1925** –The BIA in Washington DC sent instructions to Superintendent Montsorf to draw up a list of "competent" Indians on the "connecting strip" in anticipation of the expiration of their allotment trust periods. Another large group of allotments were then taken out of trust.
- **1931** – The Forest Service, in creating the "Redwood National Forest", established a Redwood forest acquisition program targeting reservation lands, including 780 acres of the Klamath River Military Reserve and 2,110 acres of Indian allotments for acquisition.
- **1933** – The State of California bans all forms of tribal traditional burning practices. The California Department of Fish and Game bans all commercial fishing and closes the canneries on the lower Klamath River.
- **1934** – Indian Reorganization Act, the Government extended the trust period for allotments from 25 years to indefinitely, stopped the issuing of Indian allotments and annulled their authority to sell surplus reservation lands, and instead move towards efforts of returning these lands back to the Indian People. The Klamath River Indians were banned from all of their traditional practices of commercial fishing and gill-netting. Yurok fishermen are given jobs building a road from the Klamath Glen to Blue Creek in exchange for gill nets.
- **1950** – With the assistance of the B.I.A., some Hupas organized as the Hoopa Valley Business Council. Prior to this time, from time immemorial, none of the Indian Tribes of the area had been formally organized.
- **1952** – The Secretary of the Interior approved the Hoopa Valley Tribe's Constitution and by-laws.
- **1953** – Public Law 280 enacted by Congress imposed State of California jurisdiction over criminal and civil cases committed by or against Indians in Indian Country. This failed to recognize tribal sovereignty and tribal self-determination. House Concurrent Resolution 108 encouraged the termination of Indian Reservations and the idea of relocating Indians off their reservations. Many Indians were encouraged to sell their allotted lands through questionable and forced fee patents, resulting in at least 60% of the lands being taken out of trust and sold to logging companies, primarily to support the plywood industry that was booming after WWII.
- **1955** – The Trinity River Act allowed the construction of the Trinity River Dam along the Trinity River that flows into the Klamath; to be completed by 1963. The B.I.A. approved timber sales for communally held timber in the Square and as the request of the Hoopa Valley Business Council; the B.I.A. began disbursing per capita payments to individual Hoopa Valley tribal members.
- **1958** – Solicitor's opinion provided that it is legal to distribute revenues from the unalloted trust timberlands of the Square in per capita payments to Hoopa Tribal members (later determined to be erroneous in Short).
- **May 19, 1958** – The Indian Land Restoration Act allowed the return of previously disposed of land restored back to tribal trust, most of which were exceptionally steep or frequently flooded, thus unsuitable for habitation. The 20 acres of Village Reserve at Requa was returned to public domain and allotted to four individual Indians.

- **1960** – Logging upon the North Coast had consumed nearly 90% of the original Redwood forest.
- **1962** – 173-foot high Iron Gate Dam was constructed in order to regulate the flows of the Copco Dams and to run 20 mega-watt's for Pacific Power's power plant. With the construction of Iron Gate Dam another 7 miles of salmon and steelhead spawning habitat disappeared.
- **1963** - A legal suit was filed against the United States on behalf of 16 named Yurok's. Later 3,222 additional claimants and descendants were added in a 1967 modification. The suit asserted that the Yurok Indians should share equally in the proceeds derived from the selling of timber resources on the area comprising the original Hoopa Valley Reservation. Jesse Short, et al v. United States.
- **1964** – The worst flood in recorded history occurred on the Klamath River wiping out the town of Klamath and many low-lying houses.
  The Lewiston dam is built on the Trinity River.
- **1968** – Redwood National Park was created by Congress and later expanded in 1978. The National Parks Service took over the possession of three individual allotments that were along the south end of the Lower Klamath. In all, 1,300 acres of Yurok Tribal land were included in the new Parks boundaries.
- **1973** – Jessie Short Et. Al. v. The United States, Court of Claims held that the Yurok Reservation was not a separate entity but actually an extension of the Hoopa Valley Reservation and was therefore entitled to equal rights to income from timber sales on unalloted trust land.
- **1973** – Mattz v. Arnett, was decided; it upheld the "Indian Country" status of the Reservation. The case involved the State of California trying to assert jurisdiction to regulate Indian fishers on the Klamath River; The Court determined that California had no such jurisdiction.
- **1974** – The U.S. Supreme Court declined to review Short v. United States. The Short court embarked on the task of determining which of the 3,800 plaintiffs were bona fide Indians of the Reservation and therefore entitled to damages. The U.S. and the Hoopa Valley Tribe vigorously contested the status of many of the plaintiffs and litigation continued for two decades. Eventually, in 1994 plaintiffs were certified and received Treasury checks for damages for the period of 1955 to 1974.
- **1974** – The Secretary of the Interior established the 70% escrow account for timber revenues. "Upon the denial of certiorari to the court's decision…The Secretary of the Interior ceased to distribute revenues exclusively to members of the Hoopa Valley Tribe. On the theory that all of the 3,800 plaintiff's could eventually be entitled to 70 percent of annual timber revenues in escrow pending a final decision on the number of plaintiffs in Short qualifying as Indians of the Reservation entitled to per capita distributions of timber revenues." Hoopa Valley Tribe v. United States.
- **1976** – Arnett v. 5 Gill Nets held that the state of California lacked jurisdiction to regulate the Indian fishing on a reservation and that the Yurok Indians had a reserved right to commercial fishing dating back to their aboriginal times and are protected by the governments trust responsibility.

- **1979** – The Hoopa Valley Tribe's suit for damages against the United States for breach of trust and otherwise for failing to protect the Hoopa Valley Reservation was decided adversely to the Tribe.
- **1974-1987** – The Hoopa Valley Tribe unsuccessfully urged Congress to over-turn Short.
- **April 1988** – Puzz v. United States affirmed the previous decision for the Hoopa Valley to receive consent from the Yurok's in the distribution of the escrowed timber sale proceeds. The Yurok's continued to refuse to form a separate tribal roll from that of the Hoopa Valley Tribe as well as participate in any "joint-management" schemes that would allow them to govern themselves. That the Department of the Interior would no longer recognize the Hoopa Valley Tribe as the exclusive government of the Hoopa Valley Reservation.
- **October 31, 1988** – 102 Stat. 2924 The Hoopa-Yurok Settlement Act (P.L. 100-580) divided the land into two separate Reservations: the "square" became the Hoopa Valley Reservation and the "extension" (including the original Klamath River Military Reserve) became the Yurok Reservation; excluding the Resighini Rancheria. This bill reversed the previous court decisions of the Short and Puzz cases and directed the Yurok Tribe to form a tribal council to handle their reservation responsibilities; they also had to establish a tribal roll as well as criteria for sharing the proceeds of the decision. Persons eligible by the criteria of the Short cases who elected not to pursue Yurok Tribal membership were entitled to a buyout payment of $15,000. The Short escrow accounts, plus some small Yurok escrow accounts, are transformed into a Hoopa-Yurok Settlement Fund; and a ten million dollar federal contribution to the Settlement fund was authorized (and appropriated). The Yurok Tribe, subject to adopting a waiver of claims, was given several small land tracts, the authority to organize, and an authorization of not less that 5 million dollars for land purchases. The Settlement Fund was to be allocated to the Hoopa Tribe and the Yurok Tribe based on their relative enrolled population at time of distribution. Both Tribes were to provide waives of claims against any takings of land or assets affected by the Act. This act specifically vest to the Yurok Tribe the fishery. The Yurok allocation of fish is 80% of the total Tribal allocation.
- **1990** – Water division due to the upriver dams has led to a 90% decline in the Klamath and Trinity Rivers fisheries.
- **1991** – The tribe becomes organized under the adoption of the Constitution of the Yurok Tribe and establishes their first Yurok Tribal Council.
- **1991** – In Heller, Ehrman v. Lujan, the Short claims attorneys sued the Secretary of Interior for attorney's fees of up to 25% of the Settlement Fund. They asserted that 70% escrow account was derived from their litigation efforts and that the Settlement Fund was in fact the escrow account. Yuroks, Jesse Short, Susan Masten, and Valerie Reed intervened as co-defendants with the consent of the United States to protect the Settlement Fund. The Yurok and United States defendants were successful when the federal court of appeals determined that the plaintiffs could not sue the United States for money damages in federal district court.

- **1991** – The Department of the Interior allocated the Hoopa-Yurok Settlement Fund based on Hoopa and Yurok tribal enrollments. From the $85,979,348.37 Fund balance, the Hoopa Tribe's share is determined to be 39.5% or $34,006,551.87. This amount has been provided to the Hoopa Valley Tribe. The balance of the Fund, after withdrawals for payments for buy-outs, and enrollments are made, was placed in a Yurok Tribe Trust Fund. The balance after the Hoopa withdrawals and the individual buy-out and enrollment (payment) withdrawals in 1991-93 in the Yurok Trust Account was $37,819,971.79. Each individual Yurok who received as enrollment check had to waive his/her rights to sue the United States for money damages for an unconstitutional taking under the Settlement Act
- **1993** – Twenty acres of the former Weitchpec Bar Mining Claim near Weitchpec was returned to tribal trust due to a surveying problem near Cappell and the end of the Reservation line at Weitchpec.
- **1993** – The Yurok Tribe formally organized and adopted a Constitution under its inherent powers of self-governance. The Department of the Interior recognized the Constitution and the Yurok Tribal Council as the governing body of the Yurok Tribe.
- **1994** – The Yurok Tribe assumed responsibility over the management of their fisheries from the Bureau of Indian Affairs and the U.S. Fish and Wildlife Service.
- **1996** – Parravano v. Masten affirmed the right of the Yurok and Hoopa Valley Tribes to 50% of the harvestable surplus of Klamath River Chinook.
- **1997**- Coho salmon are listed under the Endangered Species Act.
- **2002** – Klamath Fish Kill. Over 30,000 returning adult fall Chinook salmon die in the Lower Klamath River, within the Yurok Reservation as a result of diseases caused by low flows and increased water temperatures. The Yurok Culture Committee statement on the mass die off: The Yurok Tribe files suit against the United States as a result.
- **2006** – The Yurok Tribe, in a settlement agreement over the 2002 Klamath Fish Kill enters into a co-management agreement with the Department of the Interior. The Congress set aside funding for disaster relief due to the low populations of Klamath River fall Chinook for this year.
- **Today** - The Yurok Tribe is currently the largest tribe in California with over 5,600 members. The Yurok currently have approximately 3,400 acres of unalloted trust land, 350 acres of village reserves and 1,900 acres of trust allotments left on the reservation. This represents less than 10% of the original reservation land set-aside for the Yurok people. Billions of dollars in timber, water, fish and minerals have been removed from the lands within the Yurok Reservation with little or no support returned to the original inhabitants of the land. (petition was filed to list Chinook salmon in the Klamath River noting low populations of natural spring and fall Chinook in the Klamath)

III. Yurok Traditional Knowledge and the Klamath River

PREAMBLE OF THE CONSTITUTION OF THE YUROK TRIBE

Approved by the Interim Council on November 24, 1993

Our people have always lived on this sacred and wondrous land along the Pacific Coast and inland on the Klamath River, since the Spirit People, *Wo'ge'* made things ready for us and the Creator, *Ko-won-no-ekc-on Ne ka-nup-ceo*, placed us here. From the beginning, we have followed all the laws of the Creator, which became the whole fabric of our tribal sovereignty. In times past and now Yurok people bless the deep river, the tall redwood trees, the rocks, the mounds, and the trails. We pray for the health of all the animals, and prudently harvest and manage the great salmon runs and herds of deer and elk. We never waste and use every bit of the salmon, deer, elk, sturgeon, eels, seaweed, mussels, candlefish, otters, sea lions, seals, whales, and other ocean and river animals. We also have practiced our stewardship of the land in the prairies and forests through controlled burns that improve wildlife habitat and enhance the health and growth of the tan oak acorns, hazelnuts, pepperwood nuts, berries, grasses and bushes, all of which are used and provide materials for baskets, fabrics, and utensils.

For millennia our religion and sovereignty have been pervasive throughout all of our traditional villages. Our intricate way of life requires the use of the sweathouse, extensive spiritual training, and sacrifice. Until recently there was little crime, because Yurok law is firm and requires full compensation to the family whenever there is an injury or insult. If there is not agreement as to the settlement, a mediator would resolve the dispute. Our Indian doctors, *Keg-ae*, have cared for our people and treated them when they became ill. In times of difficulty village headmen gather together to resolve problems affecting the Yurok Tribe.

Our people have always carried on extensive trade and social relations throughout our territory and beyond. Our commerce includes a monetary system based on the use of dentalium shells, *Terk-n-term*, and other items as currency. The Klamath River was and remains our highway, and we from time beginning utilized the river and the ocean in dugout canoes, *Alth-wayoch*, carved from the redwood by Yurok craftsmen, masterpieces of efficiency and ingenuity and have always been sold or traded to others outside the tribe. Our people come together from many villages to perform ceremonial construction of our fish dams, *Lohq-en*. Our traditional ceremonies -- the Deerskin Dance, Doctor Dance, Jump Dance, Brush Dance, Kick Dance, Flower Dance and others -- have always drawn hundreds, and sometimes thousands, of Yuroks and members of neighboring tribes together for renewal, healing, and prayer. We also have always traveled to the North

and East to the high mountains on our traditional trails to worship the Creator at our sacred sites, -- Doctor Rock, Chimney Rock, *Thklamah* (the stepping stones for ascent into the sky world), and many others.

This whole land, this Yurok country, stayed in balance, kept that way by our good stewardship, hard work, wise laws, and constant prayers to the Creator.

Our social and ecological balance, thousands and thousands of years old, was shattered by the invasion of the non-Indians. We lost three-fourths or more of our people through unprovoked massacres by vigilantes and the intrusion of fatal European diseases. The introduction of alcohol weakened our social structure, as did the forced removal of our children to government boarding schools, where many were beaten, punished for speaking their language, and denied the right to practice their cultural heritage. After goldminers swarmed over our land we agreed to sign a "Treaty of Peace and Friendship" with representatives of the President of the United States in 1851, but the United States Senate failed to ratify the treaty. Then in 1855, the Unites States ordered us to be confined on the Klamath River Reserve, created by Executive Order (pursuant to the Act of March 3, 1853, 10 Stat. 226, 238) within our own territory.

In 1864 a small part of our Ancestral land became a part of the Hoopa Valley Indian Reservation which was set apart for Yuroks and other Indians in Northern California. This became known as the 12-mile "Square." In 1891, a further small part of our Ancestral land was added when "The Extension" to the Hoopa Valley Indian Reservation was set aside by executive order authorized by the 1864 statute, which created the Hoopa Valley Indian Reservation. This statutory reservation extension extended from the mouth of the Klamath River, including the old Klamath River Reserve, about 50 miles inland and encompassed the river and its bed, along with one mile of land on both sides of the river.

But even this small remnant of our ancestral land was not to last for long. In the 1890's, individual Indians received allotments from tribal land located in the Klamath River Reserve portion of the Hoopa Valley Reservation and almost all of the remainder of the Reserve was declared "surplus" and opened for homesteading by non-Indians. The forests were logged excessively and the wildlife was depleted. Even the great salmon runs went into deep decline due to over-fishing and habitat destruction. In the mid 1930's the State of California attempted illegally to terminate traditional fishing by Yurok people, the river's original --and only -- stewards from Bluff Creek to the Pacific Ocean. Our fishing rights were judicially reaffirmed in the 1970's and the 1980's after many legal and physical battles.

Throughout the first 140 years of our tribe's dealings with the United States, we never adopted a written form of government. We had not needed a

formal structure and were reluctant to change. The United States had decimated the Yurok population, land base, and natural resources and our people were deeply distrustful of the federal government. Yet we, the Yurok people, know that this is the time to exercise our inherent tribal sovereignty and formally organize under this Constitution. We do this to provide for the administration and governance of the modern Yurok Tribe that has emerged, strong and proud, from the tragedies and wrongs of the years since the arrival of the non-Indians into our land. Our sacred and vibrant traditions have survived and are now growing stronger and richer each year.

The Yurok Tribe is the largest Indian tribe in California, and, while much land has been lost, the spirit of the Creator and our inherent tribal sovereignty still thrives in the hearts and minds of our people as well as in the strong currents, deep canyons, thick forests, and high mountains of our ancestral lands.

Therefore, in order to exercise the inherent sovereignty of the Yurok Tribe, we adopt this Constitution in order to:

1) Preserve forever the survival of our tribe and protect it from forces which may threaten its existence;

2) Uphold and protect our tribal sovereignty which has existed from time immemorial and which remains undiminished;

3) Reclaim the tribal land base within the Yurok Reservation and enlarge the Reservation boundaries to the maximum extent possible within the ancestral lands of our tribe and/or within any compensatory land area;

4) Preserve and promote our culture, language, and religious beliefs and practices, and pass them on to our children, our grandchildren, and to their children and grandchildren, on and on, forever;

5) Provide for the health, education, economy, and social well being of our members and future members;

6) Restore, enhance, and manage the tribal fishery, tribal water rights, tribal forests, and all other natural resources; and

7) Insure peace, harmony, and protection of individual human rights among our members and among others who may come within the jurisdiction of our tribal government.

(Yurok Tribe Constitution 1993)

Yurok Culture and the Klamath River

From time immemorial Yurok people have lived along the Klamath River from the mouth of the river up to the Karuk boundary. Nearly every aspect of Yurok life, language, ceremonies, society, and economy, was, and continues to be, bound by the river. The River, being so basic that it has no specific Yurok word designation, is euphemistically referred to in its lower stretch as the "Yurok highway". At the mouth of the River, Yurok also refer to the Klamath River as *HeL kik a wroi* or "watercourse coming from way back in the mountains." It is not surprising that Yurok culture reflects a strong connection to the riverine environment. In contemporary times the Klamath River is referred to as "the main vein" or "blood line" of Yurok People, emphasizing the vital importance of the River to Yurok health and survival.

With the steep terrain and temperate rainforest climate of the Klamath-Trinity basin, the sun's rising and setting are not an accurate means of tracking time and direction. Thus, the Yurok have always based time and direction on the Klamath's flows. As one Yurok elder said, "without this river we would not know who we are, where we're from or where we're going" (Gates 1996). Under natural conditions, the rates and sounds of the River's flow tell the Yurok both the season and time of day. The skill of the Yurok fisherman has always been measured by his ability to navigate the Klamath River in the dark. Navigation is not done by the stars or landmarks, but by correlating the location and swiftness of the current and back eddy of the River with the sounds that are unique to each bend, slick and riffle. Every feature of water's movement and characteristics are named by the Yurok. Even when the Yurok are away from the River, they remain acutely aware of their location in relation to it, always measuring direction by the River's flow. For example, it is not uncommon to refer to the burners on a kitchen stove as up or down-river burners depending on their position in relation to the River's flow.

The Yurok's connection to rivers (particularly the Klamath), and their flows, go far beyond time and direction. Through a long history of observation and inter-generational education they have developed an extensive knowledge of rivers, an ability to astutely interpret what changes in the river's flows and ecosystem mean for the Yurok people. For example, it is known that the Spring run of salmon will come soon after the budding of the thimble berry that grows along the Klamath River. It is known that 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. The Yurok people have developed numerous ceremonies that officiate this human connection and communication with all these river processes.

A Yurok elder recalls in the 1920's going down the Klamath River in a traditional Yurok dugout canoe powered by an outboard motor and guided by his father. As they approached within five miles of the coast they noticed that the River was backed up and stagnant because the sand buildup prevented it from flowing out to the ocean. Prayers and offerings were made on the sandbar. A day later, a spirit guardian represented as a large rock granted the request, and the River broke through the sand bar, allowing fish to once again enter.

The majority of the Yurok cultural sites on the Klamath and Trinity Rivers are traditional fishing spots owned by Yurok families. Fishing spots are locations where there are deep holes, significant back eddies and ideal spots to set a net or erect a platform out over the river. Fishing spots can be given, inherited, loaned, leased, hawked and bought and sold and were central to the Yurok economy. Over time, as the rivers' flows have changed, so have the locations of these cultural sites. With nearby mining activity and dam-impeded river flushing, many of these sites have been filled with sediment and are no longer viable for fishing.

The Yurok Tribe, and Yurok people prior to the formal organization of the Tribe, fought hard to preserve the ability of Yurok Tribal members fish. The Tribe's dependence upon fish is recognized throughout is history and by the United States when the Yurok and prior reservations were created. The Yurok's dependence upon fish is well established applicable law and reflected by the fact that approximately 90% of Klamath River fish is harvested by the Yurok Tribe. The Yurok Tribe's allocation of Klamath River fish is 80% of the total Klamath River tribal allocation.

Yurok Oral History and the Klamath River

There are Yurok stories that reinforce the Yurok belief that the river was created in a distinct way in order to provide Yurok people with the best of worlds. For example, Wohpekumeu said "let the river run downstream" and that is how the river came to flow the direction it does. In the story No'ots, a young man went out on the river and took his paddle and rode about on the river. That is why it is crooked at Olege'l.

It is clear from Yurok oral history that the River is such an integral part of the Yurok way of life that without it the traditions of the Yurok people would be perceived in a radically different perspective. Practically every function of the Yurok way of life is associated to the river: The origination of fish, proper methods for taking fish, how the river is to flow, death passage ceremonies, locations for fish dams and ceremonies all reflect the bond between the river and the Yurok people. It is essential that the river be maintained at a level that provides relevance to the young Yurok mind that hears these stories.

The anthropologist Alfred Kroeber traveled throughout the Yurok's territory in the early 1900's interviewing Yurok people and documenting the tribe's way of life. Of the 169 stories which Mr. Kroeber presents in his book Yurok Myths (Kroeber 1978), 77 make direct reference to the river.

Among those stories, there are tales of the construction of the fish dams, locations and origins of ceremonies held along the river, bad places in the river, where the first salmon was created, what one must do with salmon caught at certain locations, how the river came to flow the way it does, and death passage on the river. Much of Yurok knowledge and belief about the river and its resources are held in their stories.

When the creator, *Wohpekumeu*, first came to the Klamath and Trinity Rivers, he saw that there was no food for the people. There were only two women who had salmon. *Wohpekumeu* took the salmon from the women and let them go into the River. *Wohpekumeu* said the people would never catch the Great Salmon. When the Great Salmon comes up, he will swim in the middle of the river so he isn't caught with the nets. The Immortals (*Woge*) only wanted salmon to go up on one side of the river to make sure they knew where they could get salmon. But they never caught anything so they made it so the salmon would come up both sides. A man from the village of *Welkwau* wanted to learn how to fish at the mouth of the River so he went to *Kowetsek* (the home of the salmon) and asked the headman to show him how to harpoon fish. The headman agreed to show the man from *Welkwau*. When *'Nepwo'* (the Great Fish) came through the mouth of the river, the headman acted as if he was going to spear it. He would make thrusting motions with his spear but not actually spearing it, at the same time, he was praying for more salmon to come up the river. More salmon came up the river. The headman speared some salmon and the man from *Welkwau* saw that he handled the fish in a particular way. The headman explained that if salmon was caught at the mouth, a man was not to use a wooden club to kill it; he was to use a stone to hit it in the head. But upstream from the mouth everyone else would use wooden clubs. If a salmon is caught at the mouth it must be buried with only its tail sticking out. People who use a spear to catch fish at the mouth must practice certain medicine before catching salmon. The lamprey eel was also made at *Kowetsek* and there are certain rules one must follow when catching them at the Mouth. This story, as recorded by Kroeber (1978), tells of how the reverence for fish and creator provided the Yurok not only with abundance of salmon, a place for salmon and people to inhabit (the River), that explains the proper etiquette and moral responsibilities of salmon and people.

Among the oral traditions are accounts how the River came to flow the way it does, of Yurok ocean travel to the home of salmon, construction of the fish dams, locations and origins of ceremonies held along the River, where the first salmon was created, what is supposed to be done with salmon when caught at certain locations, and in the proper method for transporting a corpse up the River. There are Yurok stories that reinforce the Yurok belief that the River was created in a distinct way in order to provide Yurok people with the best of worlds. For example, *Wohpekumeu* said, "let the river run downstream" and that is how the River came to flow the direction it does. In the story *No'ots*, a young man went out on the River and took his paddle and rode about on the River. That is why it is crooked at *Olege'l*.

When the world was made ready for Yurok to inhabit, immortals (*woge*) who occupied the land and River came together for discussion. There was indecision as to whether the Yurok people should be taught the knowledge of immortality. It was decided that instead the people should know mortality. Those *woge* who felt sorry for Yurok decided to transform into rocks along the River that would help Yurok with the suffering of death. The last journey of the deceased involves a boat trip up-river with ritual stops at various rocks at the River's edge.

The anthropologist Alfred Kroeber traveled throughout the Yurok territory in the early 1900's interviewing various Yurok people and documenting a Yurok way of life. In *Yurok Myths* (Kroeber, 1978), it is obvious that the River was as important to the people from that era as it is to Yurok people now. Out of the 169 stories in Yurok Myths, there are 77 that make direct reference to the River. Yurok words that name places, plants, animals, and things associated with the River are detailed throughout Yurok stories.

When *Wesona-me'getoL* (the one up-above) created the world, the homes of the supernatural and the people were segregated. The ocean *Pish kaL* separated the two homes. The region on the other side is further divided into *tsi'k-tsik-oL* the home of money, culture hero *Wopekamaw's* home, *Pulekuk,* home of gambling, and the home of *Koowetsik*, the dwelling place of Salmon. Salmon and humans were created to interact with one another and accordingly the River was created to provide a zone of interaction. There are Yurok stories that reinforce the Yurok belief that the River was created in a distinct way in order to provide Yurok people with the best of worlds. For example, *Wopekamaw* said, "let the River run downstream" and that is how the River came to flow the direction it does (Kroeber 1978).

The story *The Salmon and Koowetsik* depicts the location of where the first salmon originated (Kroeber 1978). When *Wohpekamaw* first came to the Klamath River, he saw that there was no food for the people. There were only two women who had salmon. *Wohpekamaw* took the salmon from the women and let them go. *Wohpekamaw* said the people would never catch the Great Salmon (*Nepwo*). When *Nepwo* comes up, he will swim in the middle of the River so he isn't caught with the nets. The Immortals (*woge*) only wanted salmon to go up on one side of the River to make sure they knew where they could get salmon. But they never caught anything so they made it so the salmon would come up both sides. A man from the village of *Welkwau* (south side of the mouth of the Klamath River) wanted to learn how to fish at the mouth of the River so he went to *Koowetsik* and asked the headman to show him how to harpoon fish. The headman agreed to show the man from *Welkwau*. When *Nepwo* came through the mouth of the River, the headman acted as if he was going to spear it. He would make thrusting motions with his spear but not actually spearing it, at the same time, he was praying for more salmon to come up the River.

These ritual actions demonstrated to *Nepwo* that Yurok were sincere in the proper treatment of salmon and *Nepwo* informed the other salmon that it was good to come into the Klamath River. More salmon came up the River. The lamprey eel was also made at *Koowetsik* and there are certain rules one must follow when catching them. This Yurok story is the explanation for the origin of the first fish ceremony.

In the story *Cappel fish dam or Tsurau man*, a young man from *Tsurai* (a Yurok village near the present day coastal town of Trinidad) longed to be around people (Kroeber 1978). He made a place where he could get woodpecker crests and money *'OL we-tsik'*. In order to get those things he would need to wash his hands in certain springs. While he was sitting near the springs, a stick spoke to him and informed the man to build a sweathouse. After the man built the sweathouse, he came back and the stick had turned

into a man whose name was *Tohstek*. *Tohstek* told the man to follow certain rules and he would become rich and would be able to do anything else he desired. The man slept in the sweathouse and began to dream. He dreamed of the Deerskin, Jumping, and Brush ceremonies and he thought that these are the types of things he wants to see. He went to get wood and when he came back to the sweathouse there were ten wooden trunks. Inside the trunks, were all of the things he would need to hold the ceremonies he dreamed about. He traveled up the Klamath River stopping along the way to hold the ceremonies. His final destination was *Cappell*. When he arrived, the people were in the process of building the fish dam but they did not have the proper medicine to finish the dam. *Tsurau* man conducted a ceremony there and the people were able to finish the dam. The headman from *Cappell* gave *Tsurau* man his best boat (*yoch*) so he could return home. Every autumn when the Fish Dam was built, *Tsurau* man traveled up the Klamath River to help the people conduct the ceremony.

Fish dams *?umyo?* were built to make sure there was enough fish for everybody. The Cappell Dam was of utmost importance because it signified the beginning of the dance cycle. Many stories center around the fish dam and the importance of proper ceremony and medicine in its construction and the taking of fish. One such tale, The Salmon and *Kowetsek*, tells about the time that the Creator, *Wohpekumeu*, fist came to the Klamath and Trinity Rivers, and saw there was no food for the people. There were only two women who had salmon. Wohpekumeu took the salmon from the women and let them go into the river. He said the people would never catch the Great Salmon. When the Great Salmon comes up the river, he will swim in the middle so he isn't caught with nets. The immortals (*Woge*) only wanted salmon to go up on one side of the river to make sure they knew where they could catch them. But they never caught anything so they made it so the salmon would come up both sides. A man from the village of *Welkwau* wanted to learn how to fish at the mouth of the river so he went to *Kowetsek* (the home of the salmon) and asked the headman to show him how to harpoon fish. The headman agreed to show the man from *Welkwau*. When *Nepwo* (The Great Fish) came through the mouth of the river, the headman acted as if he was going to spear it. He made thrusting motions with his spear without actually spearing it. At the same time, he prayed for more salmon to come up the river and more salmon came up the river. The headman speared some salmon and the man from *Welkwau* saw that he handled the fish in a particular way. The headman explained that if salmon was caught at the mouth, a man was not to use a wooden club to kill it, he was to use a stone to hit it in the head. But upstream from the mouth everyone else would use wooden clubs. If a salmon is caught at the mouth it must be buried with only its tail sticking out. People who use a spear to catch fish at the mouth must practice certain medicine before catching salmon.

Another Yurok story depicts a place on the river named *Akierger* where the immortals who used to fish there established a rule that any fish caught in that spot must have its eyes taken out and thrown away. In yet another story, a young man from *Tsurau* longed to be around people. He made a place where he could get woodpecker crests and money, *Ol we-tsik*. In order to get those things he would need to wash his hands in certain springs. While he was sitting near the springs, a stick spoke to him and informed the man to build a sweat house. After the man built the sweat-house, he came back and the stick

turned into a man whose name was *Tohstek*. *Tohstek* told the man to follow certain rules and he would become rich and would be able to do anything else he desired. The man slept in the sweat-house and began to dream. He dreamt of the deerskin, Jumping, and Brush dances and he thought that these are the types of things he wants to see. He went to get wood and when he came back to the sweat-house there were ten wooden trunks. Inside the trunks were all of the things he would need to hold the ceremonies that he had dreamt about. He traveled up the Klamath River stopping along the way to hold the ceremonies. His final destination was Cappell. When he arrived, the people from Cappell were in the process of building the fish dam but they did not have the proper medicine to finish the dam. The headman from Cappell gave *Tsurau* man his best boat (or *yoch*) so he could return home. It is said that *Tsurau* man travels every year to help the people dance.

In the story of the *Lo'olego* Ceremony, a young man from *Lo'olego* sought to build a fish dam, but when asked, the *Weitspus* people would not help. They thought he wanted to have a ceremony but lacked the regalia to do so. There was a rock with a hole in it located on the river. The young man went into the hole and didn't come out for a year. When the young man returned, the *Weitspus* people came to help him build the fish dam. When the dam was built, the *Weitspus* people went downstream to perform the White Deerskin Ceremony. The *Lo'olego* people had their own deerskin ceremony at *Lo'olego*. This story helps to show that personal sacrifice is respected and is rewarded.

In another story, *Kerenit* (Chicken Hawk) built his house on top of a large boulder by the river at *Knetkenolo*, which translates as "arrowhead-where fish-weir." He built a fish dam near the boulder and made a water fall so high that the salmon couldn't jump over. There are holes in the rock that held the posts that can still be seen today.

Several stories with translated titles such as, "Origin of Death" and "Death and Purification," indicate the location of eighteen rocks along the Klamath River which are central to the death purification ceremony of the *Woge*. Specifically, when the Yurok transport a corpse along the River they must speak to the *Woge* spirits that live in these rocks.

There are Yurok stories that reinforce their belief that the River was created in a distinct way to provide for the Yurok people. *Wohpekumeu* said "let the river run downstream" and that is how the River came to flow in the direction it does. In the Yurok story *No'ots*, a young man went out on the River and took his paddle and rode about the River near *Olege'l*. This is why it is believed the river is crooked at *Olege'l*.

It is evident from Yurok oral history that rivers are such an integral part of their way of life that without them, their traditions and culture would have little meaning. The stories from which young Yurok learn of their people depend on healthy and vibrant river ecosystems for much of their context. These selected oral traditions and corresponding ritual practices, of which there are many more, tell of the Yurok reverence for fish and creator and if adhered to, provide the Yurok with abundance of salmon, and a place for salmon and people to inhabit.

How Fish Came to be in the River (as told by Florence Shaughnessy, Yurok and documented by Perry 1988):

> In the beginning, there was an Indian goddess. They sent her with the first Indians to be settled here. They told her to stock the world with whatever she thought our people were going to need. So they got all kinds of animals- deer, elk, bear, and all the others. Then she took her people down to the beach, and she talked to the god there.
>
> "I have brought the children here because that is going to be their home. This is where they shall live."
>
> "Now" she said, " I will need help, because along the shore here there is food."
>
> And he said, "Yes, there is food, but there shall be proper help at the proper time. The food that is in the ocean is so delicate that it cannot be exposed for hours like the food that goes on land. They are different. You shall have a helper."
>
> And she said, "Who will my helper be?"
>
> "The moon, The moon shall control the tides."
>
> And so it was settled who should control the tides. They put the fish down at the mouth, the sturgeon and every known fish.
>
> And she said, "The sturgeon shall go far, far up the River until he is trapped, but he shall be a strong swimmer. And the salmon, there shall be four kinds of salmon coming in over the year. There shall be different species that survive the winter rains. And steelhead. And there shall be smaller fish that are seasonal, like the candlefish and surfish. And the lamprey eels, they are for variety of the diet."
>
> Then the sea foods were promised. So we got seaweed, seaboots, crabs, mussels, China slippers, clams of all sizes and others.
>
> And so it was that all the fish were named and sent as far as they could go up the river to feel the people all along the way. And the people were to follow and have their own fishing rocks. They were to look for a place with and eddy and claim that rock. Then they would build homes nearby because their food rock would be there, and then they can take care of their families. (Perry 1988:15)

The Yurok people are named and live in relation to the rivers and the sustenance that those quality flows provide. Residency, natural and cultural resource sites, ceremonial practices, oral history, transportation route, economic and sociological dependence, indeed the Yurok identity, are all intricately woven into the ecosystems of the Trinity and Klamath Rivers. Of 72 village sites in Yurok ancestral lands, the Yurok continue to live upon many of the 44 village sites that line the Klamath and Lower Trinity Rivers. These are places where Yurok have been born, lived, fished, gathered, prayed and have been buried.

Each generation was taught the appropriate respect for each other and everything in the Yurok World. Respect for the River was of particular importance because Yurok and the River are intertwined with sustaining the balance of life. The River is the main stem of Yurok life ways. Nearly every aspect of Yurok life was and continues to be bound to the River and surrounding landscapes that are defined by the actions of these waters. Yurok people and the River provide important roles in Yurok ceremonies, in defining proper methods for treating the deceased, religiously sanctified methods for taking fish at certain locations, gathering the necessary plant products for the manufacture of Yurok material culture and in maintaining the central transportation route.

A Yurok elder said, "without this river we would not know who we are, where we're from or where we're going." Other Native Americans track directionality based on cardinal directions. In a steep riverine environment with a temperate rainforest climate, the suns' rising and setting points are not accurate ways of tracking time and direction. Instead, the flow of the river is most essential for telling time and direction. River flow rates under natural conditions indicate both seasonality and time of day. The capability to estimate time of day and year is enhanced in the estuary where the river is subject to tidal fluctuations. A good Yurok boatman is rated by his ability to navigate the River in the dark. The boatman does this by correlating the location and swiftness of the current and the back eddy of the river in relation to the sound of the river that is uniquely created in each bend, slick and riffle of the riverine environment. Every type of unique feature of the water's movement and characteristics are named. Even when away from the water directionality is measured by the river flow, requiring people to always know where they are in relation to the river. For example it is not uncommon to refer to burners on one side of a kitchen stove as up or down-river burners.

Not only are the Rivers' fluctuations known by characteristics of water content but is also know by what the water flows additionally provide Yurok people. For example it is known that the spring run of salmon will come soon after the budding of the thimbleberry that grows along the Rivers' courses. It is know that after a good flooding 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. After a flood event, specific gravel bars are searched for new deposits of granite boulders used for porch rocks in Yurok traditional homes. It is known that in a drought year, flooding occurs in the lower portions of the River because of sandbar buildup at the mouth of the River. And for all of these natural occurrences Yuroks know of appropriate ceremonies that officiate the human communication with these river processes.

Various ethnographic sources show a wide diversity and abundance of cultural sites located along the River. For example in 1909 the anthropologist Thomas Waterman documented 82 various cultural places, 41 rocks of cultural significance, 97 fishing spots, and 44 villages all located in the river channel, river flood-plane or just above the high water mark. The 82 places are places significant to Yurok history (both historic and legendary), ceremony, gathering, and hunting. In addition to these 264 sites, the Yurok Tribe Heritage Preservation Office has documented approximately 100 additional sites

that were either missed by Waterman or have been established since his early century visit to the territories of the Yurok people.

Yurok Traditional Law and the River

Yurok political organization is and has always been very organized. Traditional political organization and the accompanying judicial system was established by Creator's Law, is institutionalized in the Yurok ceremonial system, and the determination of fault and compensation occurs in very exacting ways. Yurok Traditional Law operates on principles of payment rather than punitive penalty for damages or wrong-doing. This traditional system of jurisprudence is interrelated with the harvesting of fish through both individual fishing places as well as the annual community construction of the fish dam. As these traditional forms of communal fishing, traditional use of the river and traditional forms of jurisprudence were disrupted by non-Indian intervention so also did Yuroks become involved in the Indian wars of the 1860s and the Yurok fish wars of the1970s. Likewise, the traditional and stabilized living patterns were disrupted and Yuroks began to shift from permanent dwelling lifestyles (with bi-annual migrations) to multiple and migratory dwelling lifestyle. These new lifestyles also led to a change of traditional life ways but core Yurok values, particularly in relation to the River and Yurok Traditional Law persist:

The Creator placed Yurok people and fish together for reasons of balance and longevity. The Yurok have a responsibility for assuring the fish get up the River. These reasons are codified as Indian Law, first instructions from the Creator to the Yurok People. When the Law is not followed, the balance is not maintained and the fish do not return, the River dries up and the Yurok people dwindle away.

(Yurok Culture Committee 2003)

Traditional Yurok Fishing Law is as follows:

1. **Know your family relations. Know where you are related along the river. Know the River and its locations, particularly the village name that your family is from.**

2. **Not every Yurok family had/has a fishing place right.**

3. **Every Yurok has a fishing place right through permission.**

4. **Permission is gained by asking and being granted the right, with terms and conditions.**

5. **Permission given once is not permission given forever.**

6. **One standard condition is to offer some fish caught at the place where permission was granted.**

7. **Some fishing places are "open" and anyone can fish there. They are open on a first-come, first-serve basis. If someone is fishing in an open place then the latercomer informs the first party that they want to fish, and then they politely wait a day unless they have already caught enough fish, then they should make ready to leave. It is polite for the first party to provide some fish to those waiting.**

8. **No fighting on the River, particularly no fighting over fishing places. The River is a place to show respect.**

9. **Do not waste fish; do not take more than what is needed. It is not what the River will do for you, it is what you will do for the River.**

10. **Drift netting can occur anywhere as long as it doesn't disturb anyone else's fishing place or net set.**

(Yurok Culture Committee 2003)

Yurok Language and the Klamath River

The Yurok language reflects the intimate connection and relationship between Yurok People and the Klamath River. Yurok words that name places, plants, animals and other things they associate with the river are detailed throughout their stories. The importance of river resources to their people are captured in Yurok names. As discussed previously, rivers are the mainstream of the Yurok people. Nearly every aspect of Yurok life, their ceremonies, society and economy, was and continues to be bound by the river. Therefore, it is not coincidental that the Yurok language and oral history reflect a strong connection to the riverine environment. Yurok knowledge and tradition is handed down and preserved from generation to generation in stories. Stories and the Yurok language are an important part of the education received by younger generations.

There are numerous words for all aspects of the River's characteristics, rate of flow, back flows, eddies, boils, riffles and slicks, and color. Locations and directions are linguistically identified in relation to the river. For example, *poh* refers to 'down river' and *pech* refers to 'up river'. This is why the original Yurok word denotating the Yurok people is '*Poh lik lah*' or "down river people." Even places away from the river, such as the high country, are referenced as "way back from" the River or "*heL kau*." It has been reported that an elderly Yurok woman referred to her stove burners and knobs as the up-river and down river burners, effectively aligning the cook, stove, and house in relation to the directional flow of the river (Hinton 1994).

Waterman (1920) documents only three cardinal directions in Yurok Geography: 'up river', 'down river', and 'away from river'. This use of language in Yurok concepts of

geography underscores the central role the Klamath River has played in Yurok culture, history and cosmology. It also supports the Yurok view of the River as the central bloodline for Yurok People.

Language analysis can show the long-term values and emphasis of a people. For example while there is no specific name word for the Klamath River, the word for 'river' is *la yoh,* and translates as "to run" in reference to liquids. Another word for river, *?ume?wo* is in reference to the fish dams that are placed across the river. The English word 'salmon', denoting several types of anadromous fish does not readily translate into the Yurok word '*ne po y*', "that which is eaten." *'Ne po y'* denotes more than 'fish', but also includes connotations of Yurok reverence for a creature that provides sustenance to a people and way of life. Thus, *ne po y* reflects the Yurok reverence for a creature of the river and an explicit recognition that it sustains their people and way of life.Yurok places are sometimes named after the way the river moves in a particular stretch.

Place Names Associated with River

Yurok people have place names for numerous features and locations on the River and within their landscape. Yurok places are sometimes named after the way the river moves in a particular stretch. For example the town of '*Rekwoi*" denotes the mouth of the river; the town of '*AyoL*' denotes a wide curve in the River and the town of '*Olegel*' denotes a particularly twisty stretch of the River.

Many of these place-names were documented in T.T. Waterman's geographical research (Waterman 1920). Fishing places had names, rock out crops had names, villages, trails, and gathering areas all had Yurok names. Place names were often descriptive, others were references to creation stories, or stories about events that had occurred there. The number of place names given to locations on and around the river and surrounding landscape speak to the intimate relationship between Yurok and their environment, as well as their long-term presence within it.

Various ethnographic sources show a wide diversity and abundance of cultural sites located along the rivers. For example in 1909 the anthropologist Thomas Waterman documented eighty-two various cultural places, forty-one rocks of cultural significance, ninety-seven fishing spots, and forty-four villages all located in the river channel, river flood-plane or just above the high water mark. The eighty-two places locate places significant to Yurok history (both historic and legendary), ceremony, gathering and hunting. In addition to these two hundred and sixty-four sites, the Yurok Tribe Heritage Preservation Office has documented approximately one hundred additional sites that were either missed by Waterman or have been established since his early century visit to the territories of the Yurok people.

Many of these place names reflect geographic placement in relation to the River. For example the Yurok center of the world is named *Kenek*. A place immediately down-river from the town of *Kenek* is named *Kenek-pul*; '*pul*' translates as 'down-river'. A place up

the hill from *Kenek-pul* is named *Kenek-pul hi-won*; '*hi-won'* translates as 'little way up hill'. Another town, named *Ayolth*, denotes a sweeping bend in the River. The village is named after that type bend. The Yurok Village of *Rekwo*i, located at the mouth of the Klamath River, translates as "Mouth of the river." Other examples abound. The word 'Yurok' is a Karuk word for 'down river'. The Yurok people call them selves *Poh-lik Lah*; translated as 'down-river people'. Whether the Karuk or Yurok words are used, it is very clear that a people are named and identify with the river and its particular place in the world.

Yurok Traditional Fishing Technology and Use

The technological expertise of Yurok people presents a direct link to how and why tools were made. Specific types of implements or devices were made to fit a particular environment and type of fishing. For example, specific types of nets were made for river fishing and other types were made for ocean fishing. Tools or devices were not made simply to take river or ocean resources, but some were created specifically to signify the time of sacred ceremonies. The fixed weir is one such example. The most important Yurok fish weir (dam) is known as the Cappell Fish Dam, which signified the time to hold the Deerskin and Jump ceremonies, which in turn insured the abundance of health and resources for all the people. As described in *Fishing Among the Indians of Northwestern California* (Kroeber & Barrett, 12:1960):

> The weir was an elaborate structure built in ten named sections by ten groups of men, all working under the actual, as well as the ceremonial, direction of one formulist. Each section was built with an enclosure provided with a gate, which could be closed when the fish entered. The fish were then easily removed with dip nets.... All told, the full ceremonial cycle connected with the Kepel dam covered some fifty to sixty days. It was the most elaborate undertaking of any kind among the tribes of this Northwestern California region.

While the Fish Dam allowed for community fishing activities, Yurok fishing technology also allows for individual fishing activities. Landing, lifting, flat, and cylindrical nets are used to take a variety of fish. Trap baskets are used to catch eels. Mesh size was determined by the size of fish taken. Some nets were equipped with trigger mechanisms that trapped incoming fish. River & ocean going boats, nets hooks, lines, rope, sinkers, bait, harpoons, clubs fishing baskets and carrying baskets are just some of the technological adaptations employed by the Yurok to assist in the taking of fish.

One of the most important technological advancements of Yurok culture is the construction of river and ocean goings canoes. Canoes, or *yoch,* were carved from selected redwood trees. The ocean going Yurok canoe was from 30 to 40 feet in length, six to eight feet in width and three feet deep. It could haul up to five tons of cargo (usually seal carcasses) and was customarily paddled by five to 20 paddlers and an oarsman who steered the boat from the back. The oarsman was also the headman or,

poyweson, who had the financial and persuasive background to coordinate ocean-going expeditions. There are historic accounts of expeditions traveling 180 miles along the coast (Powers 1871, Gould 1968). Canoes were also used for gathering, fishing, and hunting and general travel along the River. River canoes average from 16 to 20 feet in length and are three to four feet in width. Canoes were customarily paddled and/or pushed with a long pole.

In proto-historic times canoes were also rigged with sails. The double ender canoe was introduced for travel on the estuary near the mouth of the River. Double ender canoes introduced by Yurok carvers in the early 20th century are easier to make and could be adapted to the outboard motor. As redwood logs and access to suitable logs for making a traditional Yurok canoe decreased, the Yurok utilized non-traditional boats to continue their use of and travel on the River. As the motorboat was introduced to the Klamath River, motors were also adapted to fit onto traditional canoes. More recently, modern aluminum boats have been designed specifically for use on the Klamath River, these are often referred to as "Klamath River Sleds" because their design allows them to travel well in various River depths and currents. Today the best boatmen of the Lower Klamath River, utilizing various watercraft, are predominately Yurok.

Specialized methods for harvesting fish and eel from the River were utilized to maximize the success of fishing at different localities on the river. Specific attributes of the river, riffles, shallows, eddies, falls, deep pools, and creeks each had unique attributes for which the Yurok developed specialized equipment or fishing methods to ensure a successful harvest:

> Riffles: harpoons and gaffs were used along with specialized traps.
>
> Shallows: fish weirs were often built in these areas, with impounding pens for spearing, dip netting, gaffing and trapping. Kepel fish dam was in one of these areas on the Klamath.
>
> Eddies: platform fishing with triggered lifting nets were used in these areas.
>
> Falls or cascades: plunge nets, traps, harpoons, and gaffs were used to harvest fish that were trapped below these natural river features.
>
> Deep pools: diving, bow and arrow, snaring, poisoning and sturgeon riding were used in these still and deep areas of the river.
>
> Creeks, streams and tributaries: short fish weirs, basket traps, and hook and line fishing techniques were common in these areas.
>
> Lamprey were harvested by use of lifting nets, dip nets, and basketry eel traps, gaffs and hand catching in certain areas. (Kroeber and Barrett 1960:8)

Fishing techniques were highly specialized to take advantage of specific characteristics of river morphology, as well as species behavior in their annual migration up the Klamath River. The importance of these river resources for Yurok people, and other Klamath River tribes is evident in the complex fishing methods, schedules, rituals and the use of specialized equipment and technique for each species. (Kroeber and Barrett 1960:8)

Traditional Fishing and Gathering

The river is lined with numerous fishing and gathering sites. A detailed discussion of Yurok Fishing Places is provided in Chapter V. The river is also lined with numerous gathering areas associated with plants adapted to flow levels of the river. Various plants are used as food and material to make ceremonial regalia, baskets, cloths, houses, boats, nets, and other everyday household utensils. For example it is well known that a specific type of willow root is best gathered in long narrow stretches of the river where the rivers scouring effect exposes the material sought. There are also places along the river where weavers traditionally meet to avoid the hot summer sun and weave together.

A wide variety of plants, for food, materials, and medicines were gathered along the riparian zone of the Klamath. Numerous species of berries grew along the banks of the River. Plants and roots used for basketry were collected along the River and along tributaries. Plants used for medicines and ceremonies grew along the riparian zone and were gathered for specific purposes by medicine women and ceremonialists (Curtis 1924). Resource areas used for gathering plants for food and materials were often owned by families or individuals. Driftwood along the river, root-gathering areas, seed gathering areas, tobacco plots were resources that were owned by families and individuals (Pilling 1978:147).

The Lower Klamath River, and most of Yurok ancestral territory occupies a discrete botanical niche, commonly referred to as the Oregon Biotic Province. In addition to containing unique species which do not occur anywhere else in North America (for example, California coastal redwoods), the groups that occupy this unique botanical niche share a common culture, and traditional subsistence pattern that is not shared with their neighbors who reside outside of this biotic region. Culturally significant plants for foods, medicines and arts are shared by the distinct Indian tribes that occupy this region and are part of the common culture that is defined by the Klamath River (Mead 1971:48-49). Yurok share a common forest type with their Karuk and Hupa neighbors, primarily mixed evergreen forest and coniferous forest even if the range and percentage of this type varies between groups (Mead 1971:97).

According to Mead, Yurok used over 13 species of plants in basketry, both in the construction and design of a basket. Four plants were used as dyes for basket materials (Mead 1971:64). Mead further identifies six different stems, and kinds of roots, and one type of leaf used in Yurok basketry (Mead 1971:66). Many of these roots and stems were gathered within the floodplain of the River, along the shore or from the exposed banks. Based upon the common use of plants for medicines, food and materials, Mead

concluded that the common culture areas for the region included a grouping of Yurok, Hupa and Karuk even though each group represented a different language family (Mead 1971:71).

Willow was used for many purposes and was often collected along the river. It's roots and shoots were used for basketry. It's leaves were used as medicine in myth times (Curtis 1924:174). Willow was used as a primary basketry material, particularly up river. It can be used interchangeably with hazel for the foundation of the basket. High quality willow shoots were generated every year within the floodplain of the river due to the fact that peak flows would remove the previous year's growth and stimulate new shoots in the spring, which are the most desirable for basketry (O'Neale 1995:16)

Spruce roots were primarily gathered near the mouth of the River and along the coast. They were traded upriver for basketry material for bear grass, black fern, and hazel (O'Neale 1995:17). The primary body material for a basket is spruce root (*Picea sitchensis*). This was gathered by digging out the root and cutting it in lengths of two to three feet. They are then split, while still soft, into broad, flat bands, and then split again to the desired size. These are woven over a frame of hazel (*Corylus*) sticks to form the basket (Merriam 1967:170). Spruce roots are often gathered on exposed riverbanks.

Traditional Trade and Exchange

Trade between upriver and downriver Yurok and between River Yurok and Coastal Yurok was a common practice that enabled the exchange of desired food items between localities. Shellfish, seaweed and surf fish from the coast were traded for salmon, sturgeon, and lamprey from the river. Salmon caught and dried near the mouth of the River were sought by upriver Yurok because of the better flavor provided by the extra fat, which the fish lose as they migrate upstream. These patterns of trade and exchange existed prior to European contact, and persist in present day Yurok society (Perry 1988:13).

One of the primary indicators of trade and exchange both on the River, and up the coast, was the importance of shell money, or dentalia in Yurok society. Yurok men would often have a special tattoo on their forearm for the sole purpose of measuring lengths of dentalium. These shells are indicative of wide trade and exchange because they originated offshore of Vancouver Island. The use of dentalia as currency on the Klamath River beyond Yurok territory indicates the trade networks along the river were quite extensive (Davis 1963:7).

Other common trade goods exchanged between Yurok and their upriver neighbors, the Karuk and the Shasta included obsidian, coastal shells such as Olivella, clam, mussel and abalone, tobacco seeds, juniper beads, white deerskins, woodpecker scalps, sugar pin nuts, elk antler, baskets, redwood canoes, acorns, salt, and seaweed (Davis 1963:49-50).

IV. Yurok Resources of Cultural and Religious Significance

"The River is the lifeline of the Indian people. We depend on the fish, depend on eels, sturgeon. In his lifetime, as an Indian person, going to school, come out to our freedom. River is medicine to him. He can feel lousy as hell and go out on the River and come back feeling good. Gives strength, knowing this is mine; this is where I live, where I'm born. This is where my roots are."

(Yurok Elder Walt McCovey Jr. 2003)

All the natural resources associated with the Klamath River have cultural significance to Yurok People. The fish, aquatic life, water and numerous riparian plant and riverine species are relied upon for a range of uses: subsistence, economic, ceremonial, medicinal and recreational. All are aspects of Yurok culture and lifeways. Most of these traditional practices are still practiced today, even if by a fewer number of Yurok than in pre-Contact times. Previous sections of this report have already documented many of the traditions and uses of the River and its resources and the importance of these uses and traditional practices for cultural identity, transmission and survival. As stated n the quote above, and by numerous Yurok: the River is the "Blood line" of the Yurok People. For this reason all the resources it provides remain resources of cultural and religious significance to the Yurok Tribe.

That the River remains integral to Yurok Culture and life ways is reflected in many aspects of contemporary Yurok life. Traditional ceremonies, that either never stopped or were restored in recent decades, are the Brush Dance, Jump Dance, White Deerskin Dance, and Boat Dance Ceremonies. All four ceremonies must be conducted in close proximity to the River and the cultural and ceremonial significance of these Ceremonies are linked directly to the River and include practices within the Ceremony that require direct exposure to the River, including bathing and drinking of River water. The First Salmon ceremony and the Cappell Fish Dam are currently not practiced but there is interest within the ceremonial community in restoring all Yurok Ceremonies. The Yurok ritual of taking the deceased up river to the death purification rocks is still practiced for those Yurok buried in the traditional fashion.

Yurok culture has recently had a resurgence of the traditional stick games, a ceremonial sport that combines aspects of wrestling and lacrosse. The playing fields are constructed on sandy beaches along the river during the summer months and often in conjunction with the Brush dance ceremony. Aspects of all Yurok ceremonies require interaction and even immersion in the River and require high water quality to be practiced with integrity and also the health and wellbeing of ceremonial practitioners.

Traditional gathering continues, primarily by contemporary basket weavers and medicine people and despite the increasingly difficult task of finding adequate plant population of good quality. Increased restrictions on accessing private and federal properties, increased timber production, and increased use of herbicides and pesticides have all limited the

traditional gatherers' access to suitable and desired species and have impeded efforts to revitalize traditional weaving. Willows, alders, ferns and other cultural plants used for basketry and medicines were traditionally harvested along the river bar where the materials were considered to be of highest quality for use. Decreased flows have impaired and adversely impacted many traditional gathering areas due to low flows, less scouring, and build up of gravel and cobbles along the Lower Klamath. Traditional users still access these areas for these plants and materials, but the availability of suitable materials has declined since the dams were constructed.

Yurok Ceremonial Uses of the Klamath River

This previous chapter of this report has already documented some of the rich Yurok ceremonial and cultural traditions associated with the Klamath River. All Yurok ceremonies involve the River and require high water quality as part of ceremonial activities.

As previously reported in Chpater V, Yurok oral history identifies a time before the world is as it is. In this time, the *wo'gey* lived in Yurok lands. There was a constant struggle to keep the world balanced upon the water. "Knowing that this would be so, before they left the *wo'gey* instructed certain people in what to do to put the world back in balance when the weight of human violations grew too great for it" (Buckley 2002:214). These instructions are the world renewal ceremonies that are held between villages on ceremonial grounds of Yurok, Karuk and Hupa alike. It is a common culture and a common ceremonial cycle that connect the people along the River in the past, present and future (Buckley 2002). Traditional Yurok Ceremonies included the First Salmon Ceremony, The Cappell Fish Dam Ceremony, the Brush Dance Ceremony, the White Deerskin and Boat Dance Ceremonies, and the Jump Dance Ceremony. Of these Ceremonies the Brush Dance Ceremony, the White Deerskin and Boat Dance Ceremonies, and the Jump Dance Ceremony are still practiced today. There is growing interest within the tribal community to restore all traditional Yurok ceremonies as part of cultural revival and cultural restoration efforts undertaken to heal the spiritual, social and psychological trauma experienced during the past 160 years.

Many of the items made and used in Yurok Ceremonies come from the River environment. Baskets made of plant materials collected at the water's edge are used to hold food and ceremonial medicine. Acorns, cooked in the baskets, are converted to a nourishing mush that is rendered by placing several hot rocks (cooking rocks), gathered off of specific river bars, into the acorn flour and water that is placed into the baskets. Regalia that adorn the ceremonialists is constructed out of various plant and animal products that the riverine environment provides. Ceremonial bathing in the River and its tributary creeks is a requirement for some of the participants. Ceremonialists also prepare themselves by listening to the River's sounds. While many guests today arrive by car, many more arrive by traditional transportation: boats.

In the early Spring, the first salmon to enter the Klamath River was speared and ritually eaten by medicine men. This event traditionally signified the beginning of the fishing season for the Yurok. The ritual also marked the scheduling of the construction of the fish dam at Cappell located thirty-three miles from the river's mouth on the Pacific. The fish dam was constructed in conjunction with ceremony and sanctified the taking, distribution and consumption of salmon. Salmon are ritually managed to assure that the Yurok people are all provided for, that up-river people are assured a percentage of the fishery and that enough fish are allowed to re-populate the species. While there still remains a general reverence for salmon, without proper ceremony a strong belief prevails that the salmon will not return in sufficient numbers. All other ceremonies were scheduled after the fish dam construction ceremony took place. The Yurok have many ceremonies in common with the Hupa such as the Jump ceremony and the White Deerskin ceremony. An integrated part of the White Deerskin Ceremony is the Boat Dance Ceremony. The River is central to all these ceremonies.

The Brush Dance held in many of the traditional village sites along the Klamath River, requires the proper scenic river qualities and the availability of river resources. As a brush dance unfolds over a four day period it attests to the wealth that the riverine environment provides. Baskets made of plant materials collected at the water's edge are used to hold food and ceremonial medicine. Acorns, cooked in the baskets, are converted into a nourishing mush that is rendered by placing special hot rocks gathered off of specific river bars into the acorn flour and water placed in the baskets. Regalia that adorns the dancers are constructed out of the various plant and animal products that the riverine environment provides. Ceremonial bathing in the River and its tributary creeks is a requirement for some Dance participants. Ceremonialists also prepare themselves by listening to the River's sounds. While many guests today arrive by car, many more arrive by the traditional transportation method: boats.

Just as children coming into the Yurok world are introduced in various ways to the rivers and the culture that surrounds their people's riverine way of life, so do the elderly depart from this world via the river and its features. Rocks located in the Klamath and Trinity Rivers and at their edges are seen as spirit people who guide Yurok knowledge concerning proper burial procedures. The deceased's last worldly journey is a boat ride up-river. At each of eighteen rocks from the mouth up to Slate Creek and up the Trinity, various burial rites and proscriptions are observed to assure the best departure for the deceased as well as those that remain in this world. There are several rocks in the mid-section of the rivers that contain rare petroglyphs giving instructions from the Creator to the Yurok people. One such instruction is a warning that when the rivers stop flowing it will mark the end of the Yurok world. Accordingly, some elders have prophecised that the manipulation of flows by damming represents the beginning of the end for the Yurok.

The White Deerskin Ceremony is held to thank the Earth and Creator for continued sustenance. An important component of Yurok Ceremonial life is the Boat Dance. In this ceremony, several boats filled with ceremonialists in full regalia traveled down river,

making a ceremonial crossing. The ceremonialists thank the River for continuing to flow and providing the pulse of life that sustains the Yurok world. The Boat Dance requires adequate flows of water in the River at particular times of the year. This is still true today. Therefore, diverting the water chokes the life out of the Klamath River environment. Currently the Tribes have to call the Bureau of Reclamation (BOR) and request an increase in water flows in order to have the Boat Dance during the White Deerskin Ceremony.

Klamath River Water

The Klamath River has always been the central feature of Yurok identity, cultural, spiritual and economic life. Integral to that relationship is water quality. Traditional Yurok ceremonial activities require high water quality due to ritual practices requiring immersion and even ingestion of Klamath River water. A healthy river is required for a healthy Tribe, as articulated by multiple respondents in the Yurok Tribe's 2006 Healthy River, Healthy People Traditional Foods Survey (Yurok Tribe Environmental Program 2006). Water quality issues on the Klamath River, including toxic algal blooms, have severely impacted many Yurok activities on and around the River, with many respondents indicating they stayed away from the River the summers of 2005-2010 out of concerns over public health warnings on recurring annual toxic algal blooms within the watershed. Water from the River is central to many traditional Yurok activities and ceremonies. Gathering of basketry plants and medicine plants is done along the shores, requiring one to wade in the river while following the shoreline. Similarly fishing, accessing fishing places, gillnetting, and dipnetting expose fishers to splashing water and frequent immersion. Eeling is done from the shoreline near areas of high, splashing water and rapid currents. In all cases the possibility and frequency of exposure to River water is extremely high. As a result, Native American people who utilize the River for harvesting or gathering resources have a higher risk of exposure to any toxins in the water than many other users of the same watershed. Tribal members remain very concerned about the toxic algae and other persistent toxins that may be entering the watershed from upstream sources. Degrading water quality not only has a disproportionate adverse impact on downstream tribes and tribal trust resources, but also on cultural activities. The River plays a central role in Yurok ceremonial life and as such water quality and quantity have a direct and significant impact on Yurok ceremonial and religious practices.

V. Yurok Fishing Sites and Fishing Rights

"Most Indian people had fishing spots. They have a right to fish, sometimes it's handed down through relations. You can give a fishing place to someone else….Tradition gives people the right to do things. They can say this is what we've done for years and years. Tracing back generations and generations, this is what makes us strong culturally. Hold onto the old ways. Stick with family fishing holes"

(Yurok Elder Glenn Moore Sr. 2003)

Fishing Places

Fishing places have always been considered real property in Yurok culture. The primary form of fishing was using a dip net in a deep hole or eddy that would form naturally behind a large rock or boulder in the River. A scaffold or platform would be built to access the fishing hole, and are called in Yurok, "*kworl*". Fishing places were considered to be owned by individuals or families. They could be sold, traded, or passed on to others. Agreements for fishing places were not made in writing, but were all verbal. The person giving would let it be known that the person could fish there. The owner of a fishing place could grant permission to others, families and others, to fish there. People were allowed to use the fishing hole of someone else as long as they offered it to you. The value of the fishing hole would be based upon its productivity, how many fish could be caught there in terms of Indian money (dentalia). The value of the fishing place would fluctuate depending on its condition as it would be impacted by annual river flows that could cause gravel or silt to alter its productivity (Waterman 1920:219). Several individuals might own a fishing place, which they used in rotation for one or more days according to their share of ownership in the site. Establishing a new fishing place, or fishing below an existing hole was not allowed. Ownership of existing fishing places was an economic matter, allowing for sale, trade or inheritance. This strict management of fishing places guaranteed the value and the viability of existing fishing places owned by individuals, groups, or families (Bearss 1969:3).

A fishing place can be a place where there is good river access, a deep hole, or good back eddy allows for fish to rest on the way up-river. Fishing places are designated fishing areas on the river, a pool, a rock, and eddy. Often times large projecting river rocks both provide such a place for fish and a place where Yurok fishermen can build scaffolds that allow for the establishment of fish netting areas. Fishing places are a form of real property in Yurok culture. Fishing places can be owned; by individuals, families, or a group of individuals. Fishing places are borrowed, leased, inherited and bought and sold. If shared, each owner has a right to fish there. Some ownership rights at fishing places depend on species of fish caught, salmon, eels, or sturgeon. Others depend on the water level, with individuals owning the right to fish at that place if the River is below or above a certain level. Ownership of a fishing place is not necessarily linked to ownership of

adjacent property, as individuals who live away from the River can have ownership in a fishing place. Some fishing places are abandoned during times when the productivity of a particular place was poor (Waterman 1920:219). Yurok people still recognize this traditional form of resource management and use on the River. Families and individuals continue to use and own rights to fishing places on the River. An entire traditional etiquette and jurisprudence has been developed to regulate the orderly taking of fish.

Fishing places could be shared between individuals who negotiated turns and shared equipment. A very good fishing place might be owned by five to ten men, who would rotate days and times of day to fish. Others fishing places were owned by one person for salmon, and another person for eel or sturgeon. Another fishing place might be owned to a certain water level, with one owning the right to fish when the water was above or below a certain level. Some fishing places might be abandoned due to siltation or some other factor that made it undesirable. If left abandoned so long that the owner was forgotten it could be claimed by a new owner. The Yurok word for that kind of fishing place is "*weq sisiik*". It was generally accepted in Yurok culture that all fishing places along the river were owned by individuals, families or groups of individuals who had the primary right fish there (Waterman 1920:220).

Waterman (1920) documented a total of 94 Yurok fishing places on the Klamath River. Each of these sites had a name and an identified owner or owners. The distribution of these sites on Waterman's maps indicate a gap in his own field data as he notes only one fishing site existing down river of *Turip*, near the mouth at *Rekwo*i. Contemporary ethnographic information, as well as oral history indicates that there are numerous Yurok fishing sites between *Rekwoi* and *Turip* that were not included in Waterman's inventory. Instead his field data appears to have been collected for areas upriver from *Turip* with the majority recorded between Cappell Creek and *Weistpus* at the mouth of the Trinity River.

While fishing places were owned, those who did not have a fishing place could work for the owner in exchange for some of the fish caught there. In this way it was possible for all Yurok to participate in the annual fishing season, and receive a share of the harvest, even if they did not possess a fishing place of their own (Roberts 1932:287).

The best fishing places on the River were privately owned by single individuals, or a group of individuals who rotated fishing at a specific location. Fishing places were recognized as personal property and could be sold, given away or passed on by inheritance. Fishing rights on the River extended beyond the Yurok who lived in river villages. For instance, Yurok who lived in coastal villages away from the River were still recognized as having ownership of fishing sites on the river. (Kroeber and Barrett 1960:3)

Fish Camps

Fish camps on the Klamath River are necessary in order for Indian fishers to take advantage of their fishing rights at the mouth of the River during the commercial fishing season. Many Yurok travel from upriver villages to participate in the annual commercial fishing season. Fish camps are temporary campsites where families stay during this time. Fish camps are places for people to gather, socialize, share stories, and prepare for the next day's catch (Perry 1988:14).

When Indian commercial fishing resumed on the Klamath in 1987, Indian fishing could only occur between 7:00 pm to 7:00 am. This meant nets had to be checked, and fishers had to stay up all night in order to pull in nets and clean and prepare their catch. Once7:00 am came around, Indian fishers had to remove their nets to allow for recreational fishing. When the night's work was complete, Indian fishers would sleep during the day and then prepare for the next night's work (Perry 1988:14-15).

Yurok fish camps on the Klamath continue to be both a social and economic enterprise. Fish camps are temporary camps that are used annually for the purpose of commercial and subsistence fishing on the river. They are strong indicators of a river-based economy. During the salmon runs on the river, these places are utilized by individuals and families. Yurok fish camps are primarily located near the most productive fishing locations, such as Dad's Fish Camp on the south bank, near the mouth of the River (Bearss 1969:14).

Historic Commercial Fishery

The first non-Indian commercial fishery for Klamath and Trinity chinook was established in 1876 on the lower Klamath River. The first cannery was started at Requa in the late 1880's. While non-Indian settlement and commercial fishing in the region began to erode the Yurok's ability to live in their traditional ways, they adapted as best as they could to the new economic opportunities that were created (Bearss 1969). The canneries themselves were not owned by the tribes; however, all of the fish reaching the canneries was being supplied by Indians since they were the only ones permitted access to the in-river fishery.

The peak of salmon canning on the Klamath took place in 1912 - 1915. In 1912 it is estimated that 141,000 salmon were canned. Local Indians were not only employed to harvest the fish but also performed most of the work at the canneries. With little regulation or coordination of in-River and particularly, ocean fishing activities, the Klamath and Trinity River stocks were fished to the limit during the first several decades of the 20th century. In 1933, the State of California, opting to halt the precipitous decline of both rivers' fisheries as a result of fishing, mining, logging, and farming, banned the use of gill-nets on the lower 20 miles of the Klamath (even for subsistence fishing), closed the canneries and prohibited the sale of river-caught salmon. This had severe implications for the tribes, as they were increasingly dependent on the economic opportunities provided by their fishery resources. The tribes resisted the Fish & Game

restrictions, the issue coming to a head in the 1960s and 70s when on several occasions Hupa and Yurok tribal members were cited for violations of the Code and armed confrontations narrowly averted (USFWS et al 2000).

Indian Reserved Rights

By first creating reservations "for Indian Purposes," the United States sought to provide the Hoopa Valley and Yurok tribes with the opportunity to remain mostly self-sufficient, exercise their rights as sovereigns and maintain their traditional ways-of-life.[1] Implicit in this objective was an expectation that the federal government would protect the tribes and the resources they retained (a protection that extended beyond reservation borders). The prerogative of tribes to continue to utilize resources as did their ancestors has long been recognized as an application of their inherent sovereign powers and aboriginal rights, not a privilege bestowed upon them by the Federal Government; an Indian treaty is "not a grant of rights to the Indians, but a grant of rights from them."[2] Therefore, any right not explicitly terminated by treaty or federal statue is considered reserved for a tribe. This basic principle of Indian law is called the "reserved rights" doctrine and has important implications in any action, such as the proposed Trinity River Restoration, which may affect tribal access to resources (USFWS et al 2000).

Yurok Fishing Rights

The fishing rights of the Yurok Tribe are well-established as a matter of federal law. The Yurok Reservation, created pursuant to an 1855 act of Congress, was established within the Yurok Tribe's aboriginal homeland primarily to provide a territory in which the Tribe's fishing-based culture and way of life could thrive and continue to exist. This fact has been recognized repeatedly since the Reservation was established -- by the Departments of the Interior and Commerce, the United States Supreme Court, the lower federal courts, and the California courts. *See, e.g., Mattz v. Arnett*, 412 U.S. 481, 487 (1973); *Donnelly v. United States*, 228 U.S. 243, 259 (1913); *Parravano v. Masten*, 70 F.3d 539, 545-46 (9th Cir. 1995), *cert. denied*, 116 S. Ct. 2546 (1996); *Blake v. Arnett*, 663 F.2d 906, 909 (9th Cir. 1981). As Justice Blackmun observed in *Mattz v. Arnett*, the original Klamath River Reservation, the precursor to the current Yurok Reservation, "abounded in salmon and other fish" and was in all ways "ideally suited for the Yuroks." 412 U.S. at 487.

The Yurok Tribe's right to take fish on the Klamath River is protected and guaranteed by federal law. The Ninth Circuit Court of Appeals confirmed that the executive orders that created the Yurok Reservation vested the Yurok Tribe with "federally reserved fishing rights." *Parravano v. Masten*, 70 F.3d 539, 541 (9th Cir. 1995), *cert, denied*, 518 U.S. 1016

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1 Pevar, Stephan L., The Rights of Indians and Tribes, Second Edition, 1992. Chapter 2.

2 U.S. v. Winans,198 U.S. 371 (1905).

(1996). The same court has aptly observed that the salmon fishery of the Yurok Tribe is "not much less necessary to the existence of the Indians than the atmosphere they breathed." *Blake v. Arnett, supra*, at 909. The Solicitor of the Department of the Interior has determined that the Yurok Tribe is entitled to a sufficient quantity of fish to support a moderate standard of living, or 50% of the Klamath fishery harvest in any given year, whichever is less. Memorandum from Solicitor to Secretary of the Interior, No. M-36979, October 4, 1993. The right includes fishing for subsistence, commercial and cultural purposes. As the court in *Parravano* noted, the purpose of the Yurok Reservation was to enable the Yurok people to continue their fishing way of life. The River and its fish are undeniably the cultural heart of the Yurok people.

In 1969, the State of California's jurisdiction over Indian fishing was challenged in court by Raymond Mattz a Yurok fisherman who had his gill nets taken from him by State officials when he tried to fish on the lower Klamath. Mr. Mattz asserted that as an enrolled member of the Yurok Tribe, State law does not apply since he was fishing in "Indian Country". While he lost his case in two lower courts, the Supreme Court reversed the decision in Mattz v. Arnett, 412 US 481 in 1973 (See Appendix B).

Nonetheless, it was not until 1977, that the Department of Interior reaffirmed the right of Indians of the reservations to sell fish and reopened the lower Klamath to Indian gill-net subsistence and commercial fishing. Interior's action was based in large part on the First District Court's decision in *Arnett v. 5 Gill Nets* that effectively overturned state regulation of on-Reservation Indian fishing. Shortly thereafter, in August of 1978, Interior placed a "Conservation Moratorium" on the Indian commercial fishery (in an effort to satisfy spawner escapement goals in the Klamath River drainage during anticipated low run years).

In 1977 and early 1978 more than 140 Indian fishermen sold salmon harvested from the Klamath River (includes Trinity River stock). Following implementation of the Moratorium a relatively small number of Indian's continued to sell fish, claiming the Moratorium infringed upon their fishing rights and unfairly and inequitably allocated the Rivers' fishery resources between ocean-based and Indian fisheries. This led to several armed confrontations (USFWS et al 2000).

During the nine years that Indian in-river commercial fishing was restricted for "conservation" purposes, 1978 through 1986, both in-river and off-shore non-Indian fishermen landed an average of 140,130 Klamath origin chinook per year for commercial and recreational purposes, while the Indians harvested an average of 20,660 chinook annually (Pierce, 1990).

Once the Moratorium was lifted in 1987, the tribes increased their fishing in accordance with stock abundance projections made in that year and the following two years, 1988 and 1989. More recently, tribal subsistence fishing has been severely limited, and commercial operations mostly non-existent, due to low numbers of fish. This has had a significant impact on the economic situation of the tribes. In 1993, the Department of the Interior concluded that the Pacific Fishery Management Council's ocean harvest

regulations had not met fishery conservation requirements and thus adversely impacted the tribes' in-river fisheries. During that same year, Interior's Solicitor's's office reaffirmed the fishing rights of the tribes and fixed their share of the harvestable Klamath-Trinity basin salmon fishery at an amount, sufficient to support a moderate standard of living or 50% (Solicitor 1993) (See Appendix C).

Ocean commercial fisherman subsequently sued the Secretaries of Commerce and Interior claiming that the Solicitor's decision had forced them to reduce their harvest, and thus, that their harvest rights under the Magnuson Fishery Management and Conservation Act had been violated. This suit was settled in 1995, when the U.S. 9th Circuit Court of Appeals ruled in Commerce's favor, finding that under the Magnuson Act the government can implement regulations which affect coastal fishing if the objective is to meet the purposes of other applicable law, such as its trustee obligation to protect tribal fishing rights.

Salmon, steelhead, sturgeon and lamprey that spawn and migrate up the Klamath river, pass through the Yurok Reservation and are harvested in tribal fisheries. The fishing traditions of these tribes stem from practices that far predate the arrival of non-Indians. Accordingly, when the U.S. established what are today the Hoopa Valley and Yurok Indian Reservations on the Trinity and lower Klamath Rivers, it reserved for the benefit of the Indian tribes of those reservations a right to the fish resources in the rivers running through them (Whipple, Cannery, 1933). The U.S. has long recognized the right of the tribes of the Klamath-Trinity basin to fish. To protect those rights, the Federal Government has a responsibility to ensure that sufficient fish are produced and available to meet certain of its trust obligations to the respective tribes (USFWS et al 2000).

Today, the reserved fishing right includes the right to harvest quantities of fish that the Indians require to maintain a moderate standard of living. It is a vested property right held in trust by the United States for the benefit of the Indians that has been acknowledged and confirmed by the executive, legislative and judiciary branches of the Federal Government in a number of authorities including: 1) Opinion of the Solicitor of the Department of the Interior (Opinion M-36979 (October 4, 1993, see Appendix); 2) The Central Valley Project Improvement Act, Public Law 102-575 3406 (b) (23); and 3) Parravano v. Babbitt and Brown, 837 F. Supp. 1034 (N.D. Calif. 1993); 861 F. Supp. 914 (N.D. Calif. 1994); affirmed 70 F.3d 539 (9th Cir. 1995); cert. Denied 1996 WL 79843 116 S.Ct 2546 (June 24, 1996). It cannot be supplanted by state or Federal regulation.

The above referenced 1993 Solicitor's opinion: 1) reaffirm the historic and legal basis of the reserved fishing rights of the tribes of the Klamath-Trinity region, 2) acknowledge the Federal Government's cognizance of the importance of fish to these Indians at the time it first established reservations on their behalf, 3) fixes the tribes' salmonid fishing rights at 50% of the harvestable surplus of salmonid stocks, 4) recognizes that under the current depleted condition of the fishery, a 50% allocation does not adequately meet the tribes' needs, and 5) argues that it is the degree of the Hoopa Valley and Yurok dependence on fisheries at the time their reservation's were first created or expanded, and not the tribes'

specific uses of the fish, that is relevant in determining their present day fishing rights (USFWS et al 2000).

The Yurok Tribe, and Yurok people prior to the formal organization of the Tribe, fought hard to preserve the ability of Yurok Tribal members fish. The Tribe's dependence upon fish is recognized throughout is history and by the United States when the Yurok and prior reservations were created. The Yurok's dependence upon fish is well established applicable law and reflected by the fact that approximately 90% of Klamath River fish is harvested by the Yurok Tribe. The Yurok Tribe's allocation of Klamath River fish is 80% of the total Klamath River tribal allocation.

Reserved Water Rights

In addition to fish, the tribes have reserved rights to water. The concept of reserved rights in general, and Indian reserved water rights specifically, originated just after the start of the 20th century with *Winters v. United States, 207 U.S. 564 (1908)*. The ruling in this case, commonly referred to as the *Winters* Doctrine, states that when the Federal Government established a reservation, it implicitly reserved a quantity of water necessary to fulfill the purposes of said reservation (that the government would not create a reservation, and Indians accept a permanent area for their home that would be useless without sufficient water). Generally, all original documents related to the establishment of reservations -- treaty, executive order or statute -- indicate, at a minimum, that the purpose of the reservation is to provide a "permanent home" for the tribe(s) in question. Some reservations were established with the general objective that the Indians become civilized. In cases where reservations have been created with specific language stating or implying reserved fishing, gathering or other rights, Winters has been interpreted to mean that adequate water supplies for these purposes have been reserved (even in addition to more general uses -- see *U.S. v. Adair, 723 F.2dd 1410 [9th Cir. 1983])*.

The Department of Interior Solicitor's office and the Courts have continuously reaffirmed these rights with respect to Bureau of Reclamation activities, stating that, "Reclamation is obligated to ensure that project operations not interfere with the Tribes' senior water rights. This is dictated by the doctrine of prior appropriations as well as Reclamation's trust responsibility to protect tribal trust resources" (Solicitor's Opinion, July 25, 1995,). Furthermore, the Solicitor notes that the Secretary of Interior, "through Reclamation, must operate reclamation projects consistent with vested, fairly implied senior Indian water rights" (Solicitor's Memorandum Jan 9,1997) (USFWS et al 2000)

The Salmon Resource

Salmon far exceeds other resources in its importance to the diet and cultures of the Hoopa Valley, Yurok and other tribes who have historically lived in the Klamath-Trinity basin (Swezey & Heizer, 1977; Warburton & Endert, 1966). The Supreme Court in U.S. v. Winans, 198 U.S. 371, 381 (1905) recognized the primary importance of salmon to these

tribes when they concluded that access to the fisheries was "not much less necessary to the existence of the Indians than the atmosphere they breathed" (Kroeber, 1960). The abundance of salmon has always been an important measure of tribal well-being -- where feasting is not simply an exercise in eating, but has deep rooted connections to the vitality of the Earth and a traditional connotation of community health (Gunther, 1926). The timing and cycle of many tribal societal, religious and economic activities were made to closely coincide with the seasonal and geographic variations in fish runs, particularly the arrival of the first salmon (USFWS et al 2000).

Despite variations in the size of the semi-annual runs, in times past, the tribes could typically procure enough salmon for their people. The abundance of fish once supported by the region's rivers is well documented, with stories that recount the challenge of fording the Trinity, and even Klamath River, because the salmon runs were so thick. It is estimated that prior to non-Indian settlement along California's North Coast, the region's Indians consumed over 2 million pounds of salmon annually from runs which are believed to have exceeded ½ a million fish (EIS Indian Fishing Regulations, 1985). Fishing by the Hupa and Yurok had one of the highest yield-to-effort ratios (i.e. was the most efficient) of any subsistence undertaking in all of North America (Swezey & Heizer, 1977). This was due not only to the abundance of fish, but the various fishing techniques developed by both tribes (USFWS et al 2000).

The continual bounty of salmon (as well as steelhead, sturgeon, lamprey and other fish species) available to the region's tribes prior to European settlement, has not been attributed to sparse human population or poor fishing technology, but management. These cultures have always recognized the potential humans have for damaging ecosystems. They also strongly believe that man can be sustained by nature if properly stewarded and revered by him; that nature's health is ultimately expressed through the resources it provides. Consequently, the tribes developed remarkably sophisticated and environmentally sensitive fishery management practices and shared a strong spirit of cooperation in their use of the region's fishery resources. In this manner, they minimized their impact on the fishery, and in some cases, enhanced its productivity. For example, salmon runs historically were protected by a very strict series of laws and traditional mores prohibiting over fishing and ensuring that only the amount needed by tribal communities was taken. Laws also served to guarantee that upstream people received a fair share of the salmon, and most importantly, that weir gates (e.g., fish dams) were kept opened for extended periods during harvest time to insure that adequate numbers of salmon could reach their spawning grounds. Other management activities included the clearing of smaller tributaries to facilitate fish migration. Furthermore, the tribes heeded tales that warn against eating too much and wasting food lest it run out and a belief system that states the salmon will be withheld if abused or mistreated (Lewis 1994). Such proscriptions continue to be voiced today by tribal elders (USFWS et al 2000).

During the pre-Euro-American contact period, fisheries were an essential part of the economy of the region's tribes. The sharing, trading, and consumption of fish was so important that fishing places were acquired as property. Fish were also used for commercial purposes, and were traded in substantial volume. Northwest California

Indians have been catching salmon for trade with other tribes since time immemorial.[3] Trade enabled them to acquire food, raw materials, and manufactured goods. The trade, which involved both necessities and luxuries of native life, existed because of the variation in available local resources. Food preservation methods were developed which allowed fish to be stored throughout the year and transported over great distances. It was tribal custom to take fish for food and commerce efficiently and without damaging the continued existence of the species. Today still, salmon continues to represent an important economic resource for the Klamath River tribes (USFWS et al 2000).

Yurok Cultural Resources

The inseparable relationship of the Yurok people with the environment and resources provided by the rivers of the Klamath-Trinity basin cannot be overemphasized. The Klamath River is a vital natural resource which is the foundation of Yurok social and cultural way of life. At its most basic level, the River has always been a source for food and other necessities of daily life. The River also provides basket materials, fish net materials, and a means of transportation. Even rocks from the river are used by Yurok people to practice their cultural ways. The Yurok River is traveled during religious ceremonies and in recreational activities, it is integral to the Yurok language and its oral tradition and truly represents the binding force of their community. Yurok use of the River developed over a long period of time as evidenced by the complexity of their religious ceremonies and practices. In aboriginal times, religious practices were integrated with fisheries management.

The Yurok have many traditional dances and ceremonies which they have long practiced along the banks of the Klamath and Trinity Rivers. The Yurok's ceremonial way-of-life has greatly suffered with the deterioration of the region's rivers. The Yurok have always depended on the Klamath and Trinity Rivers and the sustenance that their flows provide, they name themselves after the rivers and much of their universe is defined in terms of their physical relation to rivers. Residency, natural and cultural resource sites, ceremonial practices, oral history, transportation routes, economic and sociological resources, indeed the Yurok identity, are all intricately woven into the ecosystems of the Klamath and Trinity Rivers. Yurok continue to live upon some of the forty-four village sites that line the Klamath and lower Trinity Rivers. These are places where Yurok have lived, fished, gathered, prayed and have been buried for countless centuries (USFWS et al 2000).

[3] U.S. v. McCovey reaffirmed Yurok Fisherman's rights to sell fish off the reservation.

VI. Yurok Beneficial Uses of the Klamath River and Tributaries

"The River is part of life. No river, no life. God put it there for us, the people, to use. If people don't use it right, it's gone. It was a place for everyone. The River is there to supply food to the people who need it. We wouldn't be here without the River. I don't know how they figure the are going to get the water back [in the river system]. Who has the water? It is natural to have high water in the winter. I can't see anything bad about it. It is an act of nature".

(Yurok Elder Billy Wilson, 2003)

"The River is our life. Our life revolved around the River. For our own subsistence, our own person, later for business, kept our families for year round. We depended on the River for survival. Without the River, you don't have the fish. The River needs to be taken care of".

(Yurok Elder Fawn Morris, 2003)

"The Klamath River has provided the River Yurok people with food salmon, eels, candle fish, sturgeon and also transportation, eels, roots for basket materials and also willow sticks for basket materials."

(Yurok Tribal Member Survey Respondent 2006)

"I grew up and lived in and around the Yurok Reservation (ceremonial – social – cultural) for the first 31 years of my life. I have hunted with my family for deer and other wildlife, all of my life. I have gathered everything: acorns, berries, teas, plants/medicine mushrooms, all the resources I have used throughout my life time, Basked materials – ferns, willow, Redwood and spruce roots, bear grass, hazel stick, mosses, chitum bark. Salmon is our family's life blood – it provides (food) nourishment all year round. We fresh canned, smoked and canned smoked fish, even the heads and tails, heart and other inner parts are eaten. The backbone is dried and used for soup in the winter. Fish guts used to fertilize (food) gardens. The Redwood trees that grow on my family allotments depend on the Klamath River for water. The Klamath River is the heart and veins of our watershed – the web of life on which the tribe depends and for what we our, Yurok! Down River People! It is what our circle is: What we live, we eat, and sing songs about."

(Yurok Tribal Member Survey Respondent 2006)

The California North Coast Regional Water Quality Control Board has established both Native American Cultural and Subsistence Beneficial Uses for the Klamath River and its tributaries. In 2006, Klamath River tribes participated in an Environmental Justice Pilot Project with the State Water Resources Control Board that served to help provide data on these Beneficial Uses in terms of types of uses and also times of the year during which these Beneficial Uses occur. In 2006 a proposal prepared by the Tribes (Karuk, Yurok, Hoopa) stated:

> The Klamath Basin Tribes working with the State Water Resources Control Board propose an Environment Justice Pilot Project for the Klamath River Watershed. This project seeks to restore Klamath River water resource health for the protection, restoration, and enforcement of Native American Cultural and Traditional Subsistence Beneficial Uses.

The need for such a pilot project is clear. Water quality- based Environmental Justice issues of special concern are:

(1) that the tributaries, lakes, wetlands and the main stem of the Klamath River continue to benefit the Klamath River Basin tribes through traditional economic, subsistence, commercial, and ceremonial uses;
(2) that Native American Cultural and Traditional Subsistence Beneficial Uses, including ceremonial and religious uses of the river, subsistence fishing and other continued traditional cultural uses can and must be restored and protected.
(3) that tribal cultural, social, and physical health can be improved through State Water Board programs designed to restore water quality within the Klamath River Basin.

In order to address the significant water quality issues, the Klamath Basin Tribes have determined that the primary goal of this EJ Pilot Project is to uphold all regulatory parameters for Native American Cultural and Traditional Subsistence Beneficial Uses per the SWRCB North Coast Region Basin Plan:

> The basis for the discussion of beneficial water uses, which follows, is Section 13050(f) of California's Porter-Cologne Water Quality Control Act, which states:
>
> "Beneficial uses" of the waters of the state that may be protected against water quality degradation include, but are not necessarily limited to, domestic, municipal, agricultural, and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves. An essential part of a water quality control plan is an assessment of the beneficial uses, which are to be designated and protected….

> Protection will be afforded to the present and potential beneficial uses of waters of the North Coast Region as designated….The beneficial uses of any specifically identified water body generally apply to all its tributaries….
>
> Water quality standards are adopted to protect public health or welfare, enhance the quality of water, and serve the purposes of the Clean Water Act (as defined in Sections 101(a)(2), and 303(c) of the Act). Water quality standards consist of 1) designated beneficial uses; 2) the water quality objectives to protect those designated uses; 3) implementation of the Federal and State policies for antidegradation; and 4) general policies for application and implementation….

Established and adopted Beneficial Uses for the SWRCB North Coast Region that are of particular importance to Klamath Basin Tribes include but are not limited to:

> **Native American Culture (CUL)** Uses of water that support the cultural and/or traditional rights of indigenous people such as subsistence fishing and shellfish gathering, basket weaving and jewelry material collection, navigation to traditional ceremonial locations, and ceremonial uses.
>
> **Subsistence Fishing (FISH)** Uses of water that support subsistence fishing.

The SWRCB EJ Pilot Project for Klamath Basin Tribes should be devoted to assisting each Tribe in asserting regulatory enforcement of tribally-determined water quality criteria for these Beneficial Uses as they relate to SWRCB policies and actions for the Klamath River Basin.

It is important to recognize that each tribe has its own unique history, culture, and status relative to federal recognition, retained rights, and sovereignty. Participation in this project does not represent a waiver of sovereignty or any rights for any tribe, nor does it establish any additional rights for any tribe.

In a final 2006 Scope of Work prepared by the California State Water Quality Control Board as part of the pilot project the tribes stated:

> The State and Regional Water Boards are engaged in a number of activities to prevent further degradation to the Klamath River and its tributaries and to restore the health, habitat and beneficial uses of the river.
>
> The Klamath River and its tributaries are listed as impaired on the Federal Clean Water Act (CWA) Section 303(d) list. The Regional Water Board has adopted

Total Maximum Daily Loads (TMDLs) including Action Plans to restore the water quality and beneficial uses of Scott, Shasta, and Salmon River watersheds, and is in the process of developing TMDLs for the main stem Klamath River.

A TMDL is a framework for assessing the condition of a watershed, evaluating the factors that contribute to water quality problems in the watershed, and for developing a plan to restore healthy water quality conditions. There are five general objectives of a TMDL:

1. To assess the condition of a waterbody, and determine/confirm cause(s) / source(s) of stress.
2. To quantify the sources of the pollutant or stressor.
3. To determine how much of a particular pollutant or stressor a waterbody can handle and still meet desired conditions.
4. To identify whether and how much the different sources need to be reduced in order to support desired conditions.
5. To develop a plan which, when implemented, will restore waterbody health.

The Klamath River is listed as impaired due to low dissolved oxygen, high water temperature and nutrient concentrations. The Water Quality Control Plan for the North Coast Region (Basin Plan) designates the following beneficial uses to one or more hydrologic areas or sub-areas of the Klamath River:

- Municipal Water Supply (MUN)
- Water Contact Recreation (REC-1)
- Non-Contact Water Recreation (REC-2)
- Cold Freshwater Habitat (COLD)
- Spawning, Reproduction or Early Development (SPWN)
- Migration of Aquatic Organisms (MIGR)
- Rare, Threatened or Endangered Species (RARE)
- Commercial and Sport Fishing (COMM)
- Native American Cultural (CUL)
- Subsistence Fishing (FISH)
- Wildlife Habitat (WILD)
- Marine Habitat (MAR)
- Navigation (NAV)
- Shellfish Harvesting (SHELL)
- Aquaculture (AQUA)
- Agricultural Supply (AGR)
- Industrial Supply (IND)
- Industrial Process Supply (PRO)
- Groundwater Recharge (GWR)
- Freshwater Replenishment (FRSH)
- Hydropower Generation (POW)

In addition to beneficial uses related to the cold water fishery (COLD, SPAWN, MIGR) and drinking water (MUN); the Native American Cultural (CUL) use and the Subsistence Fishing (FISH) use are extremely important to the Klamath Basin Tribes (Tribes). The Regional Water Board added the CUL and FISH beneficial uses during a Basin Plan update in June 2003. This was done to specifically acknowledge reliance by the Tribes on fish to provide most of the protein in their diet and the extreme importance of high-quality water to their culture, spirituality and their economy.

The North Coast Basin Plan defines the Native American Cultural (CUL) and Subsistence Fishing (FISH) uses as follows.

Native American Culture (CUL) Uses of water that support the cultural and/or traditional rights of indigenous people such as subsistence fishing and shellfish gathering, basket weaving and jewelry material collection, navigation to traditional ceremonial locations, and ceremonial uses.

Subsistence Fishing (FISH) Uses of water that support subsistence fishing.

At the time the CUL use was added to the Basin Plan, the Regional Water Board staff did not have adequate information with which to support the designation of the use for all of the waterbodies in the region as existing or potential. Thus, staff did the best they could with the designations using the information submitted by approximately five tribes in the Region. For this reason the CUL designations are not complete in the beneficial use table found within the Basin Plan. There are many other waterbodies where the CUL use very likely exists or existed historically (potential). The Regional Water Board plans to update these beneficial use designations at their earliest opportunity.

In addition, Regional Water Board staff had originally proposed to add subsistence fishing to the Commercial and Sport Fishing use definition. However, at the adoption hearing for the Beneficial Use Amendment, the State Water Board stated that they preferred not to change the statewide definition of this use, but instead agreed to add a separate beneficial use entitled "Subsistence Fishing" (FISH). Because this use was adopted separately, the Regional Water Board was unable to designate this use to any specific waterbody at the time of adoption. This use is known to exist or existed historically (potential) in many waterbodies, including the Klamath River, and will be designated during the next update of the Beneficial Use Chapter of the Basin Plan.

Existing uses are those uses, which were attained in a waterbody on or after November 28, 1975. Existing uses cannot be removed or modified unless a use requiring more stringent criteria is added. However, a use requiring more stringent criteria can always be added because doing so reflects the goal of further

improvement of water quality. Biological data, human use statistics, and/or professional experience is used to document the existing uses.

Waterbodies may have potential beneficial uses established for any of the following reasons: 1) the use existed prior to November 28, 1975, but is not currently being attained; 2) plans already exist to put the water to that use; 3) conditions make such future use likely; 4) the water has been identified as a potential source of drinking water based on the quality and quantity available (see *Sources of Drinking Water Policy*, in Appendix 7); 5) existing water quality does not support these uses, but remedial measures may lead to attainment in the future or 6) there is insufficient information to support the use as existing, however, the potential for the use exists and upon future review, the potential designation may be re-designated as existing.

The CUL use is designated as an existing as well as a potential beneficial use in the Basin Plan and as such, must be protected and if impaired, must be restored. As stated above, existing uses cannot be removed using a use attainability analysis (UAA).

It is imperative that the beneficial use designations in the Basin Plan be updated to reflect existing and potential CUL and FISH beneficial uses so that water quality necessary to protect these uses can be restored and maintained as required by the federal Clean Water Act and the state Porter Cologne Water Quality Control Act.

Under the project described above, the Yurok Tribe Environmental Program (Sloan and McConnell 2007) collected data on Yurok Beneficial Uses of the Klamath River and its tributaries. This work continued in 2008 under a California Environmental Justice Grant (Sloan and McConnell 2009) and documented that Yurok traditional uses of the Klamath River and its tributaries is extensive and continual, spanning through most months of the year. The following tables present information both on types of uses and times of year during which these uses occur within the Yurok community.

YUROK TRIBE CULTURAL USES OF THE KLAMATH RIVER & TRIBUTARIES

Codes used in table: 1 = Main stem Klamath only, 2 = Tributaries only, 3 = Main stem AND Tributaries

USES:

CEREMONIAL	January	February	March	April	May	June	July	August	September	October	November	December
Plants	3	3	3	3	3	3	3	3	3	3	3	NO
Fish	3	3	3	1	1	1	1	1	1	1	1	NO
Fishing	3	3	3	3	3	3	3	3	3	3	3	NO
Water-drinking, steaming, cooking	2	2	2	2	2	2	2	2	2	2	2	2
Rocks	3	3	3	3	3	3	3	3	3	3	3	NO
Bathing						3	3	3	3	3	3	
Boating	3	3	3	3	3	3	3	3	3	3	3	3
Wildlife	3	3	3	3	3	3	3	3	3	3	3	3
River & Trail Access	3	3	3	3	3	3	3	3	3	3	3	3
Training	3	3	3	3	3	3	3	3	3	3	3	3
Swimming						3	3	3	3	3		NO
Prayer/Meditation	3	3	3	3	3	3	3	3	3	3	3	NO

YUROK TRIBE CULTURAL USES OF THE KLAMATH RIVER & TRIBUTARIES

Codes used in table: 1 = Main stem Klamath only, 2 = Tributaries only, 3 = Main stem AND Tributaries

USES:

ACTIVITIES	January	February	March	April	May	June	July	August	September	October	November	December
Plants	3	3	3	3	3	3	3	3	3	3	3	NO
Water-drinking, steaming, cooking	2	2	2	2	2	2	2	2	2	2	2	2
Rocks	3	3	3	3	3	3	3	3	3	3	3	NO
Bathing	3	3	3	3	3	3	3	3	3	3	3	3
Boating	1	1	1	1	1	1	1	1	1	1	1	1
River & Trail Access	3	3	3	3	3	3	3	3	3	3	3	3
Training	3	3	3	3	3	3	3	3	3	3	3	3
Swimming						3	3	3	3	3		
Washing	3	3	3	3	3	3	3	3	3	3	3	3
Meditiation	3	3	3	3	3	3	3	3	3	3	3	3
Wood Gathering	3	3	3	3	3	3	3	3	3	3	3	3

YUROK TRIBE CULTURAL USES OF THE KLAMATH RIVER & TRIBUTARIES

Codes used in table: 1 = Main stem Klamath only, 2 = Tributaries only, 3 = Main stem AND Tributaries

USES:

BASKETRY	January	February	March	April	May	June	July	August	September	October	November	December
Roots	3	3	3	3	3	3	3	3	3	3	3	NO
Sticks	3	3	3	3	3	3	3	3	3	3	3	NO
River & Trail Access	3	3	3	3	3	3	3	3	3	3	3	NO
Plants				3	3	3	3	3	3	3		NO

JEWELRY	January	February	March	April	May	June	July	August	September	October	November	December
			3	3	3	3	3	3	3	3	3	

YUROK TRIBE CULTURAL USES OF THE KLAMATH RIVER & TRIBUTARIES

Codes used in table: 1 = Main stem Klamath only, 2 = Tributaries only, 3 = Main stem AND Tributaries

USES:

SUBSISTENCE	January	February	March	April	May	June	July	August	September	October	November	December
Plants				3	3	3						NO
Fishing	3	1	1	1	1	1	1	1	1	1	1	NO
Eeling	1	1	1	1	1							NO
Shellfish						1	1	1				NO
Water-drinking, steaming, cooking	2	2	2	2	2	2	2	2	2	2	2	2
Wildlife	3	3	3	3	3	3	3	3	3	3	3	NO
River & Trail Access	3	3	3	3	3	3	3	3	3	3	3	3
Food Preparation	2	2	2	2	2	2	2	2	2	2	2	2

Yurok Tribe Cultural Uses of the Klamath River & Tributaries

CEREMONIAL	Pathways of Exposure
Plants	Gathering, walking in streams & river side, cooking, cleaning, soaking, exposure to water when dispensing of medicinal plants, water often taken to ceremonies and used with plants for medicine
Fish	Catching is the same as subsistence, fish for ceremonial use is fresh, contact with fish during preparation
Fishing	Same as subsistence, contact with water nearly constant
Water-drinking, steaming, cooking	Water often taken to the site of ceremony and used in various ways including cleansing, cooking, preparation, drinking, landscaping (packing sand down),
Rocks	Steaming, sweating, cooking, gathering on river and creek banks, exposure to water while walking to pick up rocks.
Bathing	Bathing before, during and after ceremonies and sweats, exposure to water while immersed.
Boating	Getting in and out of boat, splashing, paddling, accidentally falling in, boat capsizing
Wildlife	Walking during hunting for wildlife, cleaning, wildlife drank the water, otter, sea lion, ducks
River & Trail Access	Splashing while walking near and in waterways, trail often cross tributaries or run along side waterways.
Training	Swimming, diving, bathing after training
Swimming	Immersion in waterways, splashing, possibly swallowing water during swimming
Prayer/Meditation	Sitting on riverbank, feet in water
Fish dam	Full body immersion during construction, use of dam after construction, and deconstruction

Yurok Tribe Cultural Uses of the Klamath River & Tributaries

ACTIVITIES	Pathways of Exposure
Plants	Gathering in and near waterways, walking to gather plants, cleaning, cooking, steaming, rinsing, wading in waterways to gather plants,
Water-drinking, steaming, cooking	Drinking water from tributaries, using water to cook and clean, steaming, used to rinse food and eating utensils, water used in camps for multiple purposes
Rocks	Rocks gathered from banks of waterways, often time coming in contact with the water while gathering, either by splashing or wading. The rocks gathered have been in contact with the water, as well as rinsed in the water. Rocks are then used to cook and prepare either medicine or food.
Bathing	Daily bathing in river or tributaries, either by immersion, rinsing or splashing. Direct contact with skin and body
Boating	Getting in and out of boat, splashing while moving and paddling, putting in and taking boat out of water. As a result of being on the water there is constant contact with the water. Bailing of water from boat.
River & Trail Access	The trails often cross paths with waterways or are around, run along side. Contact by wading, splashing. Also when traveling the trails the waterway is used for cooling down and drinking
Training	Swimming, immersion in water, bathing, and diving.
Swimming	Full body immersion, splashing, wading, playing near and in the waterways
Washing	Washing of baskets, utensils, food, rocks, and plants. Washing hands, face, feet, and other body parts. Water used through out the day to wash various things, constant contact with water.
Meditation	Same as ceremonial
Wood Gathering	Gathering wood from the banks of the river, splashing. Traveling to gather wood, having to go through or wade in the shallows of the water to get to the wood. Also possibility that wood has been exposed to the water at some point. Winter gathering involvesthe use of a boat to gather wood that is floating downstream
Tanning hides	Placing of hides in creek

Yurok Tribe Cultural Uses of the Klamath River & Tributaries

BASKETRY	Pathways of Exposure
Roots	Having to dig near the water for roots. Wading in water to get the roots. Constant exposure of water on hands to gather. Also the cleaning and preparing the roots for use. Soaking the roots for flexibility
Sticks	Gathering near tributaries and river could possibly put one in contact with the water. Cleaning and soaking of the sticks to make them usable.
River & Trail Access	Wading to get to the resource. Crossing tributaries and river while gathering basket materials.
Plants	Gathering plants near waterways, having to travel to the plant location puts one in contact with waterways. Also the preparation and cleaning of plants uses water from river and tributaries. The soaking of plant material for flexibility uses water from the river and tributaries.
Weaving	Women would often gather in groups near a tributary. The placing of a wet stick or root in the mouth while weaving.

JEWELRY	Pathways of Exposure
Shells	Gathering from the streams and river. Wading to gather resource. Also preparation of use of the shells requires them to be cleaned in the waterways. Dipping of shell (abalone) in water while grinding

Yurok Tribe Cultural Uses of the Klamath River & Tributaries

SUBSISTENCE	Pathways of Exposure
Plants	The gathering plants in and near streams and rivers, cleaning and rinsing. Preparation, cooking, soaking, steaming…
Fishing	Getting in and out of the boat, Setting and pulling the net. Hands and arms continuously in the water while checking the net and removing fish. Cleaning the fish with water, using the water for slush tanks for storage, wading in the water, splashing from fish, boat moving and dropping the anchor. Trigger net for salmon and sturgeon
Eeling	Setting and checking eel baskets in the water ways. Hooking eels by wading and exposing feet, legs, hands and arms to the water. `Scraping' eels from rocks at Coon Creek and Smokers Falls. Trigger net and dip net. Cleaning eels and preparing them.
Shellfish	Immersion in the water to gather, cleaning and preparation of freshwater clams.
Water- drinking, steaming, cooking	Drinking water directly from tributaries, using water to cook and clean food and items used for food preparation. Water used for multi purposes in the kitchen with preparing all foods.
Wildlife	Wildlife caught in and near waterways. Water used to clean and prepare wildlife for consumption. Geese, ducks, mudhens
River & Trail Access	The trails used to gather and prepare subsistence food are in direct or indirect contact with the waterways.
Food Preparation	Water is used directly and indirectly with food preparation. Used for gathering, cooking, steaming, boiling, cleaning, and multiple uses in all food preparation.

VII. Environmental Justice

"I was born and raised on the River. My life is woven with the river and its fish and people. If the River is sick, so am I. So are we all, because it is our spirit and strength. Even though I live in town, I still live and choose to live close enough so I can go to the River whenever I choose. I participate in ceremonies on the River. If it were possible, I would live on the River, to see it and hear it and smell it every day and every night. I will not be completely healthy again until I can look out my front door at night and see the salmon moving up the River as they did when I was a child. It is not the simple fact of eating healthy food from the River that is important… It is the knowing in my mind, heart and spirit that the River itself is whole and healthy. We are merely a reflection of the river, and will never be healthy again until it is."

(Yurok Tribal Member Survey Respondent 2006)

"Over the years, the river got smaller and smaller. The color has gradually gotten darker. At first, (60's, 70's, 80's) the Klamath only looked unhealthy at the end of summer. Now the River always looks too dark in color and low. At the end of summer now, the Klamath looks dark, low, slow, dirty, slimy and too unhealthy to get into or eat anything coming from it. We used to be able to tell which salmon were not from the mouth, because they would sometimes have a muddy taste. Now I don't eat any salmon that aren't from the mouth for fear of eating toxins and diseased fish."

(Yurok Tribal Member Survey Respondent 2006)

"If something is not done to improve the river water temp – there will be no fish. As a people we are still dancing, without the fish there will be no ceremonies. Without the ceremonies we will be <u>NO MORE</u>. Something is going to have to be done about the damns on the Klamath and Trinity Rivers. Especially the Klamath River. Fish will not travel in hot water – the old holes where fish could find cool water, have filled in giving the fish no place to go – but belly up. I heard Calvin Rube speak before the Senate Committee 45 years ago. He said that we (younger generation) would see fish kills, because of the water temp., which would also cause algae to grow – making river unhealthy."

(Yurok Tribal Member Survey Respondent 2006)

"I am trying to teach my children how to fish on the River and have been very disappointed with the numbers of fish available. I do believe that a lot of traditional foods are being lost and becoming unavailable. Beach fishing is almost impossible to gather surf fish, clams and others. Gathering herbs for teas is becoming a lost art. There is very little if any big game available for food which could provide a lot for the people. Salmon is really the only thing we have left and it is hurting."

(Yurok Tribal Member Survey Respondent 2006)

"The Klamath River is considered a big pool of pesticides flowing to the ocean to do more damage. There will be <u>NO</u> chance that my children will swim in this pool of pesticide run off. I cannot see seven generations ahead on this River. I have had three family members die from cancer. They lived at Notchko. I pray for the River to come back and show my children the way of life. As it did for me."

(Yurok Tribal Member Survey Respondent 2006)

No single minority population in the US experiences higher rates of unemployment, poverty, diabetes, heart disease, cancer, or high-school drop out rates than Native Americans, and those statistics are starkly higher for on-reservation communities. EO 12898 was signed with the intent of finally recognizing, considering, and where possible mitigating the disproportionate adverse impacts on low-income and minority populations in federal actions. Presidential Executive Order 12898 issued a directive to all federal agencies on Environmental Justice:

> "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."

The Yurok People remain intrinsically tied to the Klamath River and the resources it provides the community through the fishery. For the Yurok Tribe, the river is the foundation of tribal culture, spirituality, transportation, subsistence, as well as the traditional and contemporary economy. In pre-Contact times, the Yurok villages along the Klamath managed and utilized the fishery, as their primary source of sustenance and the fishery was the basis of the Klamath River economy. During the cannery period, tribal people continued making their livings of the fish that the river provided. Even with significant declines in anadromous fish populations in recent decades, the fishery remains a primary source of the tribal economy and subsistence of the tribe.

Environmental justice issues for the Yurok Tribe with regards to the Klamath River include: loss of traditional subsistence, lack of benefit from hydro-electric power generated by Klamath River dams, increased health risks as a result of degraded water quality and increase of toxic algae blooms, and the lack of funding to actively participate in the Pacificorp and dam re-licensing efforts or in the Secretarial Determination and NEPA/CEQA process currently underway.

The Yurok Tribe has been a long-time advocate for the protection of the Klamath River and the health of the fishery. The Yurok Tribe has been actively engaged in tribal and inter-tribal efforts to protect and restore the fishery for many decades. Since it's re-organization in 1988, the Yurok Tribe has developed several departments to help promote the Tribe's goals on the management of both natural and cultural resources. The Yurok Tribe has established and active programs in Forestry, Fisheries, Watershed Restoration, and the Yurok Tribe Environmental Program (YTEP). YTEP is an ongoing and current recipient of EPA funding for several programs in several media. All of these departments have demonstrated numerous successes in obtaining and managing grant funded programs, achieving grant objectives and deliverables, and utilizing grant funding to further enhance technical capacity within the Tribe.

Klamath River Tribes and California EJ Pilot Project

In a 2006 proposal to the State Water Quality Control Board for an Environmental Justice Pilot Project, the six federally recognized Klamath Basin Tribes stated:

> The Klamath River is a valuable ecological resource to the states of California and Oregon. The Klamath River and the resources it provides serve as a common cultural, spiritual, and social link between all Klamath Basin Tribes.
>
> In pre-Contact times, the tribes on the Klamath managed and utilized the fishery as a primary source of sustenance and the fishery was the basis of the Klamath River economy. Even the location of tribal communities was determined by the significance of salmon and the fishery to these tribes. The federal government considered the significance of the subsistence fishery in determining the location of reservations and rancherias.
>
> During the cannery period, tribal people continued to make their living from the fish that the River provided. Even with significant declines in salmon populations returning to the Klamath since the construction of the Klamath Project dams, the fishery remains a primary part of the tribal economy and source of sustenance for the tribes that still have access to fish.
>
> It is significant to note that some Klamath Basin Tribes have lost their entire tribal salmon fishery. The primary reason for the loss is the construction of dams that completely block fish access to the upper Klamath, once a prime salmonid spawning area.
>
> The dams also degrade Klamath River water quality resulting in a major impact to the health of the watershed. The cumulative impacts of the dams has caused a significant decrease in the number of salmon that return each year. California Klamath Basin Tribes have experienced a dramatic decline in their subsistence and commercial fisheries as a result of degraded water quality, including increased water temperature, algae and bacteria growth, high pH, and deadly dissolved oxygen levels.

In order to better manage the Klamath River and the resources that it provides, this proposal will rely on Government Code § 65040.12, which describes "Environmental Justice".

Environmental justice is defined by California statute as,

> "The fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies." (Gov. Code. §65040.12).

Given the mandates of this Section, it is critical that any environmental justice project for the Klamath River address the significance of salmon and other river resources to the traditional life ways and contemporary cultures of Klamath Basin Tribes. This should be accomplished through the identification and development of criteria to protect, restore, and enforce Native American Cultural and Subsistence Fishing Beneficial Uses for the Klamath Basin Tribes.

The tribal governments located in the Klamath Basin take the position that the issues of water quality and the impacts of dams on the traditional diet, traditional subsistence, and the continuation of tribal culture (spiritual, ceremonial, and resource uses)of the Klamath River and its tributaries must be a priority for this project if the mandates of Section 65040.12 are to be heeded and established Beneficial Uses are to be protected, restored, and enforced. A meaningful environmental justice project must address the cumulative impacts of degraded water quality not only on Native American Cultural and Subsistence Fishing Beneficial Uses, but also on the physical health of tribal people due to the decline of salmon and steelhead, and the loss of these fish in their daily diet.

The tribal governments and their people are united in their commitment and determination to protect what remains of the fishery and restore to historic levels river health, biodiversity, and the fishery (salmon, steelhead, sturgeon, lamprey, and suckers).

Given the language of Gov. Code § 65040.12 it is important that the Klamath Basin Tribes, through their respective tribal governments, take a lead role in developing the research design, methods, and implementation strategies for any pilot project proposal for environmental justice being proposed by the SWRCB for the Klamath River watershed.

The Klamath Basin Tribes agree that the Klamath River is an excellent choice for an environmental justice pilot project by Cal/EPA and the SWRCB. In order for this project to adequately identify and design both a methodology and implementation strategy for meeting the stated goals of the Cal/EPA environmental justice policy, then it must enable tribes to take the lead in the process, particularly in identifying needs, goals, methods, and implementation of any such project.

The Klamath Basin Tribes have historically been at a disadvantage while participating in the process surrounding the re-licensing of the Klamath Hydroelectric Project. Internal

capacity, lack of funding, limitation in staff numbers, and travel expenses are all factors that inhibit fair participation by the tribes. In contrast, federal, state, and local agencies have staff and funding for their representatives to participate in these processes. Industry and special interest groups also have more resources and expertise at their disposal during this process.

Furthermore, while other interest groups have benefited greatly from the development of the Klamath River, the tribes have not realized an economic benefit, nor have they realized a benefit from the energy generated by the hydro-electric operations, or agriculture. In fact, the negative impacts of these developments have proven to be detrimental to tribal interests.

It is important to note the social, cultural, economic and health issues that impact these tribal communities as a direct result of the loss and/or decline of their traditional fisheries, degraded water quality, and the disruption of a naturally functioning watershed and ecosystem by the construction of the Klamath dams.

It is important to recognize that the Klamath Basin Tribes have all paid the highest socio-economic, cultural, and related health costs resulting from land and water management decisions that have led to adverse cumulative impacts on water quality and watershed health.

Klamath Basin Tribes have suffered the highest impacts as demonstrated in the loss or decline of their fisheries, their traditional diet, and their ability to conduct ceremonies and practice traditional culture and spirituality in harmony with nature and the historic Klamath Basin ecosystem.

There is an intrinsic relationship between the overall ecological health of the Klamath River and the physical, cultural, and economic health of the Klamath Basin Tribal communities. The fundamental goal of this project must be the overall restoration of Tribal-specific Beneficial Uses of Klamath River Basin and related fisheries and cultural resources.

California State Water Resources Control Board

The proposal from the Tribes resulted in a final scope of work for the EJ project prepared by the State Water Resources Control Board:

Scope of Work for Klamath River Watershed

Environmental Justice Pilot Project

August 16, 2006

The Klamath River is a valuable ecological resource to the states of California and Oregon. For the tribes of the Klamath, the river is the foundation of tribal culture, spirituality, subsistence, and traditional and contemporary economy. The Klamath River

Basin also provides important spawning habitat for Chinook Salmon and other fish species.

The Klamath River is in a state of decline, in which impaired flows, disease, toxic algal blooms and diminished habitat have led to loss of the anadromous fishery and significant impact to the lives, economy, health and traditions of the Klamath River tribes.

These impacts to the Klamath River have also had a significant affect on salmon fishing and have led Governor Schwarzenegger, on June 6, 2006, to declare a state of emergency for Chinook Salmon in the Klamath River Basin. The disaster declaration states, in part:

> WHEREAS Klamath River Basin Chinook Salmon have been significantly impacted by poor ocean conditions, drought, water management, water quality, water flows, disease, and the elimination of access to historical spawning habitat; and
>
> WHEREAS restoration of habitat and improved water quality and flows are critical to restoring an environment suitable to the long-term sustainability of the Klamath River Basin Chinook Salmon and other anadromous fish species; and
>
> NOW, THEREFORE, I, ARNOLD SCHWARZENEGGER, Governor of the State of California, find that conditions of disaster or of extreme peril to the safety of persons and property exist within the California counties of Monterey, Santa Cruz, San Mateo, San Francisco, Marin, Sonoma, Mendocino, Humboldt, Del Norte, and Siskiyou due to the poor ocean conditions, drought, water management, water quality, water flows, disease, and the elimination of access to historical spawning habitat and resulting from the significant restrictions that have been imposed on the State's salmon fisheries. Because the magnitude of this disaster will likely exceed the capabilities of the services, personnel, and facilities of these counties, I find these counties to be in a state of emergency, and under the authority of the California Emergency Services Act, I hereby proclaim that a State of Emergency exists in these counties.

The decline of the salmonid fishery in the Klamath River has altered the diet of each of the tribes along the river and its tributaries. For example, traditional consumption of fish by the Karuk tribe was historically estimated at 450 pounds per person per year, while in 2003 the Karuk people consumed less than 5 pounds of salmon per person, and in 2004 less than ½ pound per person was consumed.

The Klamath River Basin is home to the largest population of Native Tribes in California. Tribal groups depend on the Tribal Trust species of the Klamath River for subsistence fishing purposes. The Trust species include, but are not limited to: Coho Salmon, Chinook Salmon, Steelhead Trout, Pacific and non-anadramous Lamprey Eel, Sturgeon, and Eulachon. Sufficient numbers of Trust species must be maintained to sustain the primary dietary needs of the Klamath Basin Tribes. The federal allocation of salmon fishery to the Klamath Basin Tribes is 50% of the total available harvest. (50 CFR 661).

Sufficient habitat and suitable water quality is necessary to provide numbers of Tribal Trust species adequate to support the dietary needs of the Klamath River Basin tribal members.

The decrease in abundance and availability of traditional foods, including the Tribal Trust species, is responsible for many diet related illnesses among Native Americans including diabetes, obesity, heart disease, tuberculosis, hypertension, kidney troubles and strokes. These conditions result from the lack of nutrient content specific to traditional foods such as salmon, as well as from the decrease in exercise associated with fishing and gathering food. The estimated diabetes rate for the Karuk Tribe is 21%, nearly four times the U.S. average and the estimated rate of heart disease for the Karuk Tribe is 39.6%, three times the U.S. average.

The destruction of the Klamath River fishery has led to both poverty and hunger. Prior to contact with Europeans and the destruction of the fisheries, the Karuk, Hoopa and Yurok tribes were the wealthiest people in what is now known as California. Today they are amongst the poorest. This dramatic reversal is directly linked to the destruction of the fisheries resource base.

The devastation of the resource base, especially the fisheries, is also directly linked to the disproportionate unemployment and low socio-economic status of Karuk people today. Before the impacts of dams, mining and over fishing the Karuk people subsisted off salmon year round for tens of thousands of years. Now poverty and hunger rates for the Karuk Tribe are amongst the highest in the State and Nation. The poverty rate of the Karuk Tribe is between 80 and 85%. The poverty rate is even higher for tribal members living in Siskiyou County (Norgaard 2005 Exec Summary).

The degradation of these uses threatens the very existence of these tribes. Restoration and protection of these uses is essential to preserve the health and culture of the Tribes.

Pierce, 2002 (p.7-2) states:

Salmon are food, culture, and religion to the Klamath River tribes. Religion, lore, law, and technology all evolved from the Indians relationship with the Salmon and other fish of the Klamath River Basin. The Supreme Court has recognized the importance of salmon to the Northwest Tribes such as those in the Klamath River Basin, concluding that access to the fisheries was not much less necessary to the existence of the Indians than the air they breathe.

Dr. Thomas King and Klamath Riverscape

In 2004, anthropologist Thomas King conducted a study of the Klamath Riverscape in a report entitled *First Salmon.* This study evaluated the Klamath River as a Traditional Cultural Property and Cultural Riverscape for its potential eligibility for inclusion on the National Register of

Historic Places for the Klamath River Inter-Tribal Fish and Water Commission. In this report, Dr. King also evaluates the proposed re-licensing of the Klamath Hydro-Electric Project under a range of federal environmental laws. In his evaluation of Environmental Justice Executive Order 12898 he concludes:

> Executive Order 12898 on "environmental justice" calls upon Federal agencies to do what they can to prevent disproportionate adverse environmental impacts on low income and minority populations. The tribes – both those that are federally recognized and those that are not – constitute such populations.
>
> Guidance from the Council on Environmental Quality, Environmental Protection Agency, and Department of Justice indicates that agencies are to comply with Executive Order 12898 by identifying low income and minority communities that might be affected by their actions, by involving such communities in their environ mental review work, and by working with such communities to identify and, if possible, avoid or mitigate disproportionate adverse effect on aspects of the environ ment that affect or are important to low income and minority people. In the case of the Klamath Riverscape, all the tribes (both federally recognized and non-recognized) are minority communities, and probably low-income as well.
>
> It is evident from the preceding discussion that the dams contribute to a pattern of cumulative effects on the cultural values and interests of the tribes – aspects of the environment that are of great importance to them. This would be the case even if the Klamath Riverscape were found ineligible for the National Register, because whatever the significance of the riverscape in the eyes of the National Register, to the tribes it is utterly central to their cultural identity.
>
> This being the case, it is equally evident that the effects of the dams, together with the other contributors to the Klamath's plight, fall disproportionately on the tribes. While others live within the riverscape, travel through it, fish in it and hunt in it, only the tribes have an intimate cultural connection to the riverscape going back to time immemorial. Only to the tribes is the riverscape the core of their cultural identity. Maintaining and reinforcing this association is particularly important today, as the tribes work to reestablish their traditional belief systems and ways of life.

Yurok Comments on FERC EIS

In 2006 the Yurok Tribe provided extensive data and comments on the Draft EIS prepared by the Federal Energy Regulatory Commission (FERC) on the Klamath Hydro-Electric Project Relicensing Application filed by Pacificorp. Portions of these formal comments filed by the Yurok Tribe related to Environmental Justice issues and the inadequacy of the socio-economic analysis in the DEIS. Excerpts from these comments are provided in the remaining pages of this Chapter.

Socioeconomic Resources

A legitimate socioeconomic impact assessment of the Klamath Hydroelectric Project and current conditions must determine how the proposed *federal action* affects the lives of current and future residents of the impacted area. PacifiCorp selected a 5-mile and 50-mile corridor as the study areas identifies for analysis under the National Environmental Policy Act (NEPA), which effectively diluted the representation of Tribes that live on the Klamath River and its tributaries and distorted the impact the Klamath Hydroelectric Project has on those Tribes. A socioeconomic impact assessment must evaluate the impacts of the proposed *federal action* on low-income and minority populations. The analysis of impacts on low-income and minority populations must address both specific/direct and cumulative effects of the project on the populations' demographics, employment, income levels, aesthetic environments and community-specific social, health, and economic conditions. The FERC EIS failed to adequately assess or consider any of those criteria, particularly for their impacts on the Yurok Tribe, Yurok Indian Reservation, or other Native American tribes within the basin and watershed.

The National Environmental Policy Act mandates that the Lead Agency follow a valid, established, and legitimate scientific assessment and process for insuring NEPA compliance and considering the impacts and cumulative effects of the proposed federal action and any alternatives. Section 4332 of NEPA states:

The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this chapter, and (2) all agencies of the Federal Government shall -

(A) utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment;

(B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by subchapter II of this chapter, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations;

(C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on -

(i) the environmental impact of the proposed action,
(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
(iii) alternatives to the proposed action,
(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

The NEPA process is intended to promote excellent decision-making by federal agencies. It is intended to be interdisciplinary in scope. It requires compliance with all applicable federal and state laws. The Lead Agency cannot make any determination concerning compliance with federal and state laws if the necessary data have not been collected, and the necessary studies have not been conducted. The FERC EIS was fatally flawed because it did not contain the data necessary to identify and assess compliance with state and federal laws based on the Klamath Hydroelectric Project's effects on Native American tribes, reservation communities, and tribal trust resources.

The federal government, specifically those federal agencies involved in the preparation of the Secretarial Determination Overview Report and the associated NEPA analysis being conducted for the current proposed action, must fulfill its responsibilities under NEPA and to federally recognized Indian Tribes, especially to the Yurok Tribe; a tribe that has been undergoing active social, cultural, economic, and political restoration as a result of the Tribe's reorganization following the Hoopa-Yurok Settlement Act of 1988.

In 2006, out of concern over the lack of a legitimate socioeconomic analysis of the dams' impacts on Native American communities, the Yurok Tribe conducted a preliminary socioeconomic survey. The Tribe performed this survey as a preliminary way of identifying some of the potential socioeconomic impacts of the Project on the Yurok people. Because the Tribe recognizes the significance of these issues and understands the need for the Department of the Interior to have sufficient reliable information necessary to make a balanced and informed analyses under NEPA and for the Secretarial Determination Overview Report, the Tribe is providing key data and findings from this 2006 study in this report. Some of the key findings of this study, The Yurok Tribe's *Healthy River, Healthy People Traditional Foods Survey* are presented in the following comments. As these data and analyses will show, the FERC's socioeconomic data and analyses as presented in the Final EIS were biased and misrepresented or ignored socioeconomic impacts of the Klamath Hydroelectric Project on the Yurok Tribe, and Native American communities in general. This analysis was also submitted to the FERC in formal comments submitted by the Yurok Tribe on the Draft EIS to the formal FERC record in a separate filing. This 2006 study and the following data and findings have direct bearing on the Secretarial Determination Overview Report and the NEPA analysis currently underway. It is being submitted to the Bureau of Indian Affairs (BIA) due to its relevance and bearing on issues of tribal trust responsibilities of the federal government and its agencies.

Executive Order 12898 on Environmental Justice requires all federal agencies to consider the impacts of their actions on low-income and minority populations. Native American communities and Tribes are by all definitions low-income and minority populations. Federal and state laws, statutes, and government policies on Environmental Justice (EJ) that must be considered in the current NEPA and CEQA analysis and the Secretarial Determination Overview Report also include:

Federal Environmental Justice:

- Constitution of the United States;
- Title VI of the Civil Rights Act of 1964 (42 USC sec. 2000 et seq.) -Non discrimination in programs with Federal Funds;
- 40 CFR 7.35 (No disparate impacts from programs with Federal funds); and
- Executive Order 12898 (Established Federal EJ program).

State Environmental Justice:

- California State Constitution;
- Government Code section 65040.12 (Definition of EJ and designation of OPR as coordinating agency for EJ);
- Government Code section 65040.2 (requiring OPR to develop EJ guidance for General Plan); and
- Public Resources Code § 71110 et seq. (Established CA EJ program).

California Public Resources Code § 71110 et seq:

> 71110. The California Environmental Protection Agency, in designing its mission for programs, policies, and standards, shall do all of the following:
>
> (a) Conduct its programs, policies, and activities that substantially affect human health or the environment in a manner that ensures the fair treatment of people of all races, cultures, and income levels, including minority populations and low-income populations of the state.
>
> (b) Promote enforcement of all health and environmental statutes within its jurisdiction in a manner that ensures the fair treatment of people of all races, cultures, and income levels, including minority populations and low-income populations in the state.
>
> (c) Ensure greater public participation in the agency's development, adoption, and implementation of environmental regulations and policies.
>
> (d) Improve research and data collection for programs within the agency relating to the health of, and environment of, people of all races, cultures, and income levels, including minority populations and low-income populations of the state.
>
> (e) Coordinate its efforts and share information with the United States Environmental Protection Agency.
>
> (f) Identify differential patterns of consumption of natural resources among people of - different socioeconomic classifications for programs within the agency.

The socioeconomic analysis in the FERC EIS failed to present any evidence of tribal consultation in the NEPA process by the FERC on Project impacts on the Yurok Tribe. The relationship between the United States and Indian tribes is defined by treaties, statutes, and

judicial decisions. Indian tribes have various sovereign authorities, including the power to make and enforce laws, administer justice, and manage and control their lands and resources. Through several Executive Orders and a Presidential Memorandum, departments and agencies of the Executive Branch have been directed to consult with federally recognized Indian tribes in a manner that recognizes the government-to-government relationship between these agencies and tribes. In essence, this means that consultation should involve direct contact between agencies and tribes, in a manner that recognizes the status of the tribes as sovereign governments. Some applicable statutes on the federal responsibility regarding government-to-government consultation with Tribes include:

- Executive Order 13175, Consultation and Coordination with Indian Tribal Governments (issued November 6, 2000);
- Executive Order 13084, Consultation and Coordination with Indian Tribal Governments (issued May 14, 1998);
- Presidential Memorandum, Government-to-Government Relations with Native American Tribal Governments (issued April 29, 1994), reprinted at 59 Fed. Reg. 22,951; and
- Executive Order 12875, Enhancing the Intergovernmental Partnership (issued October 26, 1993).

In order for the Lead Agency, the BIA, or the Secretary of the Interior to make an accurate and valid determination of the current conditions on tribal trust resources, it must engage in meaningful consultation with Tribes, particularly on the design and implementation of research used to identify and assess Project impacts on tribal communities, tribal governments, tribal economies, and reservation communities. As the final FERC EIS illustrates, this consultation has yet to occur. Further, the socioeconomic analysis in the EIS makes it evident that PacifiCorp failed to make a valid or defensible effort to assess Project impacts on the Yurok Tribe, the YIR, and the Yurok People who have born the disproportionate costs of the Klamath Hydroelectric Project in the loss of many tribal trust resources, tribal trust species, cultural, traditional and ceremonial resources, traditional subsistence resources, and other significant tribal trust resources on which the Yurok Tribe relies for its survival, restoration, and recovery from more than one hundred years of cultural genocide, racism, oppression, and injustice that continues to affect the Tribe through the present-day.

Restoration of the Klamath River, its species and its fishery is an appropriate first step to begin to mitigate the decades of trauma and injustice inflicted upon Klamath River tribes, and the Yurok Tribe in particular. In fact, the Klamath Watershed is one of the few areas where that which was taken from the Yurok people can be restored. Klamath River and Basin Tribes have historically paid, and continue to pay the highest, and most adverse social, cultural, and economic costs for the Project. The failure of the FERC EIS to address these disproportionate impacts on tribal communities invalidates some of the conclusions in the FEIS. Therefore, the BIA cannot simply rely upon the FERC EIS findings specific to Environmental Justice and Tribal Trust issues.

Affected Environment

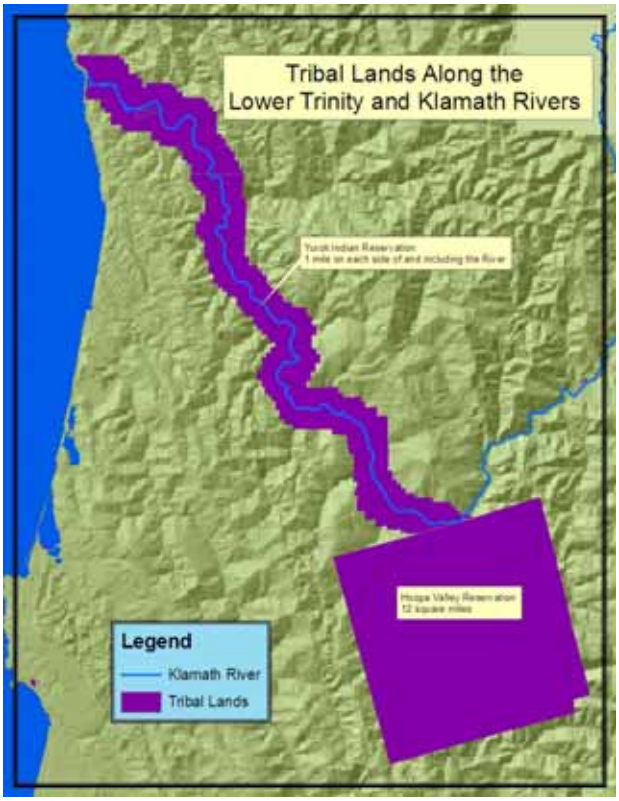
Yurok ancestral territory lies entirely within Humboldt and Del Norte Counties. The aboriginal territory used by the Yurok Tribe extended into adjacent counties. Today, the Yurok Indian Reservation (YIR) encompasses one mile on either side of the Klamath River from the Mouth at the Pacific Ocean upstream 45 miles, extending though both Del Norte and Humboldt counties. As demonstrated in the previous Yurok Tribe submissions (Sloan 2003, Gates 2003, King 2004) to the FERC, the center of Yurok culture and life has always been, and continues to be, the Klamath River. The Klamath River is the common thread that unites and connects all Klamath River Basin Tribes, in spite of distinct histories, cultures, languages, and governments.

The Yurok relationship to the Klamath River has been well-documented for the purposes of evaluating current conditions and potentially effected tribal trust resources (Sloan 2003). Abundant data exist within peer reviewed and published literature that document the Yurok reliance on the Klamath River and its abundant resources for their cultural, spiritual, economic, and political survival and for their prosperity and well-being. Information on this data (archival, historical, primary, and ethnographic documents as well as academic studies and peer-reviewed literature) have already been provided to PacifiCorp and the FERC, yet none of this information was utilized in the Final EIS. The FERC EIS failed to adequately acknowledge the previous submissions to the FERC that address the socioeconomic and cultural impacts on the Yurok Tribe resulting from the operations of the Klamath Hydroelectric Project, particularly the impacts on those tribal members who live within Yurok ancestral territory. Furthermore, the EIS mischaracterized the demographic and economic realities of Native American communities within the Klamath River Basin and watershed, the impact of the loss of the Tribe's subsistence and commercial fishery on the tribal and reservation communities and economies, and the significance of the Klamath River and the health of the Klamath River ecosystem to the past, present, and future of Yurok People.

The BIA and the Secretary of the Interior need to address the fact that the current conditions of the Klamath Hydroelectric Project have had a disproportionate and adverse impact on those Native American communities that have always relied, and continue today to rely upon the Klamath River. Executive Order 12898 on Environmental Justice directs all federal agencies to consider the impacts of their actions on low-income and minority populations. Furthermore, California Environmental Justice law requires that California agencies consider the impacts on differential rates of consumption for low-income and minority communities. The FERC EIS failed to accurately portray or assess the impacts and cumulative effects of the Project on Native American tribes, low-income and minority communities that rely upon the Klamath River and its resources for their subsistence, culture, spiritual traditions and practices, and local economies. These tribal communities experience significantly higher rates of food insecurity, poverty, and unemployment than non-Indian communities within the counties included in the study area (Fig.1-5). The FERC must consider the impacts of the Project, and any application for continued operations, on the Yurok Tribe, especially the impacts on Tribal Members

residing on the Reservation and within the two counties (Humboldt and Del Norte, CA) that contain the Yurok Ancestral Territory.

PacifiCorp did not provide adequate data or analysis for the FERC to make an accurate assessment on the determination of the affected environment. It is the position of the Yurok Tribe that PacifiCorp and the FERC did not adequately fund or conduct the necessary socioeconomic impact assessments, environmental justice analyses, cultural resources studies, or cumulative effects analyses and as a result, the information provided to the FERC by PacifiCorp was both flawed and misleading and resulted in inadequate analysis in the Final FERC EIS. It is the responsibility of the Department of the Interior, specifically the Secretary of the Interior to consider these omissions and following data in the final assessment that will lead to the Secretarial Determination for the current proposed action to remove the dams and implement the Klamath Basin Restoration Agreement (KBRA) and the Klamath Hydroelectric Settlement Agreement (KHSA).



The BIA is evaluating the effects of current conditions and the proposed Action (to remove the dams and implement the KBRA and KHSA) on tribal trust resources and the federal government's trust responsibility to the effected federally recognized Indian Tribes. The Yurok Tribe has maintained and continues to maintain that impacts of the Klamath hydroelectric Project dams extend downstream of the dams to the Klamath River mouth at the Pacific Ocean and beyond. For the Yurok Tribe, the affected environment is the Tribe's ancestral territory as well as those areas within the external boundaries of the YIR. The federal government has a trust responsibility for reservation and non-reservation trust lands; all of which are lands held in trust for the Tribe by the US Department of Interior. The FERC EIS and PacifiCorp failed to recognize the unique status of the Yurok Tribe, whose reservation occupies both sides of the Lower Klamath River (part of PacifiCorp's 'downstream subregion'), a region that suffers the cumulative adverse effects of everything that occurs upstream in the watershed. The FERC EIS failed to assess these impacts, or even acknowledge the overwhelmingly disproportionate adverse effects upon Yurok Tribe and its members. The FERC EIS not only failed to do this, but relied entirely on information provided by PacifiCorp that appears to be presented in an attempt to deliberately mask the socioeconomic realities of the YIR and

the Yurok Tribe and to avoid addressing the Project impacts on the Tribes within the region. The economic conditions on the Reservations in the downstream subregion are significantly worse compared to those in the downstream counties; likewise, Tribes suffer significantly greater poverty and food insecurity than the surrounding non-Indian communities in the downstream subregion. Thus, economically disadvantaged Native American communities have born the disproportionate socioeconomic costs of the Project resulting in the decline of the fishery and the decline or loss of numerous traditional cultural species resulting from altered riparian conditions caused by the Klamath Hydroelectric Project dams and current conditions.

Demographic Characteristics

The FERC EIS failed to consider the historical, cultural and economic geography of *tribal lands* within the Klamath Watershed. By using five- and fifty-mile corridors, the analysis offered by PacifiCorp diluted the representation of Tribes. Further by using county, city and census-designated-place data to describe the economic context of the project, the FERC EIS grossly underestimated the levels of unemployment, poverty and food insecurity in Indian Country—conditions that increased abundance of salmon and other fish species would *directly* ameliorate through increased subsistence and commercial harvests. The FERC EIS did not include data that included the socioeconomic and cultural impacts of the Klamath Hydroelectric Project on Tribes and Tribal Lands within the PacifiCorp-designated downstream five-mile corridor, nor was any economic, social or cultural justification given for using a five-mile corridor in their socioeconomic analysis. Given that both downstream and upstream Reservations are immediately adjacent to the Klamath River and its tributaries, it difficult to understand why an analysis of the socioeconomic impacts of the Klamath Hydroelectric Project on the Tribes, Reservations and Trust Lands was missing from the FERC EIS, even though it was provided to the FERC in formal comments on the Draft EIS in 2006.

The earliest historic accounts of non-Indian encounters with the *Poh-lik-lah*, the Down-River-People, the name the Yurok People used for themselves, document in great detail the elaborate cultural, spiritual, subsistence, and economic importance of the Klamath River and its abundant species of salmon, steelhead, pacific lamprey, eulachon, and sturgeon to the Tribe. As previously summarized in the Sloan (2003) Ethnographic Inventory, the Klamath River has always been the center of Yurok life and culture. This traditional life and culture continues today, in spite of the economic, social and cultural dislocation that the Tribe has experienced over the past 150 years. Yurok People continue to live, pray, practice, fish, and rely upon the Klamath River. The Yurok culture or Tribal Members' desire to continue a traditional way of life persist, but the loss of economic viability as a result of dramatically declining fish populations threatens the ability of the Yurok Tribe to continue practicing their traditions.

The FERC EIS failed to adequately address the socioeconomic impacts of the loss of the commercial fishery on the Yurok Tribe, but also fails to adequately assess the socioeconomic impacts resulting from the decline of a viable subsistence fishery. The Yurok Tribe is submitting this data to illustrate the importance of the subsistence fishery

to the Yurok Tribe, particularly for those living on the YIR and within Humboldt and Del Norte Counties. Loss of an abundant and reliable subsistence harvest compounds the extremely high levels of food insecurity experienced within these Yurok communities (Fig. 10).

Employment data and analysis used in the Secretarial Determination Overview Report and associated NEPA and CEQA analysis currently underway must clearly identify the data specific to the Yurok Tribe, the YIR, and other Native American communities within the Klamath River Basin. Tribe-specific data should then be compared against the county and state employment data. Because county-specific data for Tribes is not available in the US 2000 Census[4], these county-specific data will need to be collected before any appropriate analysis can be performed. Using available Tribal, BIA Labor Force, and Census data, the Yurok Tribe Environmental Program performed a preliminary analysis of the economic conditions of Tribes and reservations in the downstream subregion to illustrate the disparity between tribal communities and non-Indian sectors within the 5-mile corridor. Although the Yurok Tribe experiences adverse and disproportionate impacts from the current operations, data and analysis fail to address the impacts of the Project on downstream tribal communities who rely on a healthy fishery for their subsistence, cultural, spiritual, and economic survival and prosperity. The FERC EIS used county, city and census-designated-place data while ignoring the cognate 2000 census data available for reservations and non-reservation trust lands. There is no excuse for excluding sources of data on affected Tribes, such as the data from the 2000 US Census, from this analysis or any analysis currently underway for determining the effects of current conditions on the Yurok Tribe or Yurok trust resources. The Secretary and the BIA must consider the data submitted in the following sections in its analyses and reports. The current analysis must accurately capture and evaluate the very real and cumulative adverse impacts of the Klamath Hydroelectric project on Yurok Trust resources and the Yurok people.

Population, Race and Ethnicity

The 2000 Census data on demography, race and ethnicity for the 'downstream' Reservations (Yurok Indian Reservation or YIR and Hoopa Valley Indian Reservation or HVIR) paint a very different portrait than the one offered by the FERC in the final EIS for the downstream subregion. Not surprisingly, 75% of the population living within these lands is designated by the 2000 U.S. Census as "American Indian alone or in combination with one or more other races"[5]. Population growth rates for the region are also distinct; based on data from the 1990 and 2000 US Census, the population of the two reservations grew by an average 46%—a significantly higher growth rate than those cited for the downstream subregion within the EIS[5,6].

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4 US Census Bureau, 2006 Letter, Question Reference #061117-000054, copy available upon request

5 U.S. Census Bureau, Census 2000 American Indian and Alaska Native Summary Profile of Selected General Demographic Characteristics 2000 http://factfinder.census.gov/servlet/QTTable?_bm=y&-reg=DEC_2000_SFAIAN_DP1:20A|69A;&-qr_name=DEC_2000_SFAIAN_DP1&-ds_name=DEC_2000_SFAIAN&-geo_id=01000US&-_lang=en&-format=&-CONTEXT=qt

6 U.S. Census Bureau, Census 1990 Census Summary Tape File 1 (STF 1) – 100 percent data; http://factfinder.census.gov/servlet/DatasetMainPageServlet?_lang=en&_ts=182194946578&_ds_name=DEC_1990_STF1_&_program=

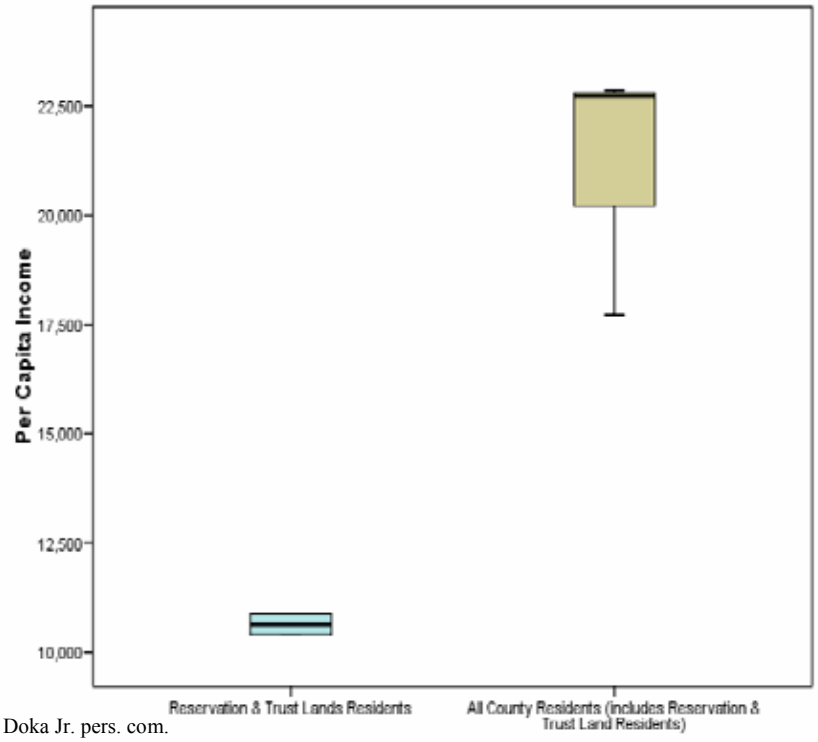
Economic Sectors

The FERC EIS failed to accurately portray the political and economic realities of tribal governments and Indian reservations. Tribal and reservation economies are unique and specific to each tribe, often operating as closed or semi-closed economic entities independent of state or county economic trends. PacifiCorp and the FERC failed to evaluate the socioeconomic impact of the Project on tribal and reservation communities within the 5- and 50-mile corridors even though there are six (i.e. Klamath Tribes, Quartz Valley Indian Tribe, Karuk Tribe, Hoopa Tribe, Yurok Tribe and Resighini Rancheria) federally recognized Indian Tribes with recognized tribal governments and within these corridors. Socioeconomic impacts of the Project on the Yurok Tribe and other federally recognized Indian Tribes must be evaluated using accurate demographic, economic, social, cultural and epidemiological data for both the YIR and the Tribe as a whole.

The following preliminary analysis was submitted as evidence that the data provided to the FERC by PacifiCorp was incomplete and misleading and resulted in a flawed analysis in the FEIS.

Employment and Income

The Tribes that live on the Klamath River have suffered and continue to suffer major losses of cultural, subsistence and commercial resources. Despite the net job growth cited by the DEIS the unemployment rate of Tribes in the downstream subregion is extremely high and significantly greater than that experienced by the counties in the downstream subregion ($G=66.77$, $p<0.001$). Employment data for 2001 from the BIA[7] indicate that the unemployment rate is 75% for Yurok and 40% for Hoopa Tribal Members. Comparable data for the downstream three counties in 2001 are much lower; Humboldt and Del Norte and Curry County Oregon having 6%, 8.1% and 6.9% unemployment respectively.[8] Likewise, there is significant disparity in the median per capita income between the downstream Reservations and the counties in the downstream subregion (Fig. 3).[9]



7 Unemployment figures for Tribes (not reservation) BIA 2001 F. Doka Jr. pers. com.
8 2001 Unemployment figures for counties Bureau of Labor Statistics http://www.bls.gov/lau/#tables

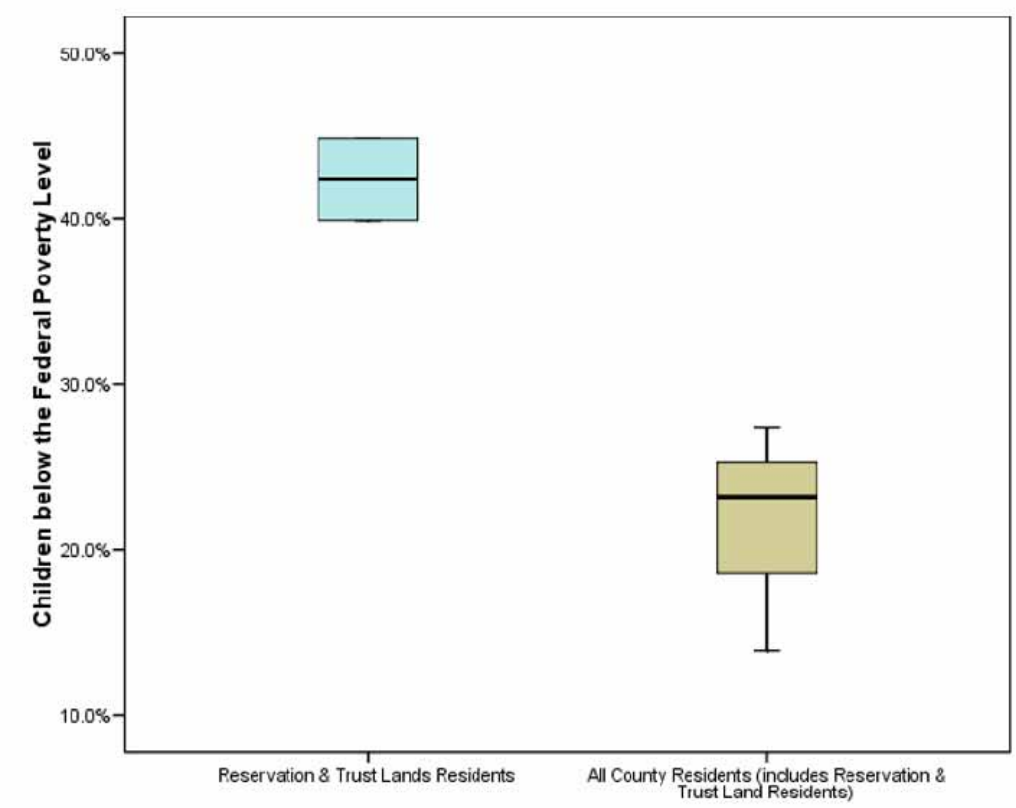
In contrast to the figures reported in the FERC EIS, between 1990 and 2000 people living on the YIR experienced a *net increase* of 59% in employment in the agriculture, forestry, fishing, hunting and mining sector, while the HVIR saw a net decrease of 7% in the same sector comparing data in the 1990 and 2000 US Census. In 2000 this sector employed 10.7% and 6.7% of Yurok and Hoopa Reservation residents respectively. Contrary to the statement in the DEIS that "employment related to recreation and tourism is not separately reported in the census" (p. 3-474), data on employment in the "arts, entertainment, recreation, accommodation and food services" sector are reported for both Reservations in the 2000 US Census. For the YIR this sector provided 18.1% of all employment in 2000, whereas for the HVIR the proportion was lower, at 3.8%.[10]

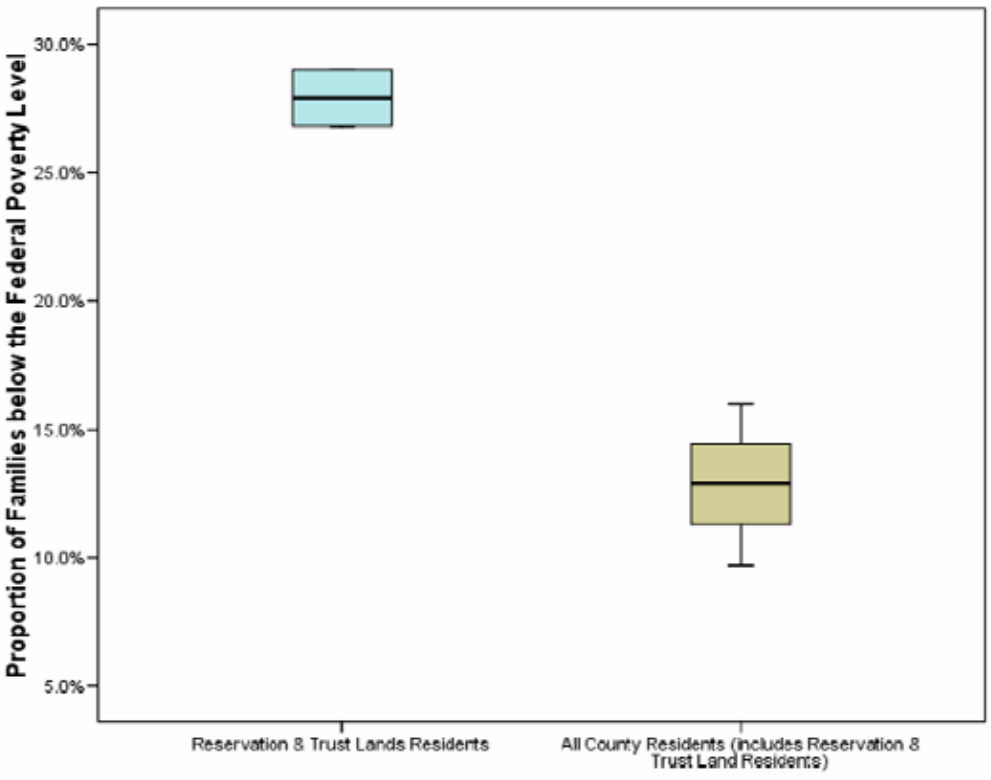
Declining fish stocks have affected all aspects of Yurok life. All the species on which Yurok People depend upon are in decline; largely because of effects the Klamath River Hydro-electric Project has had upon the fishery resource. As noted in Table 3-55 of the DEIS, the Yurok Tribe has had only minimal levels of fall Chinook commercial harvest during four of the past fifteen years. During the remaining 11 years the Yurok Tribal Council determined that the projected abundance of Klamath fall Chinook was insufficient to support a commercial fishery. For the past 15 years, the Yurok Tribe has also forgone commercial harvest of species other than fall-run Chinook (with the exception of minimal numbers of spring Chinook that were harvested during the beginning of the fall Chinook fishery). The Yurok Tribal Council has chosen not to have any commercial fisheries for other species such as spring-run Chinook salmon, Coho salmon, steelhead, lamprey, eulachon and sturgeon because of their concern regarding the status of these other species.

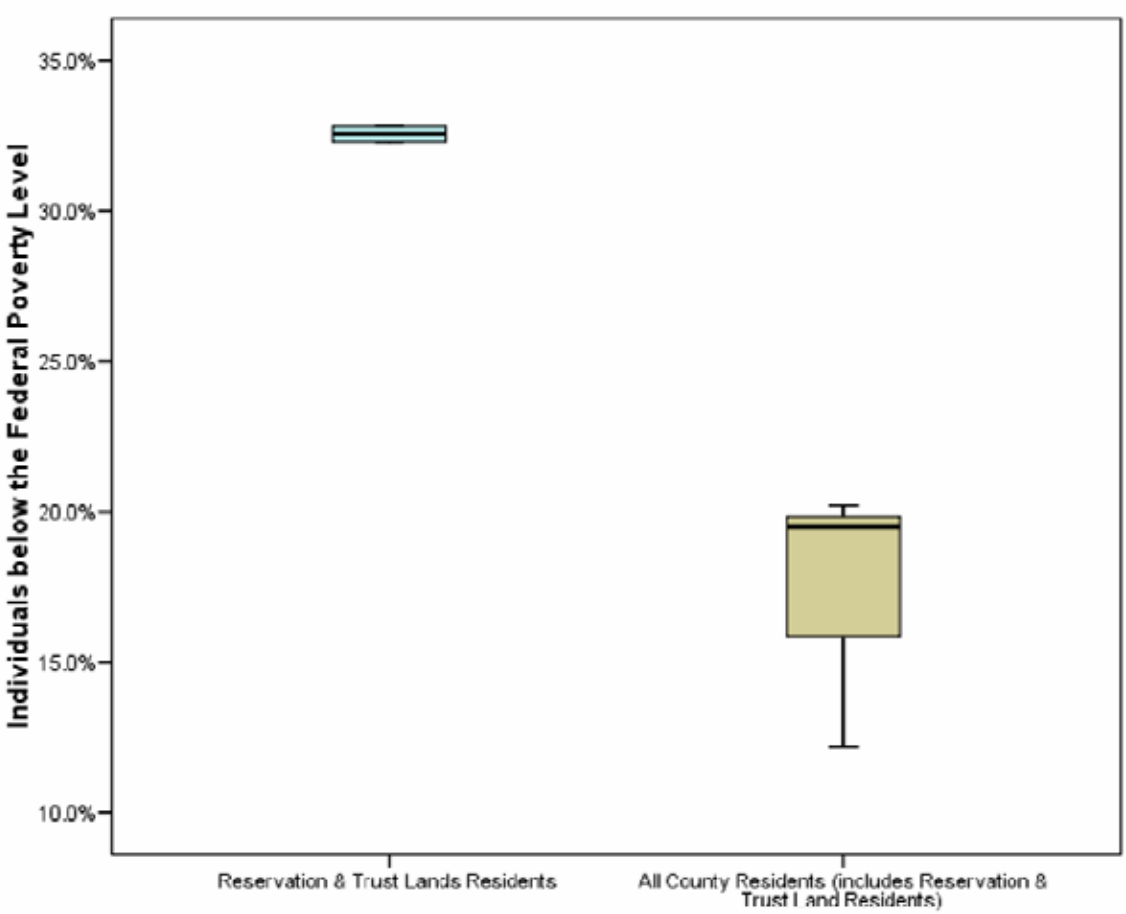
Poverty, inadequate access to traditional foods and resources, high unemployment rates and lack of food security are critical problems for the Yurok Tribe. The 2000 US Census indicates that 27% of families and 33% of individuals living on the Yurok Indian Reservation (YIR) fell below the federal poverty level in 1999[10]. For the Tribe as a whole, irrespective of residence location, the 2000 census data suggest that 20% of families, 25% percent of individuals and 26% of children fell below the federal poverty level[10]. For families with children the situation is worse: 26% of families with children under the age of eighteen and 32% of families with children under the age of five were below the federal poverty level in 1999 and 38% of Yurok families with a female head of household and no husband present fell below the federal poverty level in that year[10].Figures four through six, compare the proportion of children, families and individuals living on the downstream Reservations with children, families and individuals living in the surrounding counties the downstream subregion living below the federal poverty level in 1999; in all cases, significantly greater proportion of children, families

9 U.S. Census Bureau Census 2000 DP-3: Profile of Selected Economic Characteristics: 2000 Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data, Geographic Areas: Humboldt & Del Norte County, California, Curry County, Oregon.
10 U.S. Census Bureau, Census 2000 American Indian and Alaska Native Summary Profile of Selected General Economic Characteristics 2000 http://factfinder.census.gov/servlet/QTTable?_bm=y&-reg=DEC_2000_SFAIAN_DP3:20A|69A;&-qr_name=DEC_2000_SFAIAN_DP3&-ds_name=DEC_2000_SFAIAN&-geo_id=01000US&-_lang=en&-format=&-CONTEXT=qt

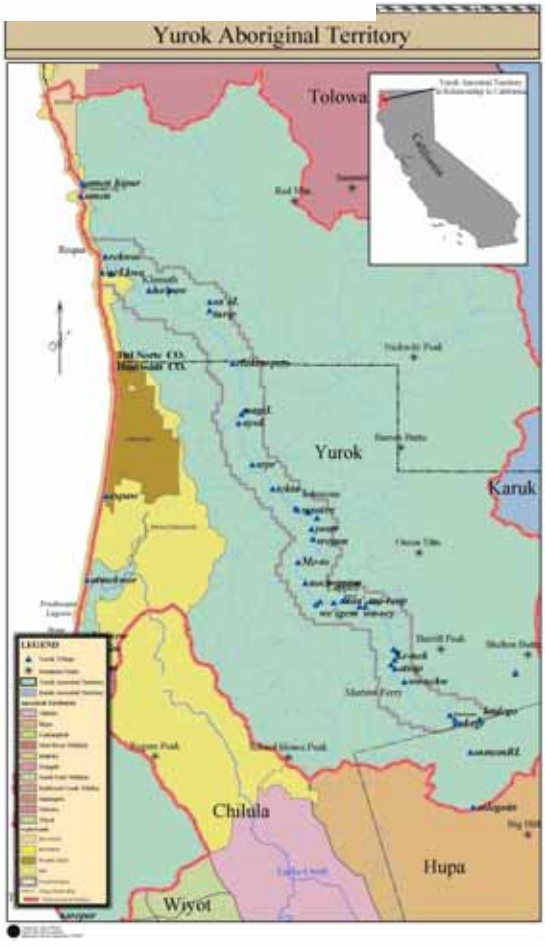
and individuals living on the downstream Reservations fall below the federal poverty limit than do the children families and individuals living in the downstream counties (chi-square, $p<0.001$, in all cases).[9,10]




Proportion of Families below the Federal Poverty Level
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
Reservation & Trust Lands Residents
All County Residents (includes Reservation & Trust Land Residents)



In 2006 the Yurok Tribe circulated a survey to determine the impact of the deteriorating health of the Klamath River on the health and wellbeing of Tribal Members. The *Healthy River, Healthy People, Traditional Foods Survey* collected data on access to traditional resources, economic status, medical conditions and the influence of water quality on Tribal Members health and wellbeing. The survey was only sent to adults (i.e. individuals 18 years of age or older) and response rate was >12%. 56% of respondents lived within the Ancestral Territory (Fig. 7) and 44% lived elsewhere. There were no significant differences in age or sex between the respondents living in the Ancestral Territory and those living elsewhere



(F=0.99, p=0.32, G=0.44, p=0.51, respectively). Regardless of where they live, the majority of respondents consider the Ancestral Territory in general, and the Klamath River in particular, home. It has been less than two hundred years since the Yurok Tribe was displaced from the Ancestral Territory and the Yurok continue to rely on the Klamath River and its abundant resources for their cultural, spiritual, economic, and political survival and for their prosperity and wellbeing and so the Klamath River is home.

I was born and raised on the River. My life is woven with the river and its fish and people. If the River is sick, so am I. So are we all, because it is our spirit and strength. It is not the simple fact of eating healthy food from the River that is important… It is the knowing in my mind, heart and spirit that the River itself is whole and healthy. We are merely a reflection of the river, and will never be healthy again until it is.

(Yurok Tribal Member Survey Respondent 2006)

Preliminary analyses of household income data from the *Healthy River, Healthy People, Traditional Foods Survey* are broadly congruent with census data for the Reservation and the Tribe. Data from both the Tribe's Survey and the 2000 US Census indicate that Yurok Tribal members living in Humboldt & Del Norte Counties suffer significantly greater poverty and unemployment compared to the populations of the three counties taken as a whole. A greater proportion of Yurok Tribal Members living within the Ancestral Territory earn less than $10,000 per anum compared to the three counties in the downstream subregion taken as a whole ($G=10.25$, $p<0.01$) (Fig. 8). Significant economic disparities also exist between Tribal Members who remain within the Ancestral Territory and those who reside outside of the Ancestral Territory ($G=23.69$, $p<0.005$) (Fig. 9). The data presented here support the common assertion by Tribal Members that they are forced by economic circumstances to move away from home.

Even though I live in town, I still live and choose to live close enough so I can go to the River whenever I choose. I participate in ceremonies on the River. If it were possible, I would live on the River, to see it and hear it and smell it every day and every night. I will not be completely healthy again until I can look out my front door at night and see the salmon moving up the River as they did when I was a child.

(Yurok Tribal Member Survey Respondent 2006)

Figure 8. Comparison of individuals earning less than $10,000PA in the counties in the downriver subregion with Yurok Tribal Members living in the Ancestral Territory within those two counties who earn less than $10,000 PA.

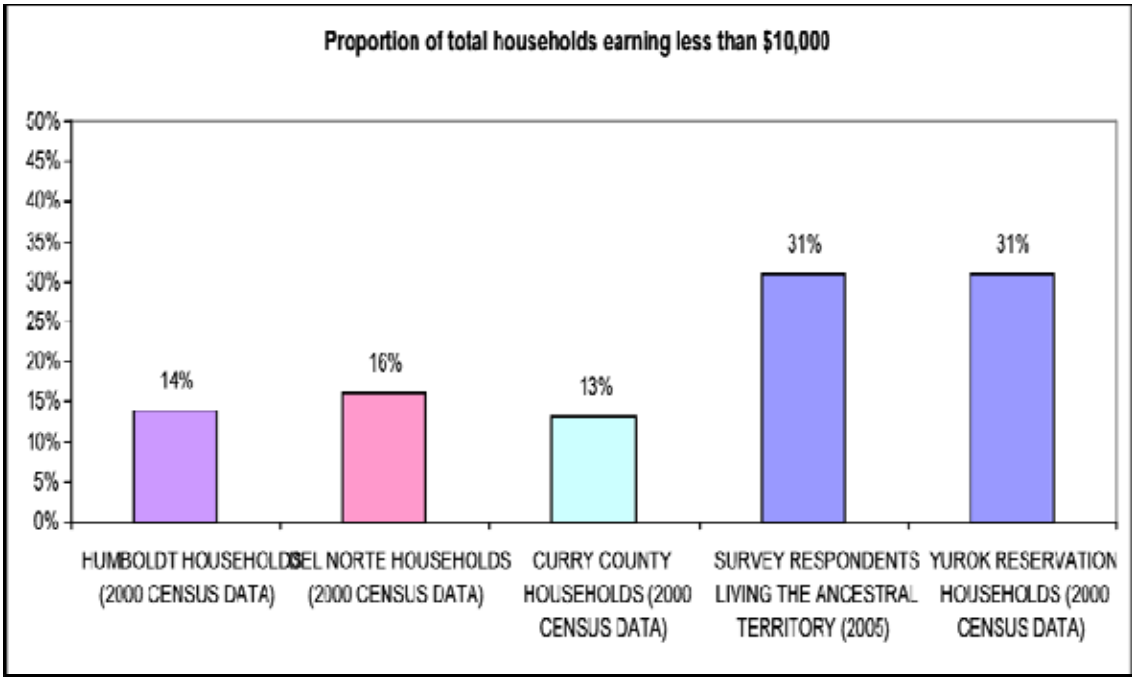
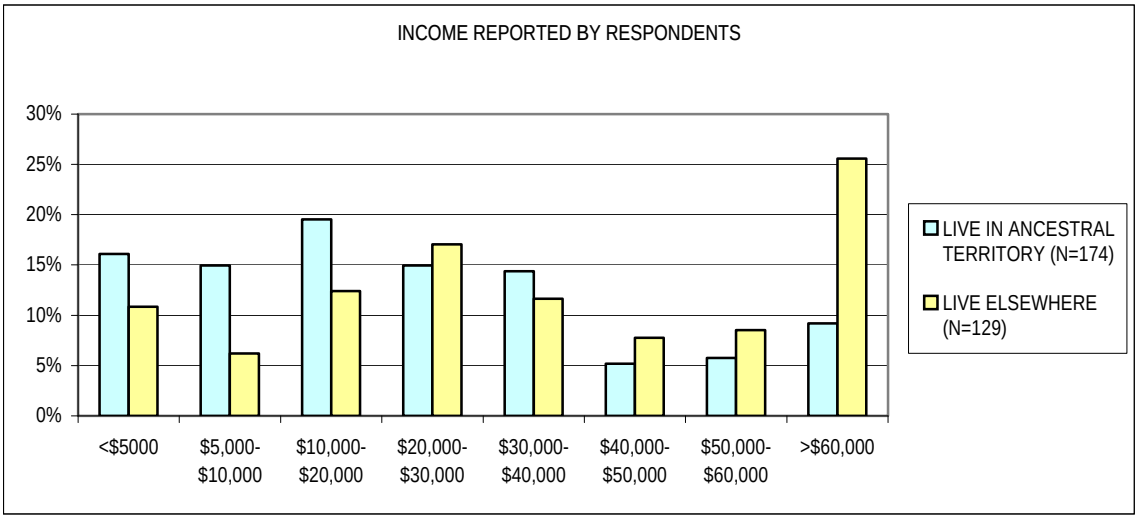


Figure 9. Comparison of income reported by survey respondents living within and outside of the Yurok Ancestral Territory



Similarly, food security continues to pose a significant problem for Tribal members. As defined by Harrison *et al.* in their 2002 UCLA Health Policy Research Brief, families and households in California are food insecure if their income is <200% of the federal poverty level[11]. According to the 2000 US Census, the average size of a Yurok family or household is three persons.[12] If we assume that the 'average' Yurok family or household in 2006 also consisted of three people, the federal poverty level for that family/household in 2006 is $16,600[13] and 200% of the poverty level for an 'average' Yurok family/household is $33,200. By the definition of food insecurity used by Harrison *et al.* (2002) 57% of Yurok families/households lack basic food security.

Respondents living within the Ancestral Territory are even more at risk: ***80% lack basic food security***. The 2000 Census reports that 68% of individuals living on the YIR were below 200% of the Federal Poverty Level in 1999, the survey data suggest that poverty, and with it, food insecurity has increased within the Ancestral Territory during the six years since the census was performed.

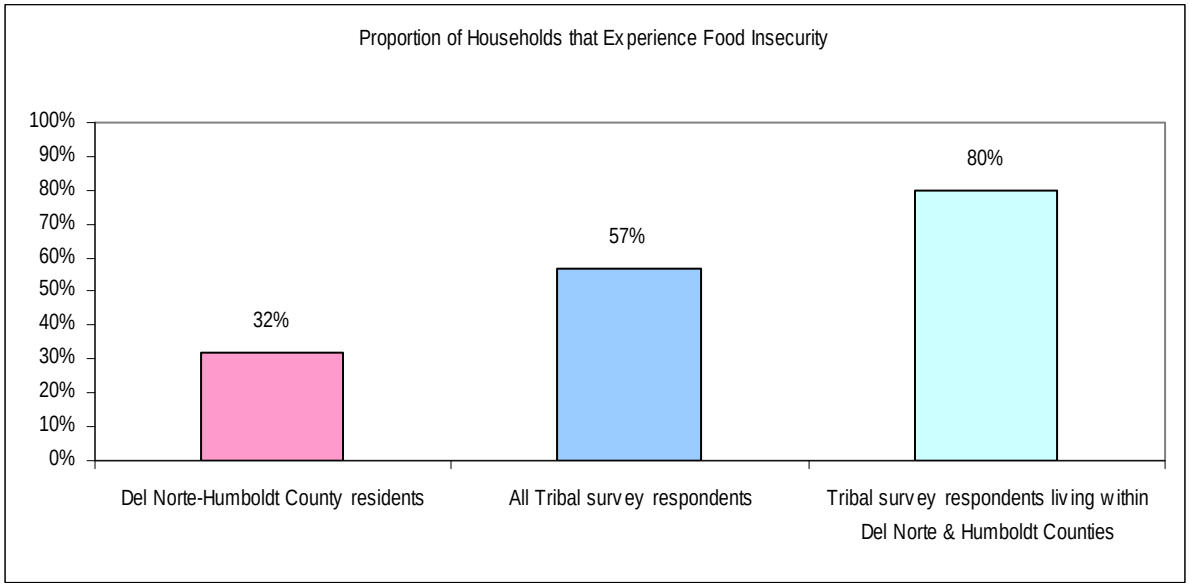
How do Tribal Members compare with the general population living within the Ancestral Territory? The UCLA study analyzed Del Norte and Humboldt Counties, together and found that, as of 2002, 32% of residents were food insecure (Fig. 10). The prevalence of hunger and food insecurity among Yurok Tribal Members residing within the Yurok Ancestral Territory in 2006 is almost three times that reported for the general population of Humboldt and Del Norte Counties in 2002.

11 Harrison, G.G. C.A. Disogra, G. Manalo-Leclair, J. Aguayo, W. Yen. 2002. Over 2.2 Million Low-Income California Adults Are Food Insecure; 658,000 Suffer Hunger. Policy Brief, UCLA Center for Health Policy Research, November 2002. Available online at http://www.healthpolicy.ucla.edu/pubs/files/FoodInsecurity.pdf

12 U.S. Census Bureau, Census 2000 American Indian and Alaska Native Summary Profile of Selected General Demographic Characteristics 2000 http://factfinder.census.gov/servlet/QTTable?_bm=y&-reg=DEC_2000_SFAIAN_DP1:20A|69A;&-qr_name=DEC_2000_SFAIAN_DP1&-ds_name=DEC_2000_SFAIAN&-geo_id=01000US&-_lang=en&-format=&-CONTEXT=qt

13 Federal Register, Vol. 71, No. 15, January 24, 2006, pp. 3848-3849

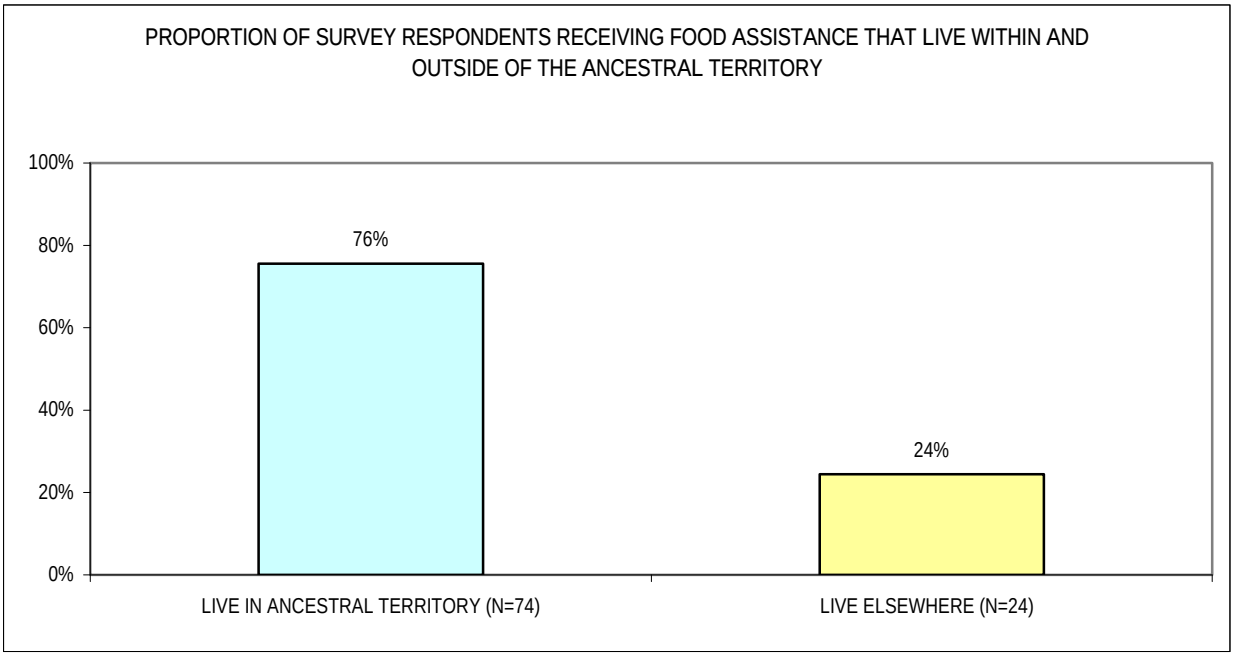
Figure 10. Proportion of households that experience food insecurity, data for Del Norte & Humboldt County residents from Harrison *et al.* 2002[11].



These estimates of food insecurity correlate well with the results of the survey regarding food assistance programs. Survey results indicate that 31% of the 305 respondents who answered the survey questions regarding food security receive some form of food assistance on a regular basis (compared to 57% classified as food insecure above), with the majority of aide going to respondents living within the Ancestral Territory ($G=21.12$, $p<0.001$) (Fig. 11).

This document uses respondents' reports of participation in the federal food assistance programs (Food Stamps, WIC and Commodity Supplemental Foods Program) as a surrogate variable for low income status since eligibility is directly linked to income (130%-185% of the federal poverty level). Because all individuals who are eligible for food assistance do not apply, the numbers used here undoubtedly underestimate the number of low income households within our pool of respondents. Harrison *et al.* (2002) report that, of income eligible persons in California who report hunger, less than 20% of adults participate in the Food Stamp Program and only 66% of hungry, eligible, pregnant women participate in WIC.[11]

Figure 11. Comparison of food assistance between respondents living within and outside the Ancestral Territory.



Historically, Yurok People were able to harvest fish from the Klamath River all year-round. People harvested fall Chinook and Coho salmon during the late summer/fall; steelhead, lamprey and candle fish during the winter and spring Chinook, sturgeon and lamprey during the spring and summer. The decline in these and other river species means that the Yurok People can no longer sustain themselves from the river on a year-round basis. In any community where 80% of the people lack basic food security this loss is ruinous. For the Yurok People who are recovering from more than one hundred years of cultural genocide the loss is catastrophic. Any assessment of the impact of the current conditions on the Yurok Tribe, the federal government's trust responsibility and any impacts of current conditions on tribal trust resources must consider these facts.

Dependence on food assistance and lack of traditional foods have been implicated in the development of a range of medical conditions. [14][15] Preliminary results from the Healthy River, Healthy People, Traditional Foods Survey suggest that similar patterns may exist within the Yurok Tribe. For example, the prevalence of diabetes among survey respondents 65 years and older is significantly greater among those who receive food assistance than those who do not ($G=5.64$, $p<.0.05$) (Fig. 12). In contrast, the prevalence of obesity, hypertension and heart disease and other related disorders show no significant differences between those who receive food assistance and those who do not.

14 Dillinger, Teresa L. et al. 1999. Feast or famine? Supplemental food programs and their impats on two American Indian communities in Calfiornia. Intl. J. Food Sci and Nutr. 50:173-187.
15 Norgaard K. 2005. The Effects of altered diet on the health of the Karuk People. A Report prepared for the Karuk Tribe of California

The prevalence of diabetes among American Indians and Alaska Natives is 2.3 times greater than that of non-Hispanic Whites and as of 2002, diabetes prevalence for American Indian and Alaska Natives as a whole was 15.3%[16]. Yurok Tribal Members report comparable levels of diabetes by and large, although they do report higher levels of diabetes among younger (25-30 year olds) and older (65 and older) age classes compared to the diabetes levels reported for American Indian and Alaska Natives as a whole (Fig. 13)[16]. Further research is needed to determine if these differences are significant and to determine the underlying factors associated with these high-than-average rates of diabetes among Yurok Tribal Members. Comments concerning the prevalence and incidence of diabetes within the FERC EIS indicate a lack of familiarity with the medical literature: Native American populations experience a disproportionately higher prevalence of diabetes than the overall US population. Contrary to statements within the FERC EIS, the increased prevalence and incidence of diabetes among the Native American population is statistically and epidemiologically distinct from that in the general US population (Fig. 14).[17] These preliminary findings suggest that further investigation into the health affects associated with loss of traditional foods and other river-based resources is warranted.

16 Acton, K.J et al. 2003. Diabetes prevalence among American Indians and Alaska Natives and the overall population---United States, 1994-2002. Morbidity and Mortality Weekly Report, August 1, 2003, 52(30): 702-04.

17 Diabetes prevalence among American Indians and Alaska Natives and the overall population--United States, 1994-2002. MMWR. Morbidity and Mortality Weekly Report - 2003 - Aug 1;52(30):702-4. NB According to the Editor, this report probably underestimates prevalence of Diabetes among AN/AN population;

Figure 12. Dependence on food assistance and prevalence of diabetes among respondents 65 years and older

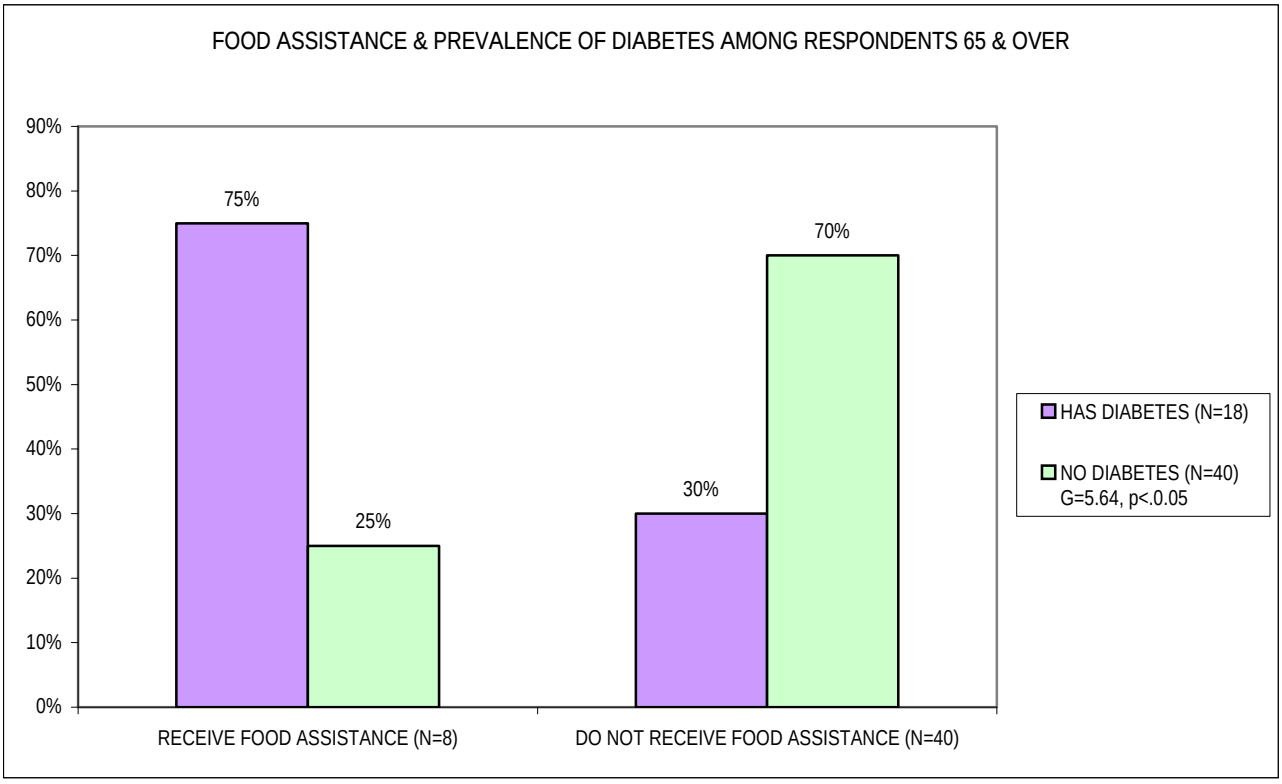


Figure 13. Prevalence of Diabetes among three populations compared within age groups. Data for AI/AN and US Population from Morbidity & Mortality Weekly Report, all differences significant (95%CI).

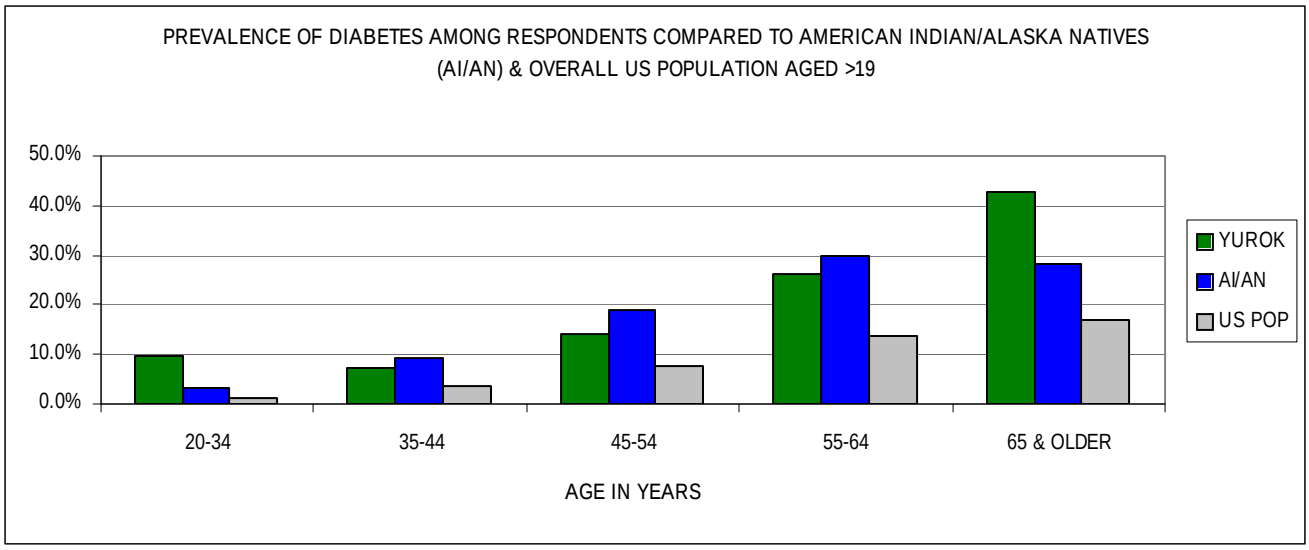
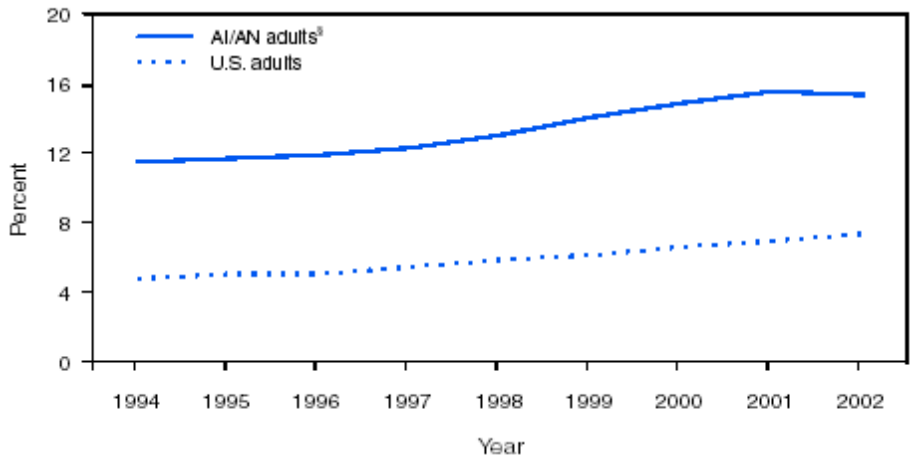


Figure 14. Prevalence of Diabetes among AI/AN and US Population taken from Morbidity & Mortality Weekly Report[17]

FIGURE. Age-adjusted prevalence* of diagnosed diabetes among American Indian/Alaska Native (AI/AN) and U.S. adults aged ≥20 years, by year — United States, 1994–2002†



* Based on the 2000 U.S. population.
† Based on Indian Health Service ambulatory patient-care data and the Behavioral Risk Factor Surveillance System.
§ Although the rate of increase in diabetes prevalence among AI/ANs slowed during 2001–2002, additional data are needed to assess recent trends.

Commercial and Subsistence Fisheries

Although subsistence and commercial fishing rights have been restored for the Yurok Tribe in recent decades, fish populations in the Klamath River have declined precipitously over this same period due to the operations of the dams, water diversions for agriculture, and other management decisions made by federal agencies within the Klamath Basin. Many of these adverse effects on tribal trust resources, specifically the fishery, are largely a result of effects the Klamath River Hydro-electric Project, or current conditions. The Yurok Tribe has had only minimal levels of fall Chinook commercial harvest during four of the past fifteen years. During the remaining 11 years the Yurok Tribal Council determined that the projected abundance of Klamath fall Chinook was insufficient to support a commercial fishery. For the past 15 years, the Yurok Tribe has also forgone commercial harvest of species other than fall-run Chinook (with the exception of minimal numbers of spring Chinook that were harvested during the beginning of the fall Chinook fishery). The Yurok Tribal Council has chosen not to have any commercial fisheries for other species such as spring-run Chinook salmon, Coho salmon, steelhead, lamprey, eulachon and sturgeon because of their concern regarding the status of these other species. Reduced abundance of these species has also affected subsistence harvest patterns.

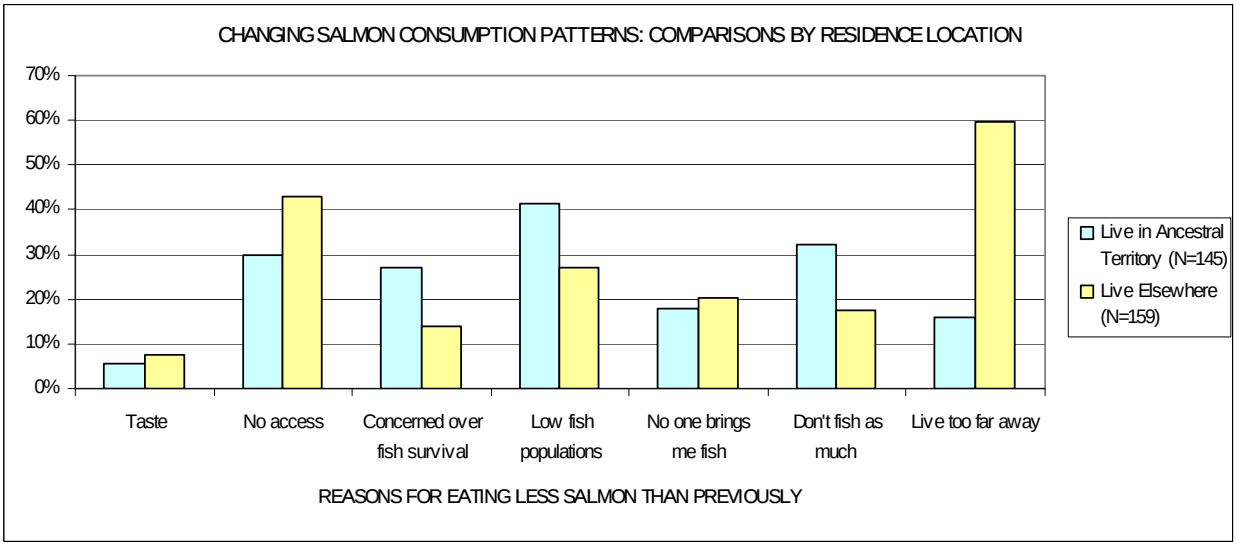
As a kid there were abundant salmon because you could see the salmon thick in the river from the bridges. You had to row your boat out to rocks that you can walk out to now…..In my lifetime I have watched the salmon, sturgeon, and eels become depleted. Salmon, eels, and sturgeon were our main food. We ate one of the three daily. We only ate meat on payday. The rest of the week we ate fish. Now we get fish only occasionally. This year we have not had any fish. My children may not have any salmon in the future.

(Yurok Tribal Member Survey Respondent 2006)

Because long-term data on fish numbers in the Klamath River do not exist for the periods prior to the construction of the first dams, respondents were asked about lifetime consumption patterns as way to document changes in the availability of particular species to Tribal Members over time. Where comparing respondents' diets growing up as a function of age, reported consumption of Coho, Lamprey and Candlefish declined significantly ($G=18.34$, $p<0.01$, 19.00, $p<0.01$, $G=37.9$, $p<0.001$ respectively). A similar trend exists for Spring Chinook, Steelhead, Fall Chinook, and Sturgeon.

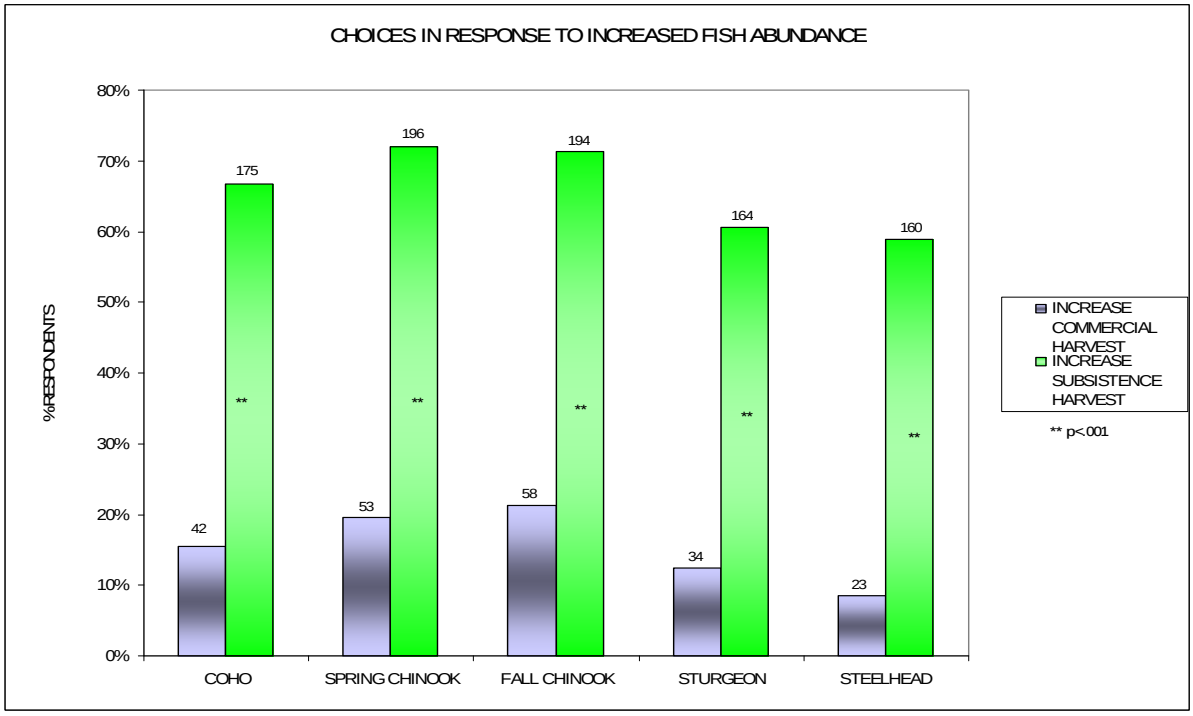
To determine whether decreased consumption was a reflection of changing tastes, respondents were asked to identify the reasons they consumed less salmon. For respondents residing within the Ancestral Territory the most influential factor was reduced fish populations, whereas those living outside the Ancestral Territory cited lack of access and distance from the Klamath River as the major factors responsible for reduced salmon consumption by other Tribal Members (Fig 15).

Figure 15. Changing consumption patterns



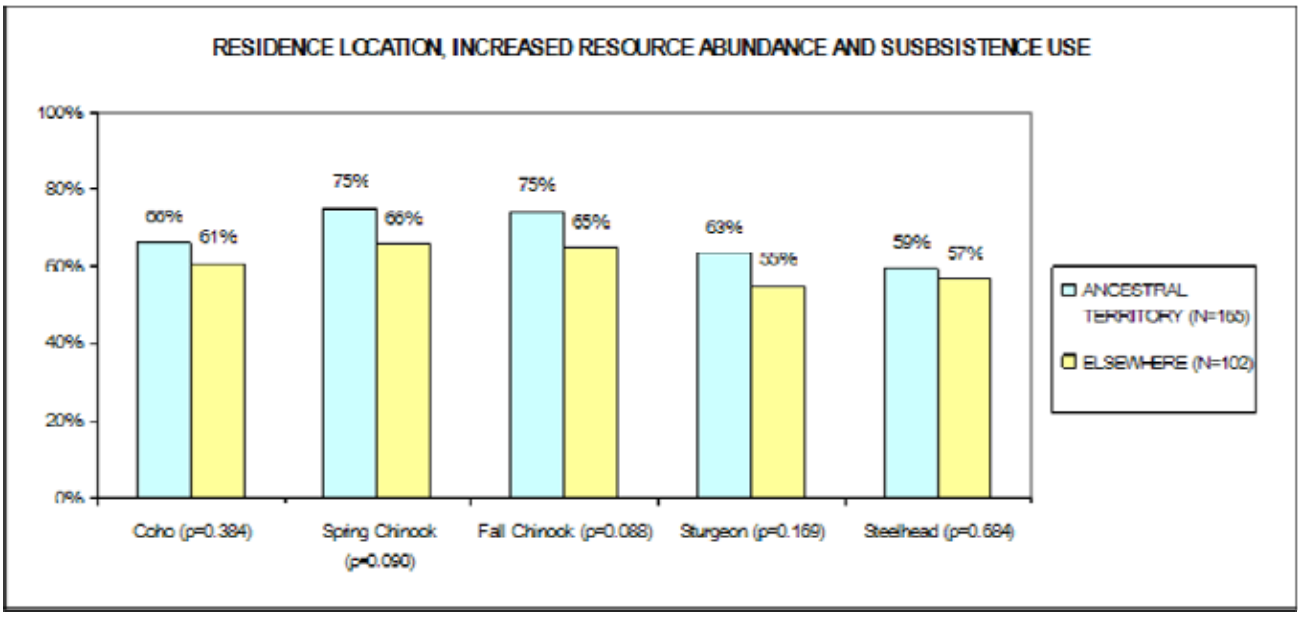
Respondents were asked whether they would increase subsistence and/or commercial harvest if fish were more abundant. In all cases, the majority of respondents indicated that they would increase subsistence fishing if the fish resource were more abundant. A significantly smaller number of individuals indicated that they would be interested in commercial harvests given increased resource availability (Fig. 16).

Figure 16. Choices in responses to increased fish abundance comparing subsistence and commercial interests of all respondents.

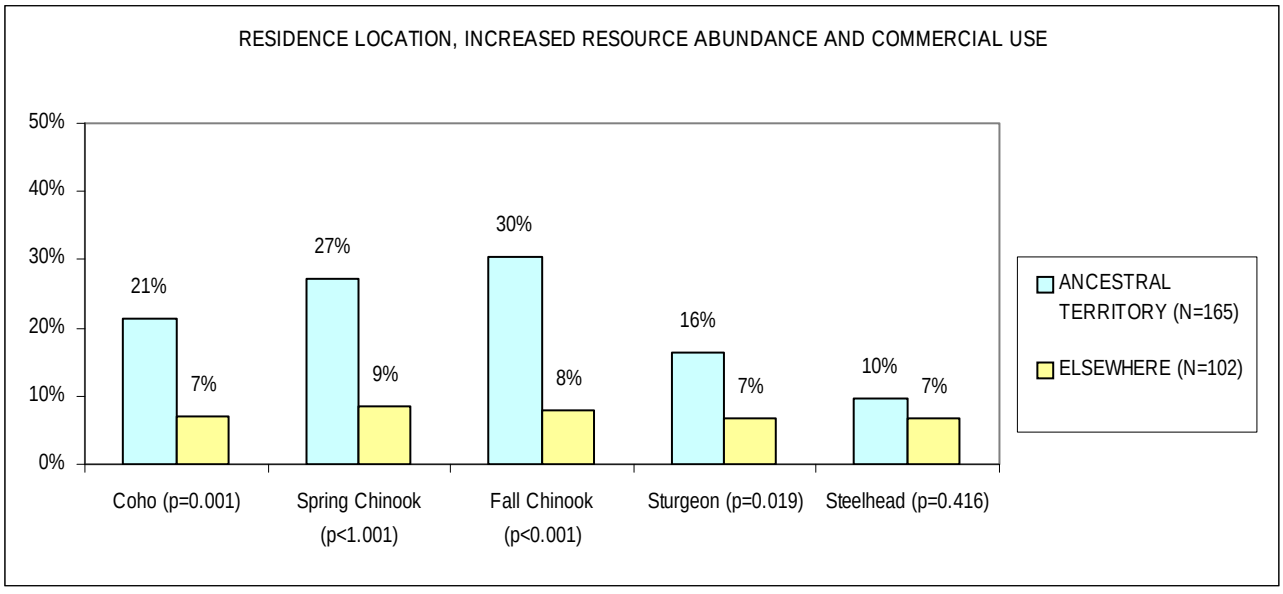


Interest in increased subsistence activity transcends geography: the majority of respondents living within and outside the Ancestral Territory indicated that they would increase subsistence activities in response to increased fish abundance (Fig. 17).

Figure 17 Comparison of responses to increased resource abundance among respondents living with the Ancestral Territory and those living elsewhere, showing the proportion of respondents who would increase subsistence harvest in response to increased resource abundance.



In contrast, interest in commercial use of most fish stocks is greater among those living within the Ancestral Territory (Fig. 18).



Fish are not commodities and their importance cannot be quantified using the usual economic measures; however the loss of these traditional resources, the closures and reduced harvests of the Tribal Commercial Fishery have had an economic impact on Tribal Members. As might be expected, the survey data suggest that the hardships associated the Commercial Fishery closures have had a greater impact on respondents living within the Ancestral Territory than those living elsewhere and in some cases these losses have disproportionately affected those respondents who receive food assistances (Table 1)

Table 1. Losses associated with Tribal Commercial Fishery closures

LOSSES ASSOCIATED WITH CLOSURE OF TRIBAL FISHERY	PROPORTION OF RESPONDENTS REPORTING LOSSES	PROPORTION OF RESPONDENTS ON FOOD ASSISTANCE REPORTING LOSSES	TOTAL RESPONDING
Loss of income	22% (61)	33%* (30)	280
Increased food expenses	28% (78)	39%* (38)	280
Reduction in social & cultural activities	24% (66)	32%* (29)	280
Loss of goods & services received through barter & trade	18% (49)	28%* (25)	280
Increased financial stress	18% (51)	30%* (27)	280
Reduced income from secondary business	8% (21)	13%* (12)	280
Applied for public assistance due to closure	8% (22)	21%*(19)	280

*Significantly greater proportion of respondents on food assistance affected, Chi-square test, $p<0.05$

Tribal Members who choose to remain within the Ancestral Territory experience higher levels of poverty and food insecurity than Tribal Members who live elsewhere. In spite of these conditions, Tribal Members choose to live in the Ancestral Territories because their culture and identity are inextricably bound to these lands and resources, and specifically the Klamath River. Economically forced relocation is perceived as another of the inequalities visited on the Tribe as a result of denied access to traditional resources, particularly the resources of the river.

I no longer live or work along the Klamath River. I had to leave due to financial reasons. I can no longer fish or gather, my children are not learning the culture like they should. They are not experiencing all that the Klamath River has to offer.

(Tribal Member Survey Respondent 2006)

Traditional Activities

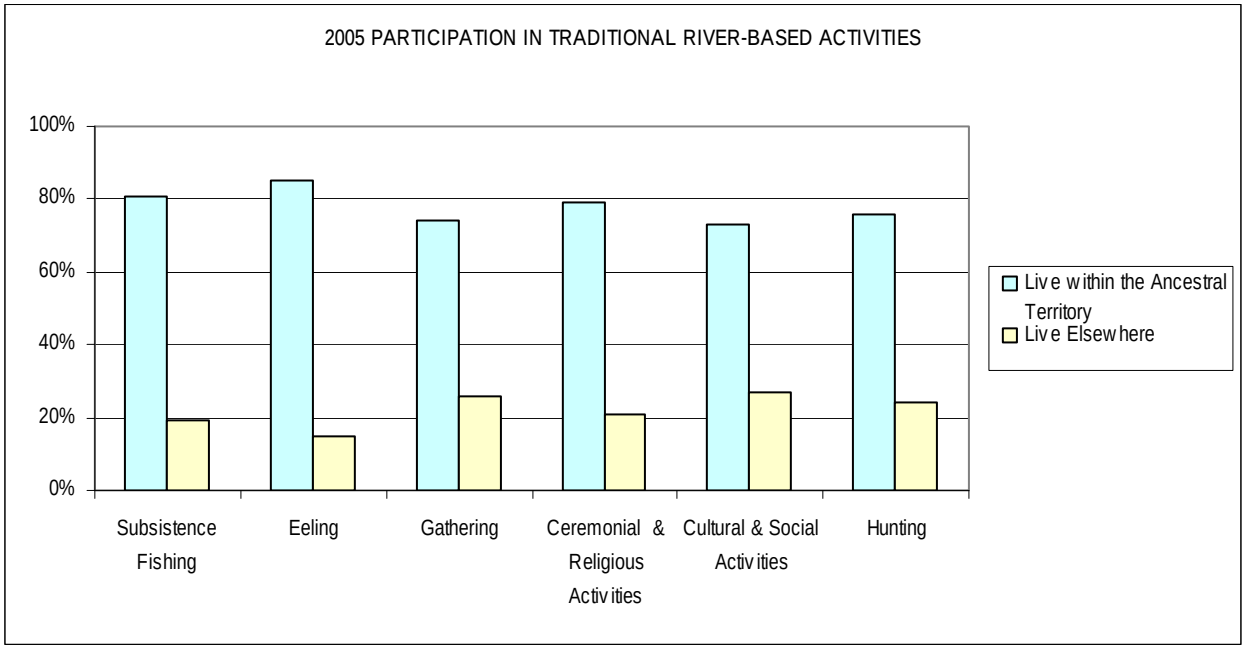
Fish plays a variety of roles in Yurok households. According to respondents, 86% use fish as food, 72% share fish with friends and family, for 34% fish fills ceremonial and religious roles and in 45% of households fish is part of cultural and social activities. In contrast, 21% of households report using fish in barter or trade and only 16% of households sell fish. This underscores the important *meanings* of fish for the Tribe. The Klamath River Hydroelectric Project has altered the river in ways that are destructive for all parts of Yurok life:

"[T]he dams contribute to a pattern of cumulative effects on the cultural values and interests of the tribes – aspects of the environment that are of great importance to them… to the tribes [the Klamath River] is utterly central to their cultural identity. This being the case, it is equally evident that the effects of the dams, together with the other contributors to the Klamath's plight, fall disproportionately on the tribes. While others live within the riverscape, travel through it, fish in it and hunt in it, only the tribes have an intimate cultural connection to the riverscape going back to time immemorial. Only to the tribes is the riverscape the core of their cultural identity. Maintaining and reinforcing this association is particularly important today, as the tribes work to reestablish their traditional belief systems and ways of life."[18]

Preliminary analyses of survey data indicate that a greater proportion of individuals who participate in traditional activities as children are more likely to continue those activities as adults. A similar pattern exists when those who live within the Ancestral Territory are compared to those who live elsewhere. In 2006, respondents who lived within the Ancestral Territory participated in traditional activities in significantly greater numbers than Tribal Members who lived elsewhere Territory (Fig. 20).

18 King, T.F. 2004. First Salmon. Prepared for Klamath River Intertribal Fish and Water Commission

Figure 20. Respondents involved in traditional activities in 2006 compared by residence location. In all cases Chi-square, $p<0.05$.



In spite of more than one hundred years of concerted attempts to destroy the Yurok Tribe's cultural and spiritual integrity, the language and the culture survived. For the Yurok Tribe, the health of the Klamath River, its fish runs and other traditional resources are essential for cultural survival.

Denied access to the river and the salmon is tantamount to denied access to essential cultural and spiritual resources. In these circumstances, poor water quality and unhealthy conditions constitute denied access. Respondents have indicated that poor water quality has had a detrimental affect on many aspects of their lives not just during the 2005 cyanobacterial bloom but various times during the past five years (Tables 2 and 3).

Table 2. Proportion of respondents who changes their use of the Klamath River in response to concerns over water quality during 2000-2004

ACTIVITY	PROPORTION REPORTING CHANGED USE	NUMBER REPORTING CHANGED USE	TOTAL RESPONDING
Fishing	52.9%	148	280
Eeling	33.2%	89	268
Hunting	19.5%	52	267
Gathering	21.2%	55	259
Ceremonial & Religious Activities	16.6%	43	258
Cultural & Social Activities	20.8%	54	260
Recreational	46.0%	126	274
Transportation	20.9%	53	254
Bathing & Drinking	49.8%	134	269

Table 3. Proportion of respondents who changes their use of the Klamath River in 2005 in response to the Microcystin Public Health Notice for the Klamath River

ACTIVITY	PROPORTION REPORTING CHANGED USE	NUMBER REPORTING CHANGED USE	TOTAL RESPONDING
Fishing	46.1%	113	245
Hunting	24.7%	59	239
Gathering	26.8%	64	239
Ceremonial & Religious Activities	22.5%	53	236
Recreational	45.8%	110	240
Transportation	22.6%	53	235
Bathing & Drinking	44.1%	104	236

When people are denied access to the River, they are cut off from these essential activities. Poor water quality has changed peoples' use of the River and interfered with many aspects of Tribal Members' lives.

> ***"Over the years, the river got smaller and smaller. The color has gradually gotten darker. At first, (60's, 70's, 80's) the Klamath only looked unhealthy at the end of summer. Now the River always looks too dark in color and low. At the end of summer now, the Klamath looks dark, low, slow, dirty, slimy and too unhealthy to get into or eat anything coming from it. We used to be able to tell which salmon were not from the mouth, because they would sometimes have a muddy taste. Now I don't eat any salmon… for fear of eating toxins and diseased fish."***
>
> **(Tribal Member Survey Respondent 2006)**

This analysis, while preliminary, clearly demonstrates the inadequate and flawed data and analyses submitted by PacifiCorp to the FERC for the DEIS. The Yurok Tribe has managed to provide a more comprehensive and accurate analysis than PacifiCorp provided or the FERC itself offered, but this is hardly sufficient to remedy the deep structural and substantive defects in the FERC analysis. A more thorough, representative evaluation of the cultural, social and economic analysis of the affects of the Project on Tribes within the region must be undertaken before any determination can be made by the FERC.

Environmental Effects

Data compiled by the Yurok Tribe and submitted in formal comments to the FERC DEIS in 2006 indicate that the Project's immediate and long-term, cumulative impacts on the socioeconomic conditions of the Yurok Tribe are actually severe and disproportionate. The impacts of the current conditions are particularly onerous on Native American Tribes in the Klamath basin and watershed, Tribes who are dependent upon the River and its fishery for not only subsistence but also their cultural, spiritual, economic way of life. Again, impacts on the Yurok Tribe, the YIR, and tribal trust resources must be accurately and meaningfully considered and evaluated in the Secretarial Determination Overview Report in addition to the NEPA and CEQA analysis currently underway.

The FERC EIS was completely inadequate in its consideration of Project effects on low-income and minority populations. Executive Order 12898 mandates that all federal agencies must consider the impacts of their actions on low-income and minority populations. California also has an Environmental Justice law that mandates all state agencies not only to consider impacts of actions on low-income and minority populations, but also examine disproportionate effects on differential rates of consumption of resources. The FERC EIS provides inadequate analysis of the impacts of the loss of a traditional diet on Klamath River tribes. Comments within the FERC EIS indicate a lack of familiarity with the evidence indicating that Native American populations experience disproportionately higher prevalence of diabetes than the overall US population. Contrary to statements within the FERC EIS, this increased prevalence is statistically and epidemiologically distinct from that in the general US population.[19]

The fact remains that the impacts of the current conditions on the Yurok Tribe, a low-income and minority population and a federally recognized Indian Tribe, are extensive. It is important to note that the FERC EIS failed to acknowledge or assess the health benefits of a traditional diet or the impact of food insecurity and

[19] Diabetes prevalence among American Indians and Alaska Natives and the overall population--United States, 1994-2002. MMWR. Morbidity and Mortality Weekly Report - 2003 - Aug 1;52(30):702-4. NB This report probably underestimates prevalence of dDiabetes among AN/AN population; also see figure below

poverty on the health of Native Americans in the affected areas. A preliminary analysis of poverty, food insecurity and tribal health data are being submitted as supporting documentation on this issue in the following comments. Peer reviewed and published medical studies support both the health benefits of a traditional Yurok diet, and the disproportionate rates of diabetes in Native American communities.[11,14,15,16,17,19]

The FERC EIS failed to address Environmental Justice (EJ) issues resulting from Project impacts on the Yurok Tribe, particularly in the area of disproportionate impacts on the health to Tribal and reservation communities, and the health of individual tribal members. The Klamath Hydroelectric project, current conditions and its continued operations, as well as the biased and discriminating treatment of Native Americans by PacifiCorp and the FERC in the previous NEPA process, as demonstrated in the flawed, insufficient and indefensible assessment of Project impacts in the FERC EIS are examples of what can only be defined as environmental racism and examples of blatant environmental injustice. The Yurok Tribe has provided ample testimony and evidence to PacifiCorp and the FERC that the Klamath Hydroelectric Project has had and continued to have significant, adverse, and disproportionate impacts on the Yurok Tribe and other tribal communities, which are low-income and minority populations. Unlike other stakeholders within the Basin, the Yurok Tribe receives no economic benefit as a result of the Project, yet the Project has resulted in the near-destruction of the River, its anadromous and resident species, numerous culturally significant resources, ie: tribal trust resources and as a result, the complete Yurok tribal fishery. The Klamath Hydroelectric Project and current conditions have had, and continue to have significant disproportionate adverse impacts on the Yurok Tribe because of its position in the watershed and its continued reliance on both subsistence and commercial fisheries. The basic and fundamental tenets of federal and state EJ laws suggest that the Department of the Interior and all federal agencies involved in the current analysis must consider the very real effects of these disproportionate impacts on a range of tribal trust resources.

The Department of the Interior and all federal agencies involved in the current Secretarial Determination and NEPA/CEQA analysis must consider the impacts of all aspects of the Klamath Hydroelectric Project and current conditions on low-income and minority communities, particularly on individual Klamath River Basin Tribes including the Yurok Tribe. The FERC EIS only provided a superficial assessment of the data submitted by the Karuk Tribe.[15] The Klamath Hydroelectric Project has had significant adverse effects on all aspects of Yurok cultural and traditional life and on numerous tribal trust resources. These impacts have been documented and submitted to the FERC, in written and verbal testimony by hundreds of Yurok tribal members, yet they are not included or reflected in the FERC EIS or the assessment of the impacts of current conditions on low-income and minority populations.

Cumulative Effects

In general this section of the DEIS fails to follow the Council for Environmental Quality's (CEQ) (1997) guidance on conducting cumulative effects analysis under NEPA. The Department of the Interior and all federal agencies involved in the current Secretarial Determination and NEPA/CEQA process should follow the CEQ guidance for identifying, evaluating, and assessing the cumulative effects of the current conditions on all types of environmental resources. Cumulative Effects analyses should be conducted for all natural and cultural resources within the study area for all alternatives under evaluation..

If the Klamath Hydroelectric Project is relicensed and current conditions continue without dam removal and implementation of the KBRA and KHSA, populations of traditionally and culturally and economically significant food sources species will continue to decline, possibly to extinction. Water quality would continue to deteriorate, toxic algal blooms would continue and possibly increase, culturally significant tribal trust resources and species would continue to suffer significant declines, diseases, and Project-related impacts that in turn would have a continuing significant adverse effect on the Yurok Tribe and YIR residents. The adverse socioeconomic impacts on the Yurok Tribe would continue and compound if current conditions continue. Only the removal of the four dams, and a fully restored River and fishery can uphold the federal government's tribal trust responsibility to the Yurok Tribe and protect these irreplaceable tribal trust resources.

The Department of the Interior and the BIA have a responsibility to ensure the protection of tribal trust resources because it acts as the primary branch of the US federal government responsible for tribal trust matters. The FERC EIS failed to acknowledge or adequately assess the impacts of the Project on tribal trust resources of the Yurok Tribe for which the federal government has a fiduciary responsibility. The status quo, or current conditions, would result in the eventual extirpation of all culturally significant tribal trust resources within the Klamath River watershed upon which Yurok culture has evolved, been sustained, and continues into the present day. If the current conditions continue they will result in severe socioeconomic and cultural costs, and continued losses, to the Yurok Tribe. These impacts must assessed by the Department of the Interior and all federal agencies involved in this current analysis and these assessments must accurately evaluated the federal trust responsibility to the Yurok Tribe and its members. The Secretarial Determination process provides for the first ever comprehensive assessment of these tribal trust issues and the environmental, economic, social and cultural impacts of the Klamath Hydroelectric Project, current conditions, and the proposed action of dam removal and implementation of the KBRA and KHSA. The further future decline of the fishery and the health of the Klamath River watershed, and its dependent tribal communities, is not an "unavoidable adverse effect". Rather, the adverse effects are only unavoidable if the federal government, its departments and agencies, fail in their trust responsibilities and the current conditions are allowed to continue, the dams are not

removed and the KBRA and KHSA are not implemented. The Department of the Interior, specifically the BIA and the Secretary of the Interior should not follow the FERC's mistake of ignoring the best possible science, the law, the needs of effected Tribes and the status quo (ie: current conditions) are maintained at the cost of a healthy river, restored watershed, sustainable economies, and tribal communities.

The Klamath Hydroelectric Project has literally destroyed, or nearly destroyed, the entire Klamath Basin ecosystem and all the abundant resources that the Tribe has relied upon for countless generations. And that near-destruction has happened within one generation or lifetime. Downstream tribal communities have received no benefit from the Klamath Hydroelectric Project, but have paid an overwhelming and disproportionate cost for the profit and benefit of PacifiCorp and a handful of upstream users. The Yurok Tribe has not even received the benefit of electricity generated from the Project, yet the Project has severely impacted the reservation economy, which relied upon the River primarily for food, and less as a commercial and recreational fishery. The lack of ability to make a living wage on the YIR has led to a Yurok diaspora, or displacement into surrounding areas or further in search of economic stability, yet Yurok who leave often return or wish to return to live on the reservation, if only they could make a living. These are profound Environmental Justice issues that have yet to be adequately addressed but must be addressed meaningfully in the Secretarial Determination and the ongoing NEPA and CEQA analysis for removing the four dams and implementing the KBRA and KHSA. Only the full removal of all four dams and the restoration of the Klamath River ecosystems and its once abundant fishery can begin to redress and resolve these Environmental Justice issues. It is imperative that the Department of the Interior, the Secretary, the BIA and all federal agencies involved in the current analysis acknowledge these long-standing Environmental Justice issues and address them in their final analysis and determinations on the proposed action and any alternatives and the Secretarial Determination Overview Report currently underway.

VIII. Tribal Trust and Potentially Impacted Trust Assets

"The River is the lifeline of the tribe. It needs to be clean and full so the salmon can come back and nourish the people. The salmon is like the miner's "canary" – if it is sick or dying it is a sign that our people are sick and dying too. If it is abundant and thriving – so are the people. It is the responsibility of the tribe and other government agencies to ensure this life line is healthy and abundant for the future generation."

(Yurok Tribal Member Survey Respondent 2006)

"There seem to be only memories of long and not so long ago when the fish were so plentiful to our kitchen tables or just catching, cleaning, hanging 20 fish in one day. Now it seems like you can go fishing all day or just to catch the tides and you come back home with 1 or 2 fish and moss and mud and plenty of sticks in your net. Not too many of us who traditionally live on eating sticks. None of the boys bring eels to you anymore cause they caught so many they don't know what to do with them. When your drifting at the mouth, you have to fight the sealions for one fish and sometimes he even takes the belly. The sealions chase you for a fish if you clean it too close to the waters edge. When I was a little girl my uncles used to bring the fish to Gram's house and we would spend all day hanging that fish and she would can it up and even share a jar or 2 for a gift every once in a while, now we can barely feed Gram and our own mouths and spirits.

Maybe we need to feed our elders and children – let them acquire a taste for that good real "CANDY" as Gram used to call it. When good fish used to run plentiful, Gram would make baked fish, fried fish, salmon patties, dried fish, canned fish, kippered fish. Cooked on sticks and even fish soup. Now we have to go buy a fish at the local market or eat burgers, pizza, Mexican food, hamburger helper, or any of the other processed foods full of all that stuff our elders wouldn't have dreamed of eating 20 to 30 years ago – Our elders don't even know what some of that stuff is.

When we have ceremonies and cultural gatherings we should not only be thankful for what we put in our mouth and cherish every bite, but pray for that fish to come back again and make us strong and keep our elders healthy and make our children healthy too with its strong vibrations. – We should ask that our fish and berries be made plentiful again. Let our youth and little Indian babies experience the love we have for the fish too and learn to harvest it the way Gram used to and feed us dried fish in the winter with her hot baked "Injun" Bread and jam. We are and always will be the fish people. May we be the ones the fish come back to."

(Yurok Tribal Member Survey Respondent 2006)

"As a kid there were abundant salmon because you could see the salmon thick in the river from the bridges. You had to row your boat out to rocks that you can walk out to now. Before I went to Vietnam in 1967 the River was high; when I came back after the Dam was built the water had dropped. In my lifetime I have watched the salmon, sturgeon, and eels become depleted. Salmon, eels, and sturgeon were our main food. We ate one of the three daily. We only ate meat on payday. The rest of the week we ate fish. Now we get fish only occasionally. This year we have not had any fish. My children may not have any salmon in the future."

(Yurok Tribal Member Survey Respondent 2006)

"My Yurok elders have always talked about the loss our natural resources and how this impacts our life way. The Tribe itself, the employees need to understand and advocate for both (ceremony and natural resources). When we do our Jump Dance we are praying for these things to return to abundance state. The Yurok people cannot survive without fish, acorns, language, and ceremonies."

(Yurok Tribal Member Survey Respondent 2006)

The Yurok have always inhabited California's northwestern coastline from Little River to Damnation Creek. Yurok Ancestral Territory also extends along the Klamath River from the mouth of the river up past the Klamath – Trinity confluence to Slate Creek. Yurok Territory continues six miles up the Trinity River. The Yurok language (and the neighboring Wiyot language) is affiliated with the Algonquin linguistic stock. Algonquin languages are primarily spoken by Tribes residing in the Great Lakes and New England areas. While the Yurok language is spoken fluently by several dozen Yurok people, a Tribal language program is in place to increase the fluency of its tribal members. Traditional subsistence animal species include salmon, ocean fish, sturgeon, sea lion, whale, elk, deer and duck. Acorns, berries, bulbs and grass seed are staple plant foods.

Yurok life is defined by extended families affiliated with villages and represented by head spokespersons. Ceremonial wealth and rights to subsistence resource areas determine familial standing within Yurok social structure. Yurok are recognized for their skills making redwood canoes, weaving fine baskets, highly stylized art forms, hunting, and specifically riverine salmon fishing. The ancient traditions are continued through contemporary times.

The traditional homeland of the Yurok Tribe extends from the Pacific Ocean along the lower Klamath River and into the Trinity River Basin. While Yurok culture and tradition centers on the Klamath River, their people have always lived along the lower Trinity and depended on its fish, water and other resources. The traditional and present territories of the Karuk and Klamath (Oregon) Tribes are located along the upper Klamath River, above the River's confluence with the Trinity. Both these tribes also depend on the

resources of the Trinity River, primarily as it influences the Klamath River ecosystem (USFWS et al 2000).

Natural resources hold significant cultural, ceremonial, spiritual and other non-economic values for all the Indian tribes of the Klamath region (the term cultural refers to the cultural anthropology of the tribes not their archaeologically significant artifacts and monuments which are addressed elsewhere in this document). Thus, standard economic methods of accounting and valuation cannot adequately measure the consequences of any action that may affect these tribes' trust assets. In fact, in previous EIS analysis processes, representatives of the Klamath River tribal governments have voiced concern over the utility and validity of attempts to quantify and express the benefits of natural resources, such as salmon, to their people in economic or dollar terms. Accordingly, the trust analysis does not focus simply on economics; instead, it evaluates the anticipated impacts of the Restoration in terms that are more meaningful and of primary importance to the potentially affected tribes. Specifically, the trust section endeavors to characterize the fundamental role of the region's rivers and river health in tribal history. It is in this context that the Restoration alternatives are evaluated in terms of their anticipated impact on the health of the Klamath River (USFWS et al 2000).

Healthy alluvial river ecosystems are ultimately the resource of greatest importance to the region's tribes. Continued tribal access to many trust resources such as fish, wildlife, water and plants depends on the condition of the rivers which transect their lands. Riverine health itself is a function of many fluvial and geomorphic attributes, including rates of sediment loading, flow variability, channel migration and riparian plant life-cycles, among others. Therefore, it is necessary to evaluate the influence the proposed project may have on these physical attributes of the Klamath River to understand the potential tribal trust impacts.

Trust Responsibility

From their earliest contact with the Indians of North America, the European powers and the United States have dealt with Indians on a government to government, or tribal basis. In principle, all treaties, statutes, and executive orders implementing Federal Indian policy are premised upon this political relationship.

From 1787 to 1871, the United States entered into hundreds of treaties with Indian nations in which Indian tribes gave up land in exchange for reservations, safety, and the well being of their people. The Supreme Court has held that treaties create a trust relationship between the Federal Government and Indian tribes. This relationship is "marked by peculiar and cardinal distinctions which exist nowhere else" and "resembles that of a ward to his guardian". The U. S. has a "duty of protection" toward the Indians. [See: Cherokee Nation v. Georgia, 30 U.S. 1 (1831); Worcester v. Georgia, 31 U.S. 515 (1832); U.S. v. Kagama, 118 U.S. 375, 384 (1886); Seminole Nation v. U.S., 316 U.S. 286 (1942)]. In U.S. v. Mitchell [463 U.S. 206, 225 (1983)], the Supreme Court reaffirmed the principle of "the undisputed existence of a general trust relationship

between the United States and the Indian people." The Federal Government's obligation to honor the trust relationship and to fulfill its treaty commitments is the trust responsibility. The Federal Government has extended the trust responsibility through federal statutes, agreements, and executive orders. These documents can create trust obligations in the same way that a treaty does. [See Antoine v. Washington, 420 U.S. 194 (1975) and Oneida Indian Nation v. County of Oneida, 414 U.S. 661 (1974); U.S. v. Mitchell, 463 U.S. 206, 225 (1983)]. The trust responsibility imposes an independent obligation upon the Federal Government to remain loyal to Indians and to advance their interests, including their interest in self-government. [See: Manchester Band of Pomo Indians v. U.S., 363 F. Supp. 1238 (N.D. Cal. 1973)]. The American Indian Policy Review Commission's, *Final Report* stated "The purpose behind the trust doctrine is and always has been to ensure the survival and welfare of Indian tribes and people. This includes an obligation to provide those services required to protect and enhance Indian lands, resources, and self-governance, and also includes those economic and social programs which are necessary to raise the standard of living and social well-being of the Indian people to a level comparable to the non-Indian society" (USFWS et al 2000).

Indian Natural and Cultural Resources

The Trust Doctrine requires, in part, that Indian tribes have continued access to natural resources if they are to preserve their cultural and traditional ways of life. Therefore, in order to fully characterize the potential impacts of any action that may affect a tribe's trust resources, it is necessary to examine the role of those resources in tribal cultures and societies.

Like all peoples, Native Americans depend on natural resources for the necessities of life, food, housing, and clothing. However, tribes have not traditionally regarded those resources simply as commodities to be bought, sold, or indiscriminately exploited. "The landscape itself…is seen as sacred and quivering with life. It is inscribed with meaning regarding the origins and unity of all life, rather than seen as mere property to be partitioned legally into commercial real-estate holdings" (USFWS et al 2000).

When non-Indians first began settling in North America, what they perceived as a wild and uninhabited land, had in many places been managed and utilized by Indian people. Over the millennia, many Native American peoples observed and learned to recognize, rely upon, and even emulate natural processes as part of their ceremonial and religious ways-of-life. In this manner, they enhanced the richness and productivity of the land and other resources on which they depended, and developed an intimate connection to the order and cycles of the natural world (Salter, 1996). The spiritual and practical environmental knowledge they amassed over time was passed orally from one generation to the next through story and language, and includes many what are today considered highly refined and enlightened techniques for eco-system management (USFWS et al 2000).

The significance of the Native American reliance on and veneration for nature is evident in all facets of their cultures, traditions, religions, and resource management. Consequently, increasing resource scarcity over the last century and a half has had a profound effect on Indian tribes. Tribal cultures across North America, such as those of the Klamath-Trinity region, are no longer in a position to fully embrace their traditional ways of life (USFWS et al 2000). This is not to suggest that Indian culture has disappeared. Rather, that the declining availability of resources critical to Native American traditional and spiritual practices has rendered some of those resources even more precious as a means of sustaining their cultures and made additional losses of their resource base increasingly difficult to accept (USFWS et al 2000).

Any tribal trust impact analysis must focus on the potential affect on the health of the Klamath River, as the River's overall health is a primary factor determining not only the availability of fish, but many trust assets including water, wildlife, and vegetation. Thus, increased numbers of chinook salmon and Pacific lamprey, just as other trust assets, represents an expected beneficial by-product of riverine health. The potential tribal trust impacts were not evaluated on a trust asset by trust asset basis because such an analysis would not only require a level of effort well beyond the scope of the EIS but it is unlikely to produce scientifically valid results or results readily interperable with respect to the overall implications for the region's tribes and the U.S.'s trust responsibility to those tribes (USFWS et al 2000)..

In the case of tribal trust resources however, a focus on present and future conditions may fail to adequately represent the true nature of the potential impacts on the region's tribes and its implications for the U.S.'s trust responsibility to those tribes. As the Tribal Trust -- *Existing Conditions* must evaluate the cultures, traditions, religions, languages and perspectives of the Indian tribes of the Klamath-Trinity region that are rooted to the area's once healthy rivers and the associated abundance of salmon, elk, vegetation, and other natural resources. Thus, while the tribes' access to natural resources and their socio-economic and cultural situations under existing and projected environmental conditions are relevant to the analysis of tribal trust impacts, it is far more meaningful to consider the impacts in the context of the tribes' traditional reliance upon rivers as well as the once pristine condition of those rivers relative to their currently degraded state.

Tribal Trust Resources

In his 2004 analysis, anthropologist Thomas King concluded:

> Another law that is pertinent to tribal use of the Klamath Riverscape is the American Indian Religious Freedom Act (AIRFA), which articulates a policy of respect for and protection of tribal rights to the practice of traditional religion. Although AIRFA provides little direction about how agencies are to carry out this policy, it has generally been interpreted to require consultation with tribes when planning actions that might affect religious practice, and actions to avoid impact to such practice where feasible.

The tribes obviously use the Klamath River, its water, its fish, and other elements of the Klamath Riverscape for religious purposes. It is not at all to much to say that the river is central to the tribes' religious practice. The Klamath Hydroelectric Project and other projects in the Klamath Basin have changed the river, and continue to change it, in ways that are deleterious to tribal religious practice. They do this by altering the quality of the river's water, which is traditionally used for purification rituals. They do this by altering the habits and habitats of the fish that play central roles in religious belief. They do this by causing the erosion of locations where key spiritual activities must take place. They do this by fundamentally altering the character of the river as an environment in which people can touch the immortal.

Under AIRFA, FERC and other Federal agencies are obligated to consult with the tribes and try to make decisions about actions affecting the river in such a way as to avoid doing further injury to religious practice. The logic of AIRFA would also suggest that FERC should seriously consider doing what it can to undo damage done in the past, in order to help the tribes regain the ability to practice their religion in traditional ways.

Effects on Indian Sacred Sites

Executive Order 13007 directs Federal agencies to try to avoid physical impact to "Indian sacred sites" on Federal and Indian land, and to avoid blocking tribal access to such sites. Sites like *Paniminik*, owned by the Karuk Tribe and recognized as a place of great spiritual importance, qualify as such sites; there may be sites meeting the executive order's definition on other tribal land or on land managed by the Forest Service, Bureau of Land Management, or Bureau of Reclamation. A site need not be eligible for the National Register to be a "sacred site" in terms of the executive order. FERC[20] and other agencies need to consider this possibility in making decisions about the Klamath Hydroelectric Project and other actions along the river.

Trust Responsibility for the Riverscape

Beyond the requirements of any specific law or executive order, the federal government has a broad trust responsibility toward federally recognized Indian tribes, derived from the Constitution, a great many treaties, laws and policies extending back to the earliest days of the nation, and a massive corpus of case law. The trust responsibility has most recently been articulated in a government-wide manner in Executive Order 13175.

[20] The applicability of executive orders to independent agencies like FERC is uncertain, but FERC's *Tribal Policy Statement* promulgated July 23, 2003 includes Executive Order 13175 among its authorities, suggesting that FERC views itself as obligated to be responsive to such orders.

Partly in response to this executive order, FERC has acknowledged in official polity 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[21].

FERC goes on to pledge itself to working with tribes on a government-to-government basis to address the effects of proposed projects on tribal rights and resources. Thus FERC has committed itself to exercising the Federal government's trust responsibilities toward tribes

Depending on its context, the term "trust responsibility" with respect to Indian tribes and the United States government is usually taken to connote either the relatively narrow responsibility to protect tribal interests in "trust assets" to which a tribe has rights by treaty, statute, or outright ownership (timber, minerals, fish)[22], or the more general responsibility to be sensitive to and represent tribal interests vis-à-vis other parties.

Taking the narrow definition first, it is well established that the Yurok and Hupa Tribes have federally recognized rights to fish in the Klamath River and its tributaries[23]. The Karuk have not been held to possess such rights, apparently because the tribe lacks a treaty explicitly reserving them. However, one of the central tenets of Indian law is that tribes retain all rights not explicitly ceded[24], so arguably the Karuk have retained rights to the Klamath's fish as well.

Apparently using a broader definition, the Trinity River EIS identifies not only anadromous fish but "non-anadromous fish, water, wildlife, and vegetation" as "trust-protected assets"[25].

FERC must understand itself to have a trust responsibility toward at least tribal rights to anadromous fish in the Klamath Riverscape, and arguably toward a broad array of the riverscape's other contributing elements.

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[21] FERC *Tribal Policy Statement:* 18 CFR 2.1c(b)

[22] 25 CFR 900.6

[23] Trinity River EIS:3-208; The primary Hupa rights are to fish in the Trinity, one of the Klamath's main tributaries.

[24] The "Reserved Rights Doctrine," see *U.S. v. Winans*, 198 U.S. 371 (1905).

[25] Trinity River EIS: 3-205

Yurok on Federal Government's Trust Responsibility

In 2009, the Yurok Tribe drafted core principles on the Tribe's position on Klamath River and Yurok Trust Resources in a White Paper presented to the US Fish and Wildlife Service.

The Yurok Tribe has developed this white paper to provide a description of the Tribe's interest in Klamath River Basin fish, water and related issues. The Klamath River Basin includes the Trinity, Scott, Shasta, Salmon, Williamson, Wood and Sprague Rivers including all connected tributaries.

The following principles must be applied when the United States is involved in any issue that affects Klamath River Basin fish, water or other resource issues:

1) That the United States fully and properly protect and restore all trust resources of the Yurok Tribe. This principle includes the need to manage Klamath River Basin resources such that the Yurok Tribe can fully participate in the subsistence, commercial and ceremonial harvest of all species and races of anadromous and other fish;
2) That the United States abide by and honor the commitments made in the Cooperative Agreement between United States Department of the Interior and Yurok Tribe for the Cooperative Management of Tribal and Federal Lands and Resources in the Klamath River Basin of California;
3) That any activities which affect fish and/or water resources within the Klamath River Basin affect the Yurok Tribe Reservation and the Yurok Tribe whether such activities occur in California or not;
4) That the United States, including the Department of the Interior, must provide the Yurok Tribe with any proposal, initiative or other concept that affects the interests and resources of the Yurok Tribe;
5) That the United States, including the Department of Interior, pursuant to the cooperative management agreement mentioned above, principles of the government-to-government relationship, and in proper recognition of the dependence of the Yurok Tribe upon Klamath River Basin fish, water and other resources, will not take any action affecting Yurok interests without the full, timely, and meaningful participation of the Yurok Tribe in all decision and other processes;
6) That the United States and the Department of the Interior recognize that the Yurok Tribe harvests the vast majority of Klamath River Basin fish as demonstrated by the Tribe's past harvest;
7) That the United States recognize and respect the Yurok Tribe fishery interests as specifically recognized by the 1993 Opinion of the Solicitor, the 1988 Hoopa Yurok Settlement Act and its legislative history and other appropriate sources.

What follows is a description of the Yurok Tribe's dependence upon the Klamath River and its fisheries, including attached rights.

The Yurok Tribe's message is that there is a continuing and substantial impact to the Yurok Tribe's fisheries and other resources. That impact has dire social and economic consequences on the lives of Tribal members, their families and Tribal communities. Any process regarding the management of Klamath River Basin fish, water or other resources must include the Yurok Tribe. The United States, including the Department of Interior, must properly share all information in its possession as it such relates. Any decisions regarding tribal resources must be based upon the Tribe's unique circumstances and strengthen Tribal culture and related priorities.

The Yurok Tribe Dependence on Klamath River Basin Fish

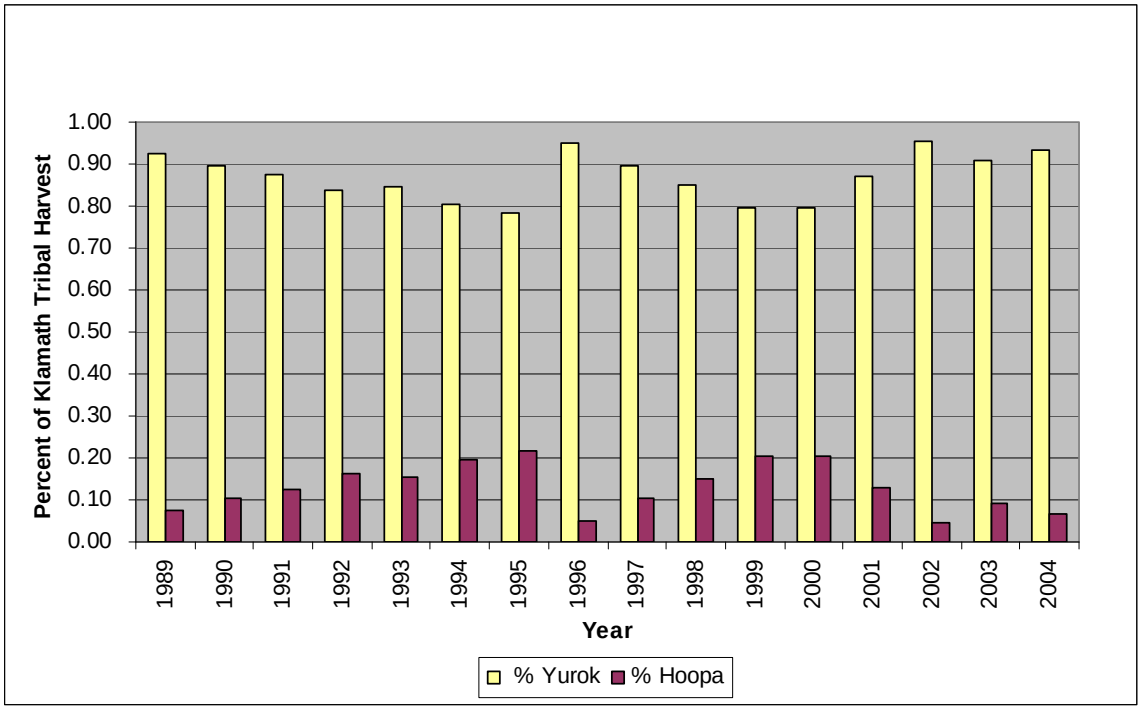
Klamath River fish are irreplaceable to the Yurok Tribe's culture, religion and economy. From time immemorial, Yurok people have depended on the Klamath River and all of its streams and tributaries. The River is central to Yurok society by providing food, transportation, commercial trade, and numerous other activities essential to Yurok life. Throughout history and today, the identity of the Yurok people has been intricately woven into natural environment including the Klamath Basin watershed. Tribal religious and ceremonial practices focus on the health of the world; the Klamath River and its fisheries are a priority. The Yurok Tribe's obligation to protect the fishery has always been understood by Yurok people. The ancestral territory of the Yurok Tribe included coastal lagoons, marshes, ocean waters, tidal areas, redwood and other ancient forests, prairies and the Klamath River.

Because of the rivers' importance, one of the Tribe's highest priorities is to protect and preserve the resources of the rivers, and in particular, to restore the anadromous fish runs to levels that can sustain Yurok people. When the original Klamath Reservation was established in 1855, the rivers were filled with abundant stocks of salmon, steelhead, eulachon, lamprey, and green sturgeon. Today, the abundance of fish in the Klamath River and its tributaries are only a small fraction of their historic levels. Many species of fish have gone extinct, many other species, such as fall Chinook, are in serious trouble. Nonetheless, anadromous fish continue to form the core of the Yurok Tribal fishery. The Yurok Tribe is pursuing its fishery restoration goals through a fish management and regulatory program, participation in various forums to reach long term solutions to Basin problems and when necessary, litigation. The Tribe has devoted a large share of scarce funding resources to budgets for fishery management and regulation. The Tribe has enacted a fisheries ordinance to ensure that the fishery is managed responsibly and in a sustainable manner and has a longstanding record of resource protection. The Tribe's fisheries department is well respected and recognized as a knowledgeable and experienced fisheries entity in the Klamath Basin. The Yurok Tribal Council and the Tribal members they represent are well known for taking and supporting responsible actions to protect fisheries resources.

The Yurok Tribe dependence upon Klamath River fish is supported by Tribal harvest information. Since the passage of the Hoopa Yurok Settlement Act in 1988, the Yurok

Tribe harvest of Klamath River fall Chinook represents approximately 87% of the 50% Tribal allocation (see Figure 1.). In terms of the overall allocation of Klamath River fall Chinook, comprised of Tribal and non-Tribal fishing groups, the allocation of fall Chinook for the Yurok Tribe is the largest single allocation of any group, Tribal or non-Tribal, harvesting Klamath River fall Chinook. The Tribe's allocation is 80% of the Tribal allocation or 40% of the total allocation of harvestable surplus of Klamath fish.

Figure 1. Percent of Klamath Tribal allocation harvested by the Yurok and Hoopa Valley Tribes, 1989 – 2004.



The Tribe's dependence on Klamath River fish and the expectation that the Tribe would have significant economic opportunities from the fishery was identified by Congress during passage of the 1988 Hoopa Yurok Settlement Act. Unfortunately, the lack of Klamath River fish has prevented the Yurok Tribe from realizing the benefits of the Klamath fishery as intended by Congress. The legislative history confirms that Congress intended to vest in the Tribe property rights to the fishery on the Klamath River. The Committee noted that the Act "will also establish and confirm the property interests of the Yurok Tribe in the Extension, including its interest in the fishery. Senate Report No. 564, 100 Cong., 2d sess. (1988).

IX. Conclusions and Recommendations

For the Yurok it is difficult to discuss the traditional and contemporary culture in two distinct life ways. Instead Tribal presence throughout the Klamath River Basin is a continuum running from time immemorial into the future generations yet to come. While this continuum can be marked by periods of change (creator, *woge*, culture heroes, oral tradition of prehistory, oral tradition of proto history, oral and written 20th century history, and 21st century contemporary occurrences.) the basic relationship remains the same: for Yurok People, social and physical health, culture and economy continue to rely on the Klamath River and its fishery. Further, the Yurok fishery depends on a healthy river ecosystem that includes as a necessary requirement adequate flows of high quality water to sustain the abundant trust resources that Yurok depend on to maintain their way of life.

The relationship between indigenous people, fish, and rivers with water is fundamentally a cultural relationship. The cultural relationship encompasses all other ways of defining the relationship and thus includes relationships of economics, politics, ecology and environment, and religion. In addition archeological or historical perspective for understanding cultures, while yielding important information, are limited in scope by the requirements of objectivity, evidence and a chronological ordering that may be radically different than that of the cultures to be understood. The River is of such great importance that there is no particular unique word that names the river. Instead, the River is named as 'river'. Yurok words for 'river' are *'la yoh'*, *'ra yoy'*, and are translated 'to run' or to 'run past' in reference to a liquid.

Yurok interaction and emulation of the environment is a spiritual - ceremonial activity. More than environmental management, for Yurok interaction and emulation are a religious right. This is important for linking Native American environmental practices to additional laws, regulations, policy orders, and policy that acknowledge Native American religious rights (American Indian Religious Freedom Act 1978, Executive Order 12898, Executive Order 13007).

Oral traditions, the spoken word that links people, cultural practices and place are critical to understanding the environment from the perspective of the Yurok and other Klamath River Tribes. The Klamath River as a cultural environment important to indigenous people is more than a collection of individual historic properties or sites. Instead it is the whole of the River considered as a single entity that best frames the meanings and relationships between Indigenous people, fish and water. It is clear from Yurok oral history that the River is such an integral part of the Yurok way of life that without it the traditions of the Yurok people would be perceived in a radically different perspective. Practically every function of the Yurok way of life is associated to the River: The origination of fish, proper methods for taking fish, how the River is to flow, death passage ceremonies, locations for fish dams and ceremonies all reflect the bond between the River and the Yurok people. It is essential that the River be maintained at a level that provides relevance to the young Yurok mind that hears these stories.

The condition of the Klamath River, it's health and quality, is of grave concern to Yurok people. Healthy habitat, adequate and high quality water flows, sustainable and abundant fish populations are of critical importance to Yurok culture. This concern is due to dependence on the River for all aspects of Yurok life, the directives handed to the People by the Creator as Indian Law, and a responsibility for good stewardship of the River and the resources it provides. The role and significance of the River in Yurok life and ceremony, from birth to death, cannot be overstated. The River is the bond that unifies Yurok culture. It is also the bond that unites Yurok with their upriver neighbors in a common life way that has persisted through time.

In a 2004 report evaluating the eligibility of the Klamath Riverscape for inclusion on the National Register of Historic Places, anthropologist Thomas King reported:

> Effects of the Project downstream from Iron Gate Dam are less straightforward than those within the Project area itself. Such effects must be understood as parts of a complex of cumulative effects – contributions to the overall transformation of the river from its natural condition to the way it is at present. This complex of effects is the result of a variety of forces. Besides the PacifiCorp Project, contributors include the dams managed by the Bureau of Reclamation (BOR), farming practices, particularly in the Klamath Basin upstream from the Project, logging, mining, sewage disposal, and other modern human activities along the river, and offshore commercial and recreational fishing that depletes salmon and steelhead runs in the river. To these contemporary impacts must be added the past impacts of hydraulic mining, which tore down riverbanks, altered streamflow, and filled in fishing holes. It is beyond the scope of this report to detail all the effects of all these sources, but it may be helpful to characterize them in general and then to consider what contribution the PacifiCorp Project may itself have to the overall pattern of effects.
>
> The culturally significant character of the riverscape is fundamentally controlled by the character of the river, which in turn is controlled by the quantity and quality of water flowing down it and the manner in which flows are regulated, whether by natural or human agent. Insufficient water, or water that has been polluted, obviously affects direct human consumption and other uses, but it also has a variety of damaging effects on the riverscape's cultural values. Effects discussed in the ethnographic reports and elsewhere, and by tribal consultants, include:
>
> - Impediments to Tribal River access, particularly just downstream from Iron Gate Dam.
>
> - Blocking the passage of anadromous fish up the river – resulting from the simple presence of the dams[26].

[26] See KRITFWC 2003. Karuk and Yurok consultants disparage the extent to which hatcheries can make up for this blockage, reporting that hatchery fish are very different from wild fish – softer, spongier. Shasta

- Other impacts on fish – ranging from catastrophic effects like the massive 2002 fish kill to a general decline in the populations of both anadromous and resident fish, and including the complete or near elimination of particular fish runs[27]., resulting from such factors as:

    - Release of insufficient water down the river, or releases at the wrong times, or in the wrong amounts, to meet the biological needs of all fish species, at all life stages.

    - Release of water that has been warmed (or cooled) by being held in reservoirs, creating an unnatural and detrimental temperature regime for fish.

    - Release of water that is polluted by agricultural runoff from above the reservoirs, full of chemical foam and algae, making it unhealthy not only for fish but also for people to drink or bathe in.

    - Deposition of sediment in cold-water holes where fish congregate.

    - Creation of a flow regime in which periodic flushing flows ("freshets") are replaced by a flat flow punctuated by flood events[28], failing to clear away sand and gravel bars at the mouths of tributaries and thus sealing off spawning ground and fish refugia.

- Through the same alterations in flow regime, causing erosion of culturally important areas along the river, such as the World Renewal site *Katamin*.

- Through flow alterations, temperature changes, and pollution, causing damage to the health of plants required for basketry and other cultural purposes.

Such effects have obvious implications for the relationships of the tribes to the river, the fish, special places along the river, and other elements that contribute to the significance of the riverscape. If the salmon do not run, the First Salmon Ceremony becomes meaningless. If the priest's sweatlodge washes away, the priest cannot use it during the World Renewal Ceremony. If the river is too polluted to bathe in, important purification rituals cannot be performed. If people cannot get enough salmon, or steelhead, or lampreys, their connection with the riverscape is diminished.

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consultants did not make this distinction but reported similar differences between wild and farmed salmon, and all consultants commented on the problem of competition between hatchery-raised fish and wild fish, arguing that the wild population is endangered by the release of hatchery fish.

[27] For summary statistics from Federal government sources, see Karuk ethnographic report:77-8

[28] See, for instance, Karuk ethnographic report:57-8

Further, interviews with Yurok tribal elders have made it clear that for Yurok, there is a direct cause and effect between the dams and the conditions on the River and impairments to the fishery and Yurok way of life:

> ***I think Iron Gate has a lot to do with the Klamath River because what it's doing is during these slack years when there is less water, that algae builds up in the bottom of swimming ponds, well that's the same thing that's happening up there now and we're getting this fertilizer and stuff from them farms building up on the floor of these little reservoirs. It is building up thick and then we get a little high water and they hold the water back. They hold the water back because they're trying to keep their water level in the reservoirs which cuts it short from going into the ocean. Then it just builds up and finally we get our weather and they say, 'Okay, we hit our level,' and they turn it loose. Then they open the gates and all we get is that slush and cow shit and debris from them reservoirs and it's pouring into our water and there is that white foamy stuff on the top of the water and this algae that is so thick you can't even walk in it and it's no good for the fish. It's no good for the wildlife. It's no good for nothing. And anymore even if we do have a high water it doesn't flush it. It goes down the little channels where the water is supposed to be and all this algae is on the sides and it floats up and goes down to where the fish are and never goes away. There it is. That has a lot of effect on our river.***
>
> ***The River used to have high winter flows. People would move around in the winter. The River would rise 40-50 feet every year in peak flows. Walt recalls high water and flood events in 1955, 1964, and 1974. High water events removed silt and sediments and large woody debris from the river. Now the flows are not high enough to float out the big logs over the riffles or clear out the gravel and sediments that pile up at the mouths of the creeks. The construction of dams on the Klamath and the Trinity Rivers had a big impact on the River and its annual flow. Walt stated that a significant decline in fish population was evident after the construction of the dams.***
>
> **(Walt McCovey Jr., 2003)**

In his 2004 analysis, Thomas King concludes the following:

> The Klamath Riverscape *is* the physical cultural environment of the tribes, and that its health is intimately related to the health of their less tangible cultural institutions. The Klamath Riverscape, the river itself, and its fish would be key cultural resources for the tribes even if they were not eligible for the National Register. To the extent the dams contribute to the pattern of cumulative impacts on the riverscape, they have an adverse effect on the integrity of these resources, which must be considered in project review under NEPA.

It remains the position of the Yurok Tribe that the only resolution of these long standing violations of Yurok sovereignty, the depletion and degradation of Yurok Trust Resources and the actual fulfillment of the federal government's Trust Responsibility to the Yurok

Tribe and its members requires the full removal of the 4 Klamath River dams and the implementation of the KBRA and KHSA all leading to the restoration of the Klamath River its ecosystem and its fishery. This report has been prepared for the purposes of providing citations, references, data and evidence that will assist the Department of the Interior, the Secretary of the Interior and all federal agencies engaged in the Secretarial Determination Process and the ongoing NEPA/CEQA process in making a sound and informed decision on these important matters of vital interest to the Yurok Tribe.

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XII. Attachments

A. 1851 Treaty with the Poh-lik-lah
B. 1973 USC 412 US 481 Mattz v. Arnett
C. 1993 DOI Solicitors Opinion: Fishing Rights of the Yurok and Hoopa Valley Tribes
D. 2006 DOI Cooperative Agreement: Cooperative Management of Tribal and Federal Lands and Resources in the Klamath River Basin in California

A. 1851 Treaty with the Poh-lik-lah

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 on behalf of the Cu-lu:

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

For and in behalf of the Tan-ok:

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-nee:

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. McKINNEY.
WILLIAM REDAR.

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.

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 Pah-lik or lower Klamath, the Pah-taick 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.

October 6, 1851.
Ratified.

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 La-qui-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 shortiron camp kettles, large size; one hundred short-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.] REDUCK McKEE,
United States Indian Agent for California.

For and in behalf of the Welch-pack tribe, living at mouth of Trinity:

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

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

MO-KU-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-si-ahs:

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

For and in behalf of the Sor-a-points:

UP-LA-GO-PUS, his x mark. [SEAL.]
MOO-ROO-KUS, his x mark. [SEAL.]
SA-ET-MA-GHIL, 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-WE-GHIT, 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-KEE 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-FAH, his x mark. [SEAL.]

For and in behalf of Cham-sucks-nee tribe:

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

For and in behalf of the Coc-kes-nan 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-SOOK-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. DUNBAR,
GEORGE GIBBS,
Interpreters.
H. W. WESSELLS, *Brevet Major, U. S. A., commanding escort.*
WALTER VAN DYKE,
GEO. W. ELLSWORTH,
MORRIS S. THOMPSON,
WALTON McDONALD,
Interpreters.

I TREATY SUPPLEMENTARY TO THE FOREGOING TREATY

The undersigned chiefs, captains and head men of the Si-wah, Op-po-o, He-ko-nock and In-nock tribes or bands of Indians, residing at and near to the mouth of the Cor-a-tens or Salmon river, having had the terms and stipulations of the foregoing treaty, concluded at Durken's ferry on the 6th instant, fully explained to them by Reddick 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-tens, near mouth of Salmon river, this twelfth day of October, anno Domini, 1851.

[SEAL.] REDDICK McKEE,
United States Indian Agent.

For and in behalf of the Si-wah band:

ESSIC-PISH-I-A, his x mark. [SEAL.]
KES-SOW, his x mark. [SEAL.]
CHEE-PEE-CHA, his x mark. [SEAL.]
PI-KA-TEEM, his x mark. [SEAL.]

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

CA-POH-U-PUCK, his x mark [SEAL.]
PECK-NEETS, his x mark. [SEAL.]

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

YAH-PEE-PAH, his x mark.
HOSS-A-PUCK-IP-MA his x mark [SEAL.]

For and in behalf of the In-nock 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. DUNBAR, *Interpreter.*
GEORGE GIBBS.
H. W. WESSELLS, *Brevet Major U. S. A., commanding escort.*
JOHN S. GRIFFIN, *Assistant Surgeon U. S. A.*
WALTER McDONALD.

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

B. 1973 USC 412 US 481 Mattz v. Arnett

MATTZ v. ARNETT, 412 U.S. 481 (1973)

412 U.S. 481
Case Number: 71-1182
Decided: 01/01/1900
United States Supreme Court

U.S. Supreme Court

MATTZ v. ARNETT, 412 U.S. 481 (1973)

412 U.S. 481

MATTZ v. ARNETT, DIRECTOR, DEPARTMENT OF FISH AND GAME
CERTIORARI TO THE COURT OF APPEAL OF CALIFORNIA, FIRST APPELLATE DISTRICT

No. 71-1182.

Argued March 27-28, 1973
Decided June 11, 1973

Petitioner, a Yurok, or Klamath River, Indian, intervened in a forfeiture proceeding, seeking the return of five gill nets confiscated by a California game warden. He alleged that the nets were seized in Indian country, within the meaning of 18 U.S.C. 1151, and that the state statutes prohibiting their use did not apply to him. The state trial court found that the Klamath River Reservation in 1892 "for all practical purposes almost immediately lost its identity," and concluded that the area was not Indian country. The State Court of Appeal affirmed, holding that since the area had been opened for unrestricted homestead entry in 1892, the earlier reservation status of the land had terminated. Indian country is defined by 1151 as including "all land within the limits of any Indian reservation under the jurisdiction of the United States Government, not withstanding the issuance of any patent." The Klamath River Reservation was established by Executive Order in 1855 and included the area in question. In 1891, by Executive Order, the Klamath River Reservation was made part of the Hoopa Valley Reservation. The Act of June 17, 1892, provided that "all of the lands embraced in what was Klamath River Reservation" reserved under the 1855 Executive Order, are "declared to be subject to settlement, entry, and purchase under the laws of the United States granting homestead rights . . . Provided, That any Indian now located upon said reservation may, at any time within one year . . . apply to the Secretary of the Interior for an allotment of land . . . . And the Secretary of the Interior may reserve from settlement, entry, or purchase any tract . . . upon which any village or settlement of Indians is now located, and may set apart the same for the permanent use and occupation of said village or settlement of Indians." The Act further provided that proceeds from the sale of the lands "shall constitute a fund . . . for the maintenance and education of the Indians now residing on said lands and their children." Held: The Klamath River Reservation was not [412 U.S. 481, 482] terminated by the Act of June 17, 1892, and the land within the reservation boundaries is still Indian country, within the meaning of 18 U.S.C. 1151. Pp. 494-506.

(a) The allotment provisions of the 1892 Act, rather than indicating an intention to terminate the reservation, are completely consistent with continued reservation status. Seymour v. Superintendent, 368 U.S. 351 . Pp. 496-497.

(b) The reference in the Act to the Klamath River Reservation in the past tense did not manifest a congressional purpose to terminate the reservation, but was merely a convenient way of identifying the land, which had just recently been included in the Hoopa Valley Reservation. Pp. 498-499.

(c) The Act's legislative history does not support the view that the reservation was terminated, but by contrast with the final enactment, it compels the conclusion that efforts to terminate by denying allotments to the Indians failed completely. Pp. 499-504.

(d) A congressional determination to terminate a reservation must be expressed on the face of the statute or be clear from the

surrounding circumstances and legislative history, neither of which obtained here. Pp. 504-505.

(e) The conclusion that the 1892 Act did not terminate the Reservation is reinforced by repeated recognition thereafter by the Department of the Interior and by the Congress. Congress has recognized the reservation's continued existence by extending, in 1942, the period of trust allotments, and in 1958, by restoring to tribal ownership certain vacant and undisposed-of ceded lands in the reservation. P. 505.

20 Cal. App. 3d 729, 97 Cal. Rptr. 894, reversed and remanded.

BLACKMUN, J., delivered the opinion for a unanimous Court.

Lee J. Sclar argued the cause and filed briefs for petitioner.

Roderick Walston, Deputy Attorney General of California, argued the cause for respondent. With him on the briefs were Evelle J. Younger, Attorney General, and Carl Boronkay, Assistant Attorney General.

Harry R. Sachse argued the cause for the United States as amicus curiae urging reversal. With him on the brief [412 U.S. 481, 483] were Solicitor General Griswold, Assistant Attorney General Frizzell, Carl Strass, and Glen R. Goodsell.

MR. JUSTICE BLACKMUN delivered the opinion of the Court.

Our decision in this case turns on the resolution of the narrow question whether the Klamath River Indian Reservation in northern California was terminated by Act of Congress or whether it remains "Indian country," within the meaning of 18 U.S.C. 1151. [1] When established, the reservation was described as "a strip of territory commencing at the Pacific Ocean and extending 1 mile in width on each side of the Klamath River" [412 U.S. 481, 484] for a distance of approximately 20 miles, encompassing an area not exceeding 25,000 acres. This description is taken from President Franklin Pierce's Executive Order issued November 16, 1855, pursuant to the authority granted by the Act of March 3, 1853, 10 Stat. 226, 238, and the Act of March 3, 1855, 10 Stat. 686, 699. [2]

Petitioner Raymond Mattz is a Yurok, or Klamath River, Indian who, since the age of nine, regularly fished, as his grandfather did before him, with dip, gill, and trigger nets, at a location called Brooks Riffle on the Klamath River. On September 24, 1969, a California game warden confiscated five gill nets owned by Mattz. The nets were stored near Brooks Riffle, approximately 200 feet from the river, and within 20 miles of the river's mouth.

The respondent Director of the Department of Fish and game instituted a forfeiture proceeding in state court. Mattz intervened and asked for the return of his nets. He alleged, among other things, that he was an enrolled member of the Yurok Tribe, that the nets were seized within Indian country, and that the state statutes prohibiting the use of gill nets, Cal. Fish & Game Code 8664, 8686, and 8630, therefore were inapplicable to him. The state trial court, relying on Elser v. Gill Net Number One, 246 Cal. App. 2d 30, 54 Cal. Rptr. 568 (1966), found that the Klamath River Reservation in 1892 "for all practical purposes almost immediately lost its identity," [3] and concluded that the area where the [412 U.S. 481, 485] nets were seized was not Indian country. The court thereby disposed of petitioner's primary defense to the forfeiture. It did not reach other issues bearing upon the application of the California statutes to Indian country and the existence of Indian fishing rights there.

On appeal, the State Court of Appeal affirmed, holding that, inasmuch as the area in question had been opened for unrestricted homestead entry in 1892, the earlier reservation status of the land had terminated. 20 Cal. App. 3d 729, 97 Cal. Rptr. 894 (1971). The Supreme Court of California, one judge dissenting, denied a petition for hearing. See 20 Cal. App. 3d, at 735, 97 Cal. Rptr., at 898. We granted certiorari, 409 U.S. 1124 (1973), because the judgments of the state courts appeared to be in conflict with applicable decisions of this Court.

We now reverse. The reversal, of course, does not dispose of the underlying forfeiture issue. On remand, the questions relating to the existence of Mattz' fishing rights and to the applicability of California law notwithstanding reservation status will be addressed. We intimate no opinion on those issues.

I

While the current reservation status of the Klamath River Reservation turns primarily upon the effect of an 1892 Act of Congress which opened the reservation land for settlement, the meaning and effect of that Act cannot be determined without some reference to the Yurok Tribe and the history of the reservation between 1855 and 1892.

The Yurok Indians apparently resided in the area of the lower Klamath River for a substantial period before 1855 when the Klamath River Reservation was established. Little is known of their prior history. There are sources, however, that provide us with relatively [412 U.S. 481, 486] detailed information about the tribe, its culture, living conditions, and customs for the period following 1855. [4] That the tribe had inhabited the lower Klamath River well before 1855 is suggested by the name. Yurok means "down the river." The

names of the neighboring tribes, the Karok and the Modok, mean, respectively, "up the river" and "head of the river," and these appellations, as would be expected, coincide with the respective homelands. Powers 19; Kroeber 15. [5] [412 U.S. 481, 487]

By the Act of March 3, 1853, 10 Stat. 238, the President was "authorized to make five military reservations from the public domain in the State of California or the Territories of Utah and New Mexico bordering on said State, for Indian purposes." The Act of March 3, 1855, 10 Stat. 699, appropriated funds for "collecting, removing, and subsisting the Indians of California . . . on two additional military reservations, to be selected as heretofore . . . Provided, That the President may enlarge the quantity of reservations heretofore selected, equal to those hereby provided for." President Pierce then issued his order of November 16, 1855, specifying the Klamath River Reservation and stating, "Let the reservation be made, as proposed." Kappler 817.

The site was ideally selected for the Yuroks. They had lived in the area; the arable land, although limited, was "peculiarly adapted to the growth of vegetables," 1856 Report 238; and the river, which ran through a canyon its entire length, abounded in salmon and other fish. Ibid.; 1858 Report 286. [6]

In 1861 nearly all the arable lands on the Klamath River Reservation were destroyed by a freshet, and, upon recommendation of the local Indian agent, some of the Indians were removed to the Smith River Reservation, established for that purpose in 1862. Only a small number of Yuroks moved to the new reservation, however, and nearly all those who did move returned within a few [412 U.S. 481, 488] years to the Klamath River. Crichton v. Shelton, 33 I. D. 205, 208 (1904); Kappler 830; 1864 Report 122. The Smith River Reservation was then discontinued. Act of July 27, 1868, 15 Stat. 198, 221.

The total Yurok population on the Klamath River Reservation in the 1860's cannot be stated with precision. In 1852, based in part on a rough census made by a trader, it was estimated at 2,500. Kroeber 16-17. [7] [412 U.S. 481, 489] The effect of the 1861 flood cannot be firmly established; but it is clear that the tribe remained on the Klamath thereafter. [8] For later years, Kroeber estimated that the population in 1895 was 900, and, in 1910, 668. Kroeber 19. From this it would appear that the flood at least did not cause a dissolution of the tribe; on the contrary, the Yuroks continued to reside in the area through the turn of the century and beyond.

The Act of April 8, 1864, 13 Stat. 39, designated California as one Indian superintendency. It also recited that "there shall be set apart by the President, and at his discretion, not exceeding four tracts of land, within the limits of said state, to be retained by the United States for the purposes of Indian reservations." It further provided that "the several Indian reservations in California which shall not be retained . . . under . . . this act, shall . . . be surveyed into lots or parcels . . . and . . . be offered for sale at public outcry, and thence afterward shall be held subject to sale at private entry." Id., at 40.

At the time of the passage of the 1864 Act there were, apparently, three reservations in California: the Klamath River, the Mendocino, and the Smith River. It appears, also, that the President did not take immediate [412 U.S. 481, 490] action, upon the passage of the Act, to recognize reservations in California. It was not until 1868 that any formal recognition occurred, and then it was the Congress, rather than the President, that acted. In that year Congress discontinued the Smith River Reservation, 15 Stat. 221, and restored the Mendocino to the public lands. Id., at 223. No similar action was taken with respect to the Klamath River Reservation. Crichton v. Shelton, 33 I. D., at 209. Congress made appropriations for the Round Valley Reservation, 15 Stat. 221, and for it and the Hoopa Valley Reservation in 1869, 16 Stat. 37, although neither of these, apparently, had been established theretofore by formal Executive Order. [9]

The Klamath River Reservation, although not reestablished by Executive Order or specific congressional action, continued, certainly, in de facto existence. Yuroks remained on reservation land, and the Department of Indian Affairs regarded the Klamath River Reservation as "in a state of reservation" throughout the period from 1864 to 1891. [10] No steps were taken to sell the reservation, or parts thereof, under the 1864 Act. Indeed, in 1879, all trespassers there were removed by the military. In 1883 the Secretary of the Interior directed that allotments of land be made to the Indians on the reservation. [11] In February 1889, the Senate, by [412 U.S. 481, 491] resolution, directed the Secretary of the Interior "to inform the Senate what proceedings, if any, have been had in his Department relative to the survey and sale of the Klamath Indian reservation . . . in pursuance of the provisions of the act approved April 8, 1864." 20 Cong. Rec. 1818. In response, the Commissioner of Indian Affairs, by letter dated February 18, 1889, to the Secretary disclosed that no proceedings to this effect had been undertaken. [12] An Assistant Attorney General for the Department of the Interior expressed a similar view in an opinion dated January 20, 1891. [13] [412 U.S. 481, 492]

In 1888, in a forfeiture suit, the United States District Court for the Northern District of California concluded that the area within the Klamath River Reservation was not Indian country, within the meaning of Rev. Stat. 2133, prescribing the penalty for unlicensed trading in Indian country. The court concluded that the land composing the reservation was not retained or recognized as reservation land pursuant to the 1864 Act and that, therefore, it no longer constituted an Indian reservation. United States v. Forty-eight Pounds of Rising Star Tea, 35 F. 403 (ND Cal. 1888). This holding was expressly affirmed on appeal to a circuit judge. 38 F. 400 (CCND Cal. 1889). The Assistant Attorney General, in the opinion referred to above, conceded the probable correctness of the judgment but was not convinced that his own views were erroneous, and he could not assent to the reasoning of the court. He felt that the court's comments as to the abandoned status of the reservation "were dicta and not essential to the decision of the case before the court."

Crichton v. Shelton, 33 I. D., at 215.

Thus, as of 1891, it may be fair to say that the exact legal status of the Klamath River Reservation was obscure and uncertain. The petitioner in his brief here, [412 U.S. 481, 493] p. 14, states that the reservation "ceased to exist in 1876, at the latest."

Any question concerning the reservation's continuing legal existence, however, appears to have been effectively laid to rest by an Executive Order dated October 16, 1891, issued by President Benjamin Harrison. [14] By the specific terms of that order, the Hoopa Valley Reservation, which, as we already have noted, was located in 1864 and formally set apart in 1876, and which was situated about 50 miles upstream from the Klamath River's mouth, was extended so as to include all land, one mile in width on each side of the river, from "the present limits" of the Hoopa Valley Reservation to the Pacific Ocean. The Klamath River Reservation, or what had been the reservation, thus was made part of the Hoopa Valley Reservation, as extended.

The reason for incorporating the Klamath River Reservation in the Hoopa Valley Reservation is apparent. The 1864 Act had authorized the President to "set apart" no more than four tracts for Indian reservations in California. By 1876, and certainly by 1891, four reservations already had been so set apart. These were the Round Valley, referred to above, the Mission, [15] the Hoopa [412 U.S. 481, 494] Valley, and the Tule River. Kappler 830-831. Thus, recognition of a fifth reservation along the Klamath River was not permissible under the 1864 Act. Accordingly, the President turned to his authority under the Act to expand an existing, recognized reservation. He enlarged the Hoopa Valley Reservation to include what had been the Klamath River Reservation as well as an intervening riparian strip connecting the two tracts. [16] The President's continuing authority so to enlarge reservations and, specifically, the legality of the 1891 Executive Order, was affirmed by this Court in Donnelly v. United States, 228 U.S. 243, 255 -259 (1913), reh. denied, 228 U.S. 708 , and is not challenged here.

II

This general background as to the origin and development of the Klamath River Reservation is not contested by either party. The reservation's existence, pursuant to the Executive Order of 1891, is conceded. The present controversy relates to its termination subsequent to 1891, and turns primarily upon the effect of the Act of June 17, 1892, 27 Stat. 52, entitled "An act to provide for the [412 U.S. 481, 495] disposition and sale of lands known as the Klamath River Indian Reservation." This Act provided:

> "That all of the lands embraced in what was Klamath River Reservation in the State of California, as set apart and reserved under authority of law by an Executive order dated November sixteenth, eighteen hundred and fifty-five, are hereby declared to be subject to settlement, entry, and purchase under the laws of the United States granting homestead rights and authorizing the sale of mineral, stone, and timber lands: Provided, That any Indian now located upon said reservation may, at any time within one year from the passage of this act, apply to the Secretary of the Interior for an allotment . . . . And the Secretary of the Interior may reserve from settlement, entry, or purchase any tract or tracts of land upon which any village or settlement of Indians is now located, and may set apart the same for the permanent use and occupation of said village or settlement of Indians. . . . Provided further, That the proceeds arising from the sale of said lands shall constitute a fund to be used under the direction of the Secretary of the Interior for the maintenance and education of the Indians now residing on said lands and their children."

The respondent Director argues that this statute effected the termination of the Klamath River Reservation. The petitioner urges the contrary. It is our task, in light of the language and purpose of the Act, as well as of the historical background, outlined above, to determine the proper meaning of the Act and, consequently, the current status of the reservation. [412 U.S. 481, 496]

The respondent relies upon what he feels is significant language in the Act and upon references in the legislative history. He contends, "The fact that the lands were to be opened up for settlement and sale by homesteaders strongly militates against a continuation of such reservation status." Brief for Respondent 3.

We conclude, however, that this is a misreading of the effect of the allotment provisions in the 1892 Act. The meaning of those terms is to be ascertained from the overview of the earlier General Allotment Act of 1887, 24 Stat. 388. That Act permitted the President to make allotments of reservation lands to resident Indians and, with tribal consent, to sell surplus lands. Its policy was to continue the reservation system and the trust status of Indian lands, but to allot tracts to individual Indians for agriculture and grazing. When all the lands had been allotted and the trust expired, the reservation could be abolished. [17] Unallotted lands were made available to non-Indians with the purpose, in part, of promoting interaction between the races and of encouraging Indians to adopt white ways. See 6 of the General Allotment Act, 24 Stat. 390; United States Department of the Interior, Federal Indian Law 115-117, 127-129, 776-777 (1958). [18] [412 U.S. 481, 497] Under the 1887 Act, however, the President was not required to open reservation land for allotment; he merely had the discretion to do so.

In view of the discretionary nature of this presidential power, Congress occasionally enacted special legislation in order to assure that a particular reservation was in fact opened to allotment. [19] The 1892 Act was but one example of this. Its allotment provisions, which do not differ materially from those of the General Allotment Act of 1887, and which in fact refer to the earlier Act, do not,

alone, recite or even suggest that Congress intended thereby to terminate the Klamath River Reservation. See Seymour v. Superintendent, 368 U.S. 351, 357-358 (1962). Rather, allotment under the 1892 Act is completely consistent with continued reservation status. This Court unanimously observed, in an analogous setting in Seymour, id., at 356, "The Act did no more [in this respect] than open the way for non-Indian settlers to own land on the reservation in a manner which the Federal Government, acting as guardian and trustee for the Indians, regarded as beneficial to the development of its wards." See United States v. Celestine, 215 U.S. 278 (1909); United States v. Nice, 241 U.S. 591 (1916). See also Wilbur v. United States, 281 U.S. 206 (1930); Donnelly v. United States, 228 U.S. 243 (1913).

III

The respondent further urges, however, that his view of the effect of the 1892 Act is supported by the Act's reference [412 U.S. 481, 498] to "what was [the] Klamath River Reservation." According to the respondent, this reference, and other references in the legislative history, compel the conclusion that Congress intended to terminate the reservation in 1892.

The 1892 Act, to be sure, does refer to the Klamath River Reservation in the past tense. But this is not to be read as a clear indication of congressional purpose to terminate. Just a few weeks before the bill (H. R. 38, 52d Cong., 1st Sess.), which eventually became the Act, was reported out of committee on February 5, 1892, H. R. Rep. No. 161, 52d Cong., 1st Sess., the President had formally extended the Hoopa Valley Reservation to include the Klamath River Reservation. And only that portion of the extension which had been the Klamath River Reservation was the subject of the 1892 Act. The reference to the Klamath River Reservation in the past tense seems, then, merely to have been a natural, convenient, and shorthand way of identifying the land subject to allotment under the 1892 Act. [20] We do not believe [412 U.S. 481, 499] the reference can be read as indicating any clear purpose to terminate the reservation directly or by innuendo.

The respondent also points to numerous statements in the legislative history that, in his view, indicate that the reservation was to be terminated. We need not refer in detail to the cited passages in H. R. Rep. No. 161, supra, or to the debates on the bill, 23 Cong. Rec. 1598-1599, 3918-3919 (1892), for there is no challenge here to the view that the House was generally hostile to continued reservation status of the land in question. In our estimation, however, this very fact, in proper perspective, supports the petitioner and undermines the respondent's position.

As early as 1879, there were efforts in Congress to abolish the Klamath River Reservation. From that date to 1892 strong sentiment existed to this effect. But it does not appear that termination ever commanded majority support. The advocates of termination argued that the reservation, as of 1879, long had been abandoned; that the land was useless as a reservation; and that many white settlers had moved on to the land and their property should be protected. See H. R. Rep. No. 1354, 46th Cong., 2d Sess., 5 (1880). That whites had settled there is clear, but the view that no Indians remained after the flood of 1861 appears to have been a gross misconception on the part of those who sought termination. [21] [412 U.S. 481, 500]

The first bill providing for public entry and sale of the Klamath River Reservation was introduced in the Senate on May 28, 1879. S. Res. 34, 46th Cong., 1st Sess.; 9 Cong. Rec. 1651. The resolution referred to the reservation's having been "abandoned" in 1855 "and the tribe removed to another reservation established for its use." No action was taken on the bill, and another, of the same purport, was introduced on January 12, 1880, in the House. H. R. 3454, 46th Cong., 2d Sess.; 10 Cong. Rec. 286. This bill provided that the reservation "be, and the same is hereby, abolished," and authorized and directed the Secretary of the Interior to survey the lands and have them made subject to homestead and preemption entry and sale "the same as other public lands." It is clear from the report on this second bill, H. R. Rep. No. 1354, supra, at 1-5, that the establishment of the reservation in 1855 was viewed as a mistake and an injustice. According to the Report, the reservation had been abandoned after the 1861 freshet, and the Indians had moved to the Smith River and, later, the Hoopa Valley Reservations. White settlers had moved in and wished to exploit the lumber and soil of the area which, some said, "has no equal in California as a fruit and wine growing country." Id., at 5. Inasmuch as the reservation blocked access to the river, the resources of the area could not be developed. Although unmentioned in that Report, the Office of Indian Affairs opposed the bill. See H. R. Rep. No. 1148, 47th Cong., 1st Sess., 1 (1882). The bill as reported was recommitted and no further action was taken. 10 Cong. Rec. 3126 (1880).

An identical bill was introduced in the following Congress. H. R. 60, 47th Cong., 1st Sess.; 13 Cong. Rec. 90 (1881). The Commissioner of Indian Affairs opposed the bill as introduced, but stated that he would not opposed it if provision for prior allotments to the Indians was made. H. R. Rep. No. 1148, supra, at 2. The [412 U.S. 481, 501] Commissioner's proposed amendment was approved by the Committee, 13 Cong. Rec. 3414 (1882), but no action on the bill was taken by the full House.

In 1883 and 1884 three more bills were introduced. It is of interest to note that each acceded to the request of the Commissioner that provision be made for prior allotments to resident Indians. H. R. 112, 48th Cong., 1st Sess.; 15 Cong. Rec. 62 (1883); S. 813, 48th Cong., 1st Sess.; 15 Cong. Rec. 166 (1883); H. R. 7505, 48th Cong., 1st Sess.; 15 Cong. Rec. 5923 (1884). Each bill would have "abolished" the reservation and would have made the land subject to homestead and pre-emption entry. None of the bills was enacted, although passage must have been generally regarded as likely, for the Indian Bureau in 1883 began the work of allotment and survey, perhaps in anticipation of passage.

In 1885 two bills were introduced in the House. Each was substantially identical to those introduced in 1883 and 1884. H. R. 158 and H. R. 165, 49th Cong., 1st Sess.; 17 Cong. Rec. 370 (1885). No action was taken on either bill.

No further bills, apparently, were introduced until 1889. During the intervening period, however, the General Allotment Act of 1887, 24 Stat. 388, was passed and thereafter amended, 26 Stat. 794. The Rising Star Tea case, 35 F. 403, was also decided.

In 1889 a bill providing for the allotment of the Klamath River Reservation was introduced. The allotments, however, were to be made in a manner inconsistent with the General Allotment Act. H. R. 12104, 50th Cong., 2d Sess.; 20 Cong. Rec. 756 (1889). And after affirmance of the Rising Star Tea case by the circuit court, 38 F. 400 (1889), identical bills were introduced in the House and the Senate providing, without mention of allotment, that "all of the lands embraced in what was Klamath River Reservation . . . are hereby declared [412 U.S. 481, 502] to be subject to settlement, entry, and purchase" under the land laws. H. R. 113, 51st Cong., 1st Sess.; 21 Cong. Rec. 229 (1889); S. 2297, 51st Cong., 1st Sess.; 21 Cong. Rec. 855 (1890). The Indian Office opposed the bills, recommending that they be amended to provide for allotments to the Indians under the General Allotment Act, that surplus lands be restored to the public domain, and that the proceeds be held in trust for the Klamath River Indians. See Short v. United States, No. 102-63, pp. 44-45 (Report of Commissioner, Court of Claims, 1972). H. R. 113 was reported out of committee with certain amendments, including one to the effect that proceeds arising from the sale of lands were to be used for the "removal, maintenance, and education" of the resident Indians, the Hoopa Valley Reservation being considered the place of removal. Allotments to the Indians on the Klamath Reservation, however, were emphatically rejected. H. R. Rep. No. 1176, 51st Cong., 1st Sess., 2 (1890). The bill was so amended and passed the House. 21 Cong. Rec. 10701-10702 (1890). It died in the Senate.

In light of the passage of this last bill in the House and the presence of the Rising Star Tea opinions, the Indian Department moved to have the Klamath River Reservation land protected for the Indians residing there. The details of this effort, including the opinion of the Assistant Attorney General, referred to above, are outlined in the Commissioner's report in Short v. United States, supra, at 45-50. These efforts culminated in President Harrison's Executive Order of October 1891 expanding the Hoopa Valley Reservation to include the Klamath River Reservation.

It is against this background of repeated legislative efforts to terminate the reservation, and to avoid allotting reservation lands to the Indians, that the 1892 Act was introduced. H. R. 38, 52d Cong., 1st Sess.; 23 Cong. [412 U.S. 481, 503] Rec. 125 (1892). The bill provided for the settlement, entry, and purchase of the reservation land and specified that the proceeds should be used for the "removal, maintenance, and education" of the resident Indians. No allotments were provided for, as the Indians were "semicivilized, disinclined to labor, and have no conception of land values or desire to cultivate the soil." H. R. Rep. No. 161, 52d Cong., 1st Sess., 1 (1892). The House Committee on Indian Affairs amended the bill by changing the word "and" to "or" in the proviso relating to the use of proceeds. Id., at 2.

The bill passed the House without change. 23 Cong. Rec. 1598-1599 (1892). It was struck out in the Senate, however, and another version was substituted deleting reference to the removal of the Indians and providing that before public sale the land should be allotted to the Indians under the General Allotment Act of 1887, as amended. Id., at 3918-3919. This substitute measure had the support of the Interior Department. Id., at 3918. The Senate called for a conference with the House, id., at 3919, and the conference adopted the Senate version with amendments. Sen. Misc. Doc. No. 153, 52d Cong., 1st Sess. (1892). The bill was then passed and became the 1892 Act.

IV

Several conclusions may be drawn from this account. First, the respondent's reliance on the House Report and on comments made on the floor of the House is not well placed. Although the primary impetus for termination of the Klamath River Reservation had been with the House since 1871, this effort consistently had failed to accomplish the very objectives the respondent now seeks to achieve. Likewise, the House in 1892 failed to accomplish these objectives, for the Senate version, supported by the Interior Department, was substituted for that of [412 U.S. 481, 504] the House. The Senate version, ultimately enacted, provided for allotments to the Indians and for the proceeds of sales to be held in trust for the "maintenance and education," not the removal, of the Indians. The legislative history relied upon by the respondent does not support the view that the reservation was terminated; rather, by contrast with the bill as finally enacted, it compels the conclusion that efforts to terminate the reservation by denying allotments to the Indians failed completely.

A second conclusion is also inescapable. The presence of allotment provisions in the 1892 Act cannot be interpreted to mean that the reservation was to be terminated. This is apparent from the very language of 18 U.S.C. 1151, defining Indian country "notwithstanding the issuance of any patent" therein. More significantly, throughout the period from 1871-1892 numerous bills were introduced which expressly provided for the termination of the reservation and did so in unequivocal terms. Congress was fully aware of the means by which termination could be effected. But clear termination language was not employed in the 1892 Act. This being so, we are not inclined to infer an intent to terminate the reservation. [22] The Court stated in United States v. Celestine, 215 U.S., at 285, that "when Congress has [412 U.S. 481, 505] once established a reservation all tracts included within it remain a part of the reservation until separated therefrom by Congress." A congressional determination to terminate must be expressed on the face of the Act or be clear from the surrounding circumstances and legislative history. See Seymour v. Superintendent, 368 U.S. 351 (1962);

United States v. Nice, 241 U.S. 591 (1916). [23]

Finally, our conclusion that the 1892 Act did not terminate the Klamath River Reservation is reinforced by repeated recognition of the reservation status of the land after 1892 by the Department of the Interior and by Congress. In 1904 the Department, in Crichton v. Shelton, 33 I. D. 205, ruled that the 1892 Act reconfirmed the continued existence of the reservation. In 1932 the Department continued to recognize the Klamath River Reservation, albeit as part of the Hoopa Valley Reservation, [24] and it continues to do so today. And Congress has recognized the reservation's continued existence by extending the period of trust allotments for this very reservation by the 1942 Act, described above, 25 U.S.C. 348a, and by restoring to tribal ownership certain vacant and undisposed-of ceded lands in the reservation by the 1958 Act, supra. [25] [412 U.S. 481, 506]

We conclude that the Klamath River Reservation was not terminated by the Act of June 17, 1892, and that the land within the boundaries of the reservation is still Indian country, within the meaning of 18 U.S.C. 1151.

The judgment of the Court of Appeal is reversed, and the case is remanded for further proceedings.

It is so ordered.

Footnotes

[Footnote 1] Title 18 U.S.C. 1151 defines the term "Indian country" to include, inter alia, "all lands within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent . . . ." Title 18 U.S.C. 1162 (a) provides that, with respect to Indian country within California, that State "shall have jurisdiction over offenses committed by or against Indians in the areas of Indian country . . . to the same extent that such State . . . has jurisdiction over offenses committed elsewhere within the State . . ., and the criminal laws of such State . . . shall have the same force and effect within such Indian country as they have elsewhere within the State . . . ." Section 1162 (b) provides, however, "Nothing in this section . . . shall deprive any Indian or any Indian tribe, band, or community of any right, privilege, or immunity afforded under Federal treaty, agreement, or statute with respect to hunting, trapping, or fishing or the control, licensing, or regulation thereof." Finally, the California Fish & Game Code 12300 (Supp. 1973), reads: "Irrespective of any other provision of law, the provisions of this code are not applicable to California Indians whose names are inscribed upon the tribal rolls, while on the reservation of such tribe and under those circumstances in this State where the code was not applicable to them immediately prior to the effective date of Public Law 280, Chapter 505, First Session, 1953, 83d Congress of the United States [18 U.S.C. 1162]."

[Footnote 2] The Executive Order is reproduced in 1 C. Kappler, Indian Affairs - Laws and Treaties 817 (1904) (hereinafter Kappler). At the end of this opinion, as the Appendix, is a map of the Klamath River Reservation. The area described in the text is indicated as the "Old Klamath River Reservation."

[Footnote 3] See Pet. for Cert., App. B 4-5.

[Footnote 4] A. Kroeber, Handbook of the Indians of California, cc. 1-4, published as Bulletin 78, Bureau of American Ethnology 1-97 (1925) (hereinafter Kroeber); S. Powers, Tribes of California, cc. 4 and 5, published as 3 Contributions to North American Ethnology 44-64 (1877) (hereinafter Powers). Various Annual Reports of the Commissioner of Indian Affairs provide further information; see, for example, the 1856 Report of the Commissioner of Indian Affairs 249-250 (hereinafter Report).

[Footnote 5] Kroeber, in the preface to his work, suggests that the factual material contained in Powers' manuscript is subject to some criticism. Kroeber's reference to Powers deserves reproduction in full here: "I should not close without expressing my sincere appreciation of my one predecessor in this field, the late Stephen Powers, well known for his classic `Tribes of California,' one of the most remarkable reports ever printed by any government. Powers was a journalist by profession and it is true that his ethnology is often of the crudest. Probably the majority of his statements are inaccurate, many are misleading, and a very fair proportion are without any foundation or positively erroneous. He possessed, however, an astoundingly quick and vivid sympathy, a power of observation as keen as it was untrained, and an invariably spirited gift of portrayal that rises at times into the realm of the sheerly fascinating. Anthropologically his great service lies in the fact that with all the looseness of his data and method he was able to a greater degree than anyone before or after him to seize and fix the salient qualities of the mentality of the people he described. The ethnologist may therefore by turns writhe and smile as he fingers Powers's pages, but for the broad outlines of the culture of the California Indian, for its values with all their high lights and shadows, he can still do no better than consult the book. With [412 U.S. 481, 487] all its flimsy texture and slovenly edges, it will always remain the best introduction to the subject." Kroeber ix.

[Footnote 6] Of this area one agent stated, "No place can be found so well adapted to these Indians, and to which they themselves are so well adapted, as this very spot. No possessions of the Government can be better spared to them. No territory offers more to these Indians and very little territory offers less to the white man. The issue of their removal seems to disappear." 1885 Report 266.

[Footnote 7] It is interesting to note that Powers believed the Yurok population at one time far exceeded 2,500 and perhaps numbered over 5,000. This was, as Powers stated, "before the whites had come among them, bringing their corruptions and their maladies . . . ." Powers 59. The renowned Major John Wesley Powell, who was then in charge of the United States Geographical and Geological Survey of the Rocky Mountain Region, Department of the Interior, placed little faith in Powers' figures and requested that he modify his estimates. Powers expressed his displeasure at this in a letter to Major Powell stating, in characteristic fashion, "I have the greatest respect for your views and beliefs, and, with your rich fund of personal experience and observation; if you desire to cut out the paragraph and insert one under your own signature, in brackets, or something of that kind, I will submit without a murmur, if you will add this remark, as quoted from myself, to wit: `I desire simply to ask the reader to remember that Major Powell has been accustomed to the vast sterile wastes of the interior of the continent, and has not visited the rich forests and teeming rivers of California.' But I should greatly prefer that you would simply disavow the estimates, and throw the whole responsibility upon me. "This permission I give you; but I have waded too many rivers and climbed too many mountains to abate one jot of my opinions or beliefs for any carpet-knight who yields a compiling-pen in the office of the - or - . If any critic, sitting in his comfortable parlor in New York, and reading about the sparse aboriginal populations of the cold forests of the Atlantic States, can overthrow any of my conclusions with a dash of his pen, what is the use of the book at all? As Luther said, at the Diet of Worms, `Here I stand; I cannot do otherwise.' "I beg you, my dear major, not to consider anything above [412 U.S. 481, 489] written as in the slightest degree disrespectful to yourself; such is the farthest remove from my thoughts." Powers 2-3. Powers' estimates were not altered, and the above-quoted letter was placed sympathetically by Major Powell in the introductory section of Powers' published study.

[Footnote 8] 1864 Report 122; Opinion dated Jan. 20, 1891, of the Assistant Attorney General for the Department of the Interior, quoted in Crichton v. Shelton, 33 I. D. 205, 210 (1904); Kroeber 19. Another source estimates that in 1871 the Indian population along the Klamath was 2,500. Report of D. H. Lowry, Indian Agent, Sept. 1, 1871, noted in Short v. United States, No. 102-63, p. 35 (Report of Commissioner, Court of Claims, 1972).

[Footnote 9] The Hoopa Valley Reservation was located August 21, 1864, but formally set apart for Indian purposes, as authorized by the 1864 Act, by President Grant only by Executive Order dated June 23, 1876. Kappler 815. See Appendix map. The area is that described as the "Original Hoopa Valley Reservation."

[Footnote 10] Letter dated Apr. 4, 1888, from the Commissioner of Indian Affairs to the Secretary of the Interior, quoted in Crichton v. Shelton, 33 I. D., at 211.

[Footnote 11] The allotments, however, were postponed "on account of the discovery of gross errors in the public surveys." Ibid.; 1885 Report XLVIII.

[Footnote 12] "In response to said resolution, I have to state that I am unable to discover from the records or correspondence of this office that any proceedings were ever had or contemplated by this Department for the survey and sale of said reservation under the provisions of the act aforesaid; on the contrary, it appears to have been the declared purpose and intention of the superintendent of Indian affairs for California, who was charged with the selection of the four reservations to be retained under said act, either to extend the Hoopa Valley Reservation (one of the reservations selected under the act), so as to include the Klamath River Reservation, or else keep it as a separate independent reservation, with a station or subagency there, to be under control of the agent at the Hoopa Valley Reservation, and the lands have been held in a state of reservation from that day to this (Ex. Doc. 140, pp. 1, 2)." Quoted in Crichton v. Shelton, 33 I. D., at 212.

[Footnote 13] "Pushing aside all technicalities of construction, can any one doubt that for all practical purposes the tract in question constitutes an Indian reservation? Surely, it has all the essential characteristics of such a reservation; was regularly established by the proper authority; has been for years and is so occupied by Indians now, and is regarded and treated as such reservation by the executive branch of the government, to which has been committed the management of Indian affairs and the administration of the public land system . . . . It is said, however, that the Klamath River reservation was abolished by section three of the act of 1864. Is this so? . . . . . "In the present instance, the Indians have lived upon the described tract and made it their home from time immemorial; and [412 U.S. 481, 492] it was regularly set apart as such by the constituted authorities, and dedicated to that purpose with all the solemnities known to the law, thus adding official sanction to a right of occupation already in existence. It seems to me something more than a mere implication, arising from a rigid and technical construction of an act of Congress, is required to show that it was the intention of that body to deprive these Indians of their right of occupancy of said lands, without consultation with them or their assent. And an implication to that effect is all, I think that can be made out of that portion of the third section of the act of 1864 which is supposed to be applicable." Quoted in Crichton v. Shelton, 33 I. D., at 212-213.

[Footnote 14] "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 April 8., 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." Kappler 815.

[Footnote 15] Kappler 819-824. It is noteworthy that the boundaries of the Mission Reservation were altered repeatedly between 1870 and 1875, [412 U.S. 481, 494] and even thereafter. These actions were taken under the President's continuing authority to set apart and add to or diminish the four reservations authorized under the 1864 Act. Donnelly v. United States, 228 U.S. 243 and 708 (1913). In its final form, the Mission Reservation consisted of no less than 19 different and noncontiguous tracts. Kappler 819-824; Crichton v. Shelton, 33 I. D., at 209-210.

[Footnote 16] See Appendix map. The strip of land between the Hoopa Valley Reservation and the Klamath River Reservation is referred to there as the "Connecting Strip." Under the 1891 Executive Order the Hoopa Valley Reservation was extended to encompass all three areas indicated on the map. The connecting strip and the old Klamath River Reservation frequently are referred to as the Hoopa Valley Extension.

[Footnote 17] The trust period on allotments to Indians on the Klamath River Reservation expired in 1919, but was later extended by Congress by the Act of Dec. 24, 1942, 56 Stat. 1081, 25 U.S.C. 348a. See S. Rep. No. 1714, 77th Cong., 2d Sess. (1942). And in 1958 Congress restored to tribal ownership vacant and undisposed-of ceded lands on various reservations, including 159.57 acres on the Klamath River Reservation. Pub. L. 85-420, 72 Stat. 121.

[Footnote 18] For an extended treatment of allotment policy, see D. Otis, History of the Allotment Policy, in Readjustment of Indian Affairs, Hearings on H. R. 7902 Before the House Committee on Indian Affairs, 73d Cong., 2d Sess., 428-440 (1934). The policy of allotment and sale of surplus reservation land was repudiated in 1934 by the Indian Reorganization Act, 48 Stat. 984, now amended and codified as 25 U.S.C. 461 et seq.

[Footnote 19] See, for example, the Act of Mar. 2, 1889, 25 Stat. 888 (Sioux Reservations), and United States v. Nice, 241 U.S. 591 (1916); the Act of Mar. 22, 1906, 34 Stat. 80 (Colville Reservation), and Seymour v. Superintendent, 368 U.S. 351 (1962); the Act of May 29, 1908, 35 Stat. 460 (Cheyenne River and Standing Rock Reservations), and United States ex rel. Condon v. Erickson, 478 F.2d 684 (CA8 1973), aff'g 344 F. Supp. 777 (SD 1972).

[Footnote 20] The respondent argues, however, that Congress, perhaps unacquainted with the Executive Order of October 1891, intended this language to convey the view expressed in the House Report, H. R. Rep. No. 161. supra, 23 Cong. Rec. 1598-1599 (1892), that the Klamath River Reservation had long been abandoned and, in fact and in law, had already been terminated. It is clear from the text, infra, that there were efforts in certain quarters of the House to terminate the reservation and open it for white settlement. See Short v. United States, supra, n. 8, at 34-52. While the respondent's interpretation of the phrase is plausible, it is no less plausible to conclude, in light of the repeated and unsuccessful efforts by the House to terminate the reservation, that the Senate proponents of the legislation were not inclined to make their cause (of requiring allotments) less attractive to the House by amending the bill to refer to the "former Klamath River Reservation, now part of the Hoopa Valley Reservation" rather than "what was [the] Klamath River Reservation."

[Footnote 21] The Department of the Interior took issue with the Committee's population estimates. H. R. Rep. No. 1148, 47th Cong., 1st Sess., 1-3 (1882). In a letter transmitted to the Committee on Indian Affairs in 1881, an infantry lieutenant, acting as Indian Agent, suggested that the Committee's population estimates were "gleaned principally from civilians, who are, I believe, somewhat inclined to lessen the number, thinking doubtlessly that the smaller the number the greater the likelihood of its being thrown open to settlers." Id., at 2.

[Footnote 22] Congress has used clear language of express termination when that result is desired. See, for example, 15 Stat. 221 (1868) ("the Smith River reservation is hereby discontinued"); 27 Stat. 63 (1892) (adopted just two weeks after the 1892 Act with which this case is concerned, providing that the North Half of the Colville Indian Reservation, "the same being a portion of the Colville Indian Reservation . . . be, and is hereby, vacated and restored to the public domain"), and Seymour v. Superintendent, 368 U.S., at 354; 33 Stat. 218 (1904) ("the reservation lines of the said Ponca and Otoe and Missouria Indian reservations be, and the same are hereby, abolished").

[Footnote 23] In United States ex rel. Condon v. Erickson, 478 F.2d 684 (1973), the United States Court of Appeals for the Eighth Circuit reached a similar conclusion in a case presenting issues not unlike those before us. The court concluded, id., at 689, that "a holding favoring federal jurisdiction is required unless Congress has expressly or by clear implication diminished the boundaries of the reservation opened to settlement" (emphasis in original).

[Footnote 24] Hearings before a Subcommittee of the Senate Committee on Indian Affairs, Survey of Conditions of the Indians in the United States, pt. 29, California, 72d Cong., 1st Sess., 15532 (1934).

[Footnote 25] Although subsequent legislation usually is not entitled to much weight in construing earlier statutes, United States v.

Southwestern Cable Co., 392 U.S. 157, 170 (1968), it is not always without significance. See Seymour v. Superintendent, 368 U.S., at 356 -357. [412 U.S. 481, 507]

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C. 1993 DOI Solicitors Opinion: Fishing Rights of the Yurok and Hoopa Valley Tribes

United States Department of the Interior

OFFICE OF THE SOLICITOR
Washington, D.C. 20240

October 4, 1993

M-36979

Memorandum

To: Secretary

From: Solicitor

Subject: Fishing Rights of the Yurok and Hoopa Valley Tribes

You have asked for an opinion concerning the rights of the Yurok and Hoopa Valley Indian Tribes to an allocation or quantified share of the Klamath River Basin anadromous fishery resources. The request arises from the need of this Department for definitive legal guidance in setting yearly tribal harvest allocations. The Department of Commerce, although it does not have authority to regulate in-river Indian fisheries, has also requested a legal determination from this Department on the Tribes' rights because of the impact on decisions that the Commerce Department must make concerning[1] ocean fisheries that harvest Klamath basin fishery resources.

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[1] By memorandum dated September 16, 1991, the Assistant Secretary - Indian Affairs, originally requested this opinion. On March 10, 1993, in a letter to the Secretary of Commerce, you stated the position that in the absence of a formal legal determination, the most reasonable and prudent course for the United States, as trustee for the Tribes, would be to set aside at least a 50 percent share of the harvestable surplus of Klamath River stocks for the Indian in-river fishery. As a temporary resolution of differences between your recommendation and concerns expressed by the Department of Commerce, which has jurisdiction over ocean fisheries, this Department set the in-river tribal harvest ceiling in 1993 at 18,500, and both Departments agreed that additional conservation measures for 1993 were appropriate. The Secretary of Commerce directed a 1993 ocean fishing season that conformed to the in-river tribal harvest constraint, and provided a natural spawner escapement floor of 38,000 for 1993. See "Commerce and Interior Departments Set Chinook Salmon Management Measures," April 29, 1993 (U.S. Department of Commerce Press Release NOAA 93-R117); Ocean Salmon Fisheries Off the Coasts of Washington, Oregon, and California, 58 Fed. Reg. 26922 (May 6, 1993) (emergency interim rule); Ocean Salmon Fisheries Off the Coasts of Washington, Oregon, and California, 58 Fed. Reg. 31664 (June 4, 1993) (amendment to emergency interim rule).

During the past twenty-two years, numerous court decisions have confirmed that when the United States set aside in-. the nineteenth century what are today the Yurok and Hoopa Valley Indian Reservations along the Klamath and Trinity Rivers, it reserved for the Indians federally protected fishing rights to the fishery resource in the rivers running through the reservations.[2] This Department, through legal opinions and policy statements, also has acknowledged the fishing rights of the Yurok and Hoopa Valley Indians, and the Department's corresponding obligations.[3] None

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[2] See, e.g., United States v. Eberhardt, 789 F.2d 1354, 1359 (9th Cir. 1986); Pacific Coast Federation of Fishermen's Ass'n v. Secretary of Commerce, 494 F. Supp. 626, 632 (N.D. Cal. 1980); Mattz v. Superior Court, 46 Cal. 3d 355, 758 P.2d 606 (1988); People v. McCovey, 36 Cal. 3d 517, 685 P.2d 687, cert. denied, 469 U.S. 1062 (1984); Arnett v. 5 Gill Nets, 48 Cal. App. 3d 454, 121 Cal. Rptr. 906 (1975), cert. denied, 425 U.S. 907 (1976); Donahue v. California Justice Court, 15 Cal. App. 3d 557, 93 Cal. Rptr. 310 (1971).

[3] The Solicitor's office, through the Associate Solicitor, Division of Indian Affairs, has issued a variety of legal opinions since 1976 concerning the nature, extent, and scope of federal reserved Indian fishing rights in the Klamath River basin. See, e.g., Memorandum from Acting Associate Solicitor, Indian Affairs, to Director, Office of Trust Responsibilities (November 4, 1976) (regulation of on-reservation Indian fishing on the Klamath River); Memorandum from Associate Solicitor, Division of Indian Affairs, to Assistant Secretary., Indian Affairs (May 4, 1978) (rights of the Klamath and Hoopa Reservation Indians to fish for commercial purposes); Memorandum from Associate Solicitor, Division of Indian Affairs, to Assistant Secretary - Indian Affairs (March 14, 1979) (Indian legal considerations with respect to Trinity River diversions at Lewiston Dam).

In addition, as a matter of policy this Department has acknowledged the existence of Indian fishing rights on the Klamath and Trinity Rivers and the Department's corresponding obligations. See, e.g., Letter from Assistant Secretary - Indian Affairs to Secretary of Commerce, May 19, 1992; Letter from Secretary of the Interior to Acting Chairperson, Yurok Transition Team, August 23, 1991; Letter from Assistant Secretary - Indian Affairs to Secretary of Commerce, July 25, 1991; Letter from Secretary of the Interior to Secretary of Commerce, May 1, 1991; Trinity River Flows Decision (May 8, 1991) (Decision of the Secretary of the Interior) (adopting recommendation for 1992 through 1996 flow releases, based in part on Department's trust responsibility to the Hoopa Valley and Yurok Tribes); Secretarial Issue Document on Trinity River Fishery Mitigation (approved by Secretary, January 14, 1981) (flow releases of water in the Trinity River); Memorandum from Assistant Secretary for Fish and

of the court decisions, however, have decided whether the Tribes' fishing rights entitle them to a specific allocation or quantified share of the Klamath and Trinity River fishery resources.

I conclude that the fishing rights reserved for the Tribes include the right to harvest quantities of fish on their reservations sufficient to support a moderate standard of living. I also conclude that the Tribes' entitlement is limited to fifty percent of the harvest in any given year unless varied by agreement of the parties.

I have reached my conclusions by examining the history of the reservations, the Indians' dependence on the Klamath and Trinity River fisheries, the United States' awareness of that dependence, and the federal intent to create the reservations in order to protect the Indians' ability to maintain a way of life, which included reliance on the fisheries. I have conducted this examination in the context of the now-substantial body of case law examining the history of the present-day Hoopa Valley and Yurok reservations and confirming the reservation Indians' fishing rights,[4] and the variety of cases involving other tribes' reserved fishing rights.

I. BACKGROUND

A. The Fishery Resource

The Klamath River originates in Oregon and flows southwesterly into California to its juncture with the Trinity River. The lower 40-50 miles of the Klamath River lie within the Yurok Reservation. From the point of confluence, the Klamath River flows northwesterly to discharge into the Pacific Ocean. The lower 12 miles of the Trinity River flow through the Hoopa Valley

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Wildlife and Parks to Assistant Secretary for Land and Water Resources, October 24, 1979.

The Department of Commerce also has recognized that the tribes of the Klamath River basin have federal reserved fishing rights. Letter from Director, National Marine Fisheries Service, Department of Commerce, to Assistant Secretary - Indian Affairs, Department of the Interior, October 16, 1992.

[4] In addition to the cases cited in footnote 2, see Crichton v. Shelton, 33 I.D. 205 (1904) (history of Klamath River and Hoopa Valley Reservations); Partitioning Certain Reservation Lands Between the Hoopa Valley Tribe and the Yurok Indians, S. Rep. No. 564, 100th Cong., 2d Sess. 2-9 (1988) (same); and Partitioning Certain Reservation Lands Between the Hoopa Valley Tribe and the Yurok Indians, H. Rep. No. 938, pt. 1, 100th Cong., 2d Sess. 8-15 (1988) (same).

Reservation, before discharging into the Klamath River near the boundary between the Hoopa and Yurok Reservations.

The Klamath and Trinity Rivers provide habitat for runs of salmon and other anadromous fish. Anadromous fish hatch in fresh water, migrate to the ocean, and complete their life cycles by returning to their freshwater places of origin to spawn. Because of the regular habits of the fish, it is possible to some extent to forecast stock abundance and to control harvesting throughout their range in order to maintain appropriate spawner escapement numbers for conservation and regeneration. However, different species have different life cycles, and different stocks intermix in the ocean before sorting themselves out and returning to the rivers of their origin. See generally Washington v. Washington State Commercial Passenger Fishing Vessel Ass'n, 443 U.S. 658, 662-64 (1979) (discussion of anadromous fish). As such, it is more difficult to regulate the numbers of particular stocks harvested in mixed-stock ocean fisheries, than to regulate stock-specific harvests by ocean terminal or in-river fisheries.

B. The Reservations[5]

1. Klamath River Reservation

The reservations which today constitute the Hoopa Valley and Yurok Reservations originally were created by executive orders issued pursuant to statutes authorizing the President to create Indian reservations in California. The Act of March 3, 1853, authorized the President "to make . . . reservations . . . in the State of California . . . for Indian purposes." 10 Stat. 226 238. On November 10, 1855, the Commissioner of Indian Affairs submitted a report to the Secretary of the Interior, recommending a reservation that would encompass "a strip of territory one mile in width on each side of the (Klamath) river, for a distance of 20 miles." I Kappler, Indian Affairs Laws and Treaties 816 (1904) ("Kappler"). The Commissioner's report noted that the proposed reservation had been selected pursuant to the Secretary's instructions "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.'" Id. The report also noted in particular the representations of the federal Indian officials in California

[5] Attached as Appendix A is a copy of a map of the former Hoopa Valley Reservation appended to the Supreme Court's decision in Mattz v. Arnett, 412 U.S. 481 (1973). The map pre-dates the more recent partition of the reservation but generally speaking, the Hoopa Valley Reservation today includes what the map refers to as the "Original Hoopa Valley Reservation," and the Yurok Reservation today encompasses the "Old Klamath River Reservation" and the "Connecting Strip" shown on the map.

"that the selection at the mouth of the Klamath River is a judicious and proper one." Id. On November 12, 1855, the Secretary of the Interior recommended the proposed reservation to the President, and four days later President Pierce signed the proclamation establishing the Klamath Reservation. Id. at 817.[6] The lands were mostly occupied by Yurok Indians, and the reservation encompassed what is today the lower portion of the Yurok Reservation.

2. Original Hoopa Valley Reservation

The original Hoopa Valley Reservation is a 12-mile square extending six miles on each side of the Trinity River. The Superintendent of Indian Affairs for California located and proclaimed it in 1864, pursuant to legislation enacted that same year. The legislation authorized the President to set apart up to four tracts of land in California "for the purposes of Indian reservations, which shall be of suitable extent for the accommodation of the Indians of said state, and shall be located as remote from white settlements as may be found practicable, having due regard to their adaptation to the purposes for which they are intended." Act of April 8, 1864, § 2, 13 Stat. 39, 40 ("1864 Act"); see I Kappler at 815; see also Donnelly v. United States, 228 U.S. 243, 255-57 (1913); Mattz v. Superior Court, 46 Cal. 3d 355, 758 P.2d 606, 610 (1988). The reservation was mostly inhabited by Hoopa Indians. Although Congress itself thereafter recognized the existence of the Hoopa Valley Reservation as early as 1868, Donnelly, 228 U.S. at 257, it was not until 1876 that President Grant issued an executive order formally setting aside the reservation "for Indian purposes, as one of the Indian reservations authorized . . . by Act of Congress approved April 8, 1864." I Kappler at 815.

3. Extended Hoopa Valley Reservation

Between 1864 and 1891, the legal status of the Klamath River Reservation as an Indian reservation came into doubt. Although the Klamath Reservation had been created pursuant to the 1853 statute, the subsequent 1864 Act limited to four the number of reservations in California, and contemplated the disposal of reservations not retained under authority of the 1864 Act. See 1864 Act, § 3, 13 Stat. at 40. By 1891, the Round Valley, Mission, Hoopa Valley, and Tule River reservations had been set apart pursuant to the 1864 Act. Mattz v. Arnett, 412 U.S. at 493-94. Still, the Department of the Interior continued to recognize that the Klamath Reservation was critical for protecting the Indians who lived there and for protecting their access to the fishery, and continued to regard it as a

[6] See also Mattz v. Arnett, 412 U.S 481, 487 (1973); Mattz v. Superior Court, 46 Cal. 3d 355, 758 P.2d 606, 610 (1988).

reservation throughout the period from 1864 to 1891. As the Court noted in Mattz v. Arnett, the reservation "continued, certainly, in de facto existence," during that time. Id. at 490.

Finally, in 1891, in order to eliminate doubt, to expand the existing reservation, and to better protect the Indians living there from encroachment by non-Indian fishermen, President Harrison issued an executive order under the authority of the 1864 Act. The order extended the Hoopa Reservation along the Klamath River from the mouth of the Trinity River to the ocean, thereby encompassing and including the Hoopa Valley Reservation, the original Klamath River Reservation, and the connecting strip in between. Thereafter, the original Klamath Reservation and connecting strip have been referred to jointly as the "Extension" or the "Addition," because they were added to the Hoopa Valley Reservation in the 1891 Executive Order. See I Kappler at 815 (Executive Order, October 16, 1891); Mattz v. Arnett, 412 U.S. at 493-4; Donnelly, 228 U.S. at 255-259. The validity of the 1891 addition and the continuing existence of the area included within the original Klamath Reservation were subsequently upheld by the Supreme Court in the Donnelly and Mattz v. Arnett decisions.[7]

4. Partition into the Yurok and Hoopa Valley Reservations

In 1988, Congress enacted the Hoopa-Yurok Settlement Act, which partitioned the extended Hoopa Valley Reservation into the present Hoopa Valley Reservation, consisting of the original 12-mile square bisected by the Trinity River and established under the 1864 Act, and the Yurok Reservation, consisting of the area along the Klamath River included in the 1891 Extension (excluding Resighini Rancheria).[8] Hoopa-Yurok Settlement Act of 1988, Pub.

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[7] In Donnelly v. United States, 228 U.S. 243, modified and rehearing denied, 228 U.S. 708 (1913), the Court affirmed the federal conviction of the defendant for murdering an Indian within the boundaries of the 1891 Extension. The Court concluded that the Extension had been lawfully established and constituted Indian country. In Mattz v. Arnett, 412 U.S. 481 (1973) the Court rejected California's argument that the Act of June 17, 1892, 27 Stat. 52, opening the original Klamath Reservation to non-Indian settlement, had diminished the boundaries of the extended reservation. The Court struck down a state forfeiture proceeding against gill nets confiscated from a Yurok Indian, holding that the act opening the reservation to settlement did not alter the boundaries of the extended Hoopa Valley Reservation.

[8] For the history and background of the 1988 Settlement Act, see S. Rep. No. 564 and H. Rep. No. 938, pt. 1, supra note 4. You asked for an opinion addressing the rights of the Hoopa and

L. No. 100-580, 102 Stat. 2924, 25 U.S.C.A. § 1300i-1300i-11 (Supp. 1993).

The congressional partition "recognized and established" each area as a distinct reservation, and declared that "[t]he unallotted trust land and assets" of each reservation would thereafter be held in trust by the United States for the benefit of the Hoopa Valley and Yurok Tribes, respectively. 25 U.S.C.A. § 1300i-1(b)&(c). Both the House and Senate committee reports accompanying the legislation make specific mention of the Yurok Tribe's interest in the fishery. See S. Rep. No. 564, supra note 4, at 2, 14; H. Rep. No. 938, pt. 1, supra note 4, at 20.[9]

Although there are now two distinct reservations for the Yurok and Hoopa Valley Tribes, the events most relevant to your inquiry occurred prior to the 1988 partition. For purposes of this opinion, the various reservation areas will be referred to as the original Klamath River Reservation, the Hoopa Valley Reservation (original 12-mile square), and the extended Hoopa Valley Reservation (the post-1891 reservation, consisting of the Hoopa Square, the original Klamath River Reservation, and the connecting strip).

Yurok Tribes. We do not address the fishing rights of the Coast Indian Community of the Resighini Rancheria or other tribes in the Klamath River basin in California.

[9] Both House and Senate committee reports refer to the substantial economic value of the Yurok Reservation fishery. The Senate Committee Report on the Settlement Act states:

> Tribal revenue derived from the "Addition" [now the Yurok Reservation] recently has totalled only about $175,000 annually. However, the record shows that individual Indian earnings derived from the tribal commercial fishing right appurtenant to the "Addition" is also in excess of $1,000,000 a year. The Committee also notes that because of the cooperative efforts of the Hoopa Valley Tribe and other management agencies to improve the Klamath River system, and because the Fisheries Harvest Allocation Agreement apportioning an increased share of the allowable harvest to the Indian fishery, the tribal revenue potential from the "Addition" is substantial.

S. Rep. No. 564, supra note 4, at 14-15; see H. Rep. No. 938, pt. 1, supra note 4, at 20. See also Central Valley Improvement Act, Pub. L. No. 102-575, Title XXXIV, § 3406(b) (23), 106 Stat. 4706, 4720 (1992) (reference to federal trust responsibility to protect the fishery resources of the Hoopa Valley Tribe).

C. Historic Dependence of the Yurok and Hoopa Indians on the Salmon Fishery

Since prehistoric times, the fishery resources of the Klamath and Trinity Rivers have been a mainstay of the life and culture of the Indians residing there.[10] See Mattz v. Arnett, 412 U.S. 481, 487, (1973); Blake v. Arnett, 663 F.2d 906, 909 (9th Cir. 1981). One-estimate is that prior to settlement along the coast by non-Indians, the Indians in the Klamath River drainage "consumed in excess of 2 million pounds . . . of salmon annually from runs estimated to have exceeded 500,000 fish." U.S. Department of the Interior, Environmental Impact Statement - Indian Fishing Regulations 2 (Hoopa Valley Reservation, California) (April 1985).

The Indians' heavy dependence on the salmon fishery for their livelihood has been well-documented.[11] "The salmon fishery permitted the [Klamath-Trinity basin] tribes to develop a quality of life which is considered high among native populations." AITS

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[10] The Indians' reliance on fishing continues. As the court noted in United States v. Wilson:

> To modern Indians of the [pre-1988] Hoopa Valley Reservation, fishing remains a way of life, not only consistent with traditional Indian customs, but also as an eminently practical means of survival in an area which lacks the broad industrial or commercial base which is required to provide its population, Indian or otherwise, with predictable, full-time employment and income adequate to provide sufficient quantities and qualities of the necessities of life.

611 F. Supp. 813, 818 n.5 (N.D. Cal. 1985) (citing National Park Service, Environmental Assessment: Management Options for the Redwood Creek Corridor. Redwood National Park (1975)), rev'd and remanded on other grounds sub nom., United States v. Eberhardt, 789 F.2d 1354 (9th Cir. 1986).

[11] See, e.g., Anthropological Study of the Hupa, Yurok, and Karok Indian Tribes of Northwestern California: Final Report 10, 22, 67-68, 101, 107 (American Indian Technical Services, Inc. January 1982) (Prepared for the U.S. Department of the Interior) ("AITS (1982)"); Edwin C. Bearss, History Resource Study - Hoopa-Yurok Fisheries Suit - Hoopa Valley Reservation 60 (U.S. Department of the Interior 1981); see also Ethnohistorical Data on the Klamath-Trinity Tribes of Northwestern California With Particular Emphasis on the Yurok (Klamath) Indians of the Lower Klamath Area (American Indian Technical Services, Inc. June 1984) (prepared for the U.S. Department of the Interior) ("AITS (1984)").

(1982) at 10. The salmon resource was the primary dietary staple of the tribes, and was the center of their subsistence economy. As the court noted in Blake v. Arnett, 663 F.2d at 909, the fishery was "not much less necessary to the existence of the [Yurok] Indians than the atmosphere they breathed") (quoting United States v. Winans, 198 U.S. 371, 381 (1905)).

During the pre-contact period, the salmon fishery also held significant commercial and economic value in Yurok and Hoopa culture and economy. Both tribes appear to have held firm concepts of property rights associated with the fishery. Fishing rights were considered personal property and part of an individual's wealth. Rights to fishing sites could be owned privately, fractionally, or communally, and could be inherited, sold, or transferred to pay debts.[12] Ownership of fishing sites gave owners the right to[13] do what they wished with the fish taken, including sale or trade. Access to the fishery was the subject of trade and barter, and use of fishing sites not one's own might be paid for by providing a portion of the catch. Virginia Egan-McKenna, Persistence with Change: The Significance of Fishing to the Indians of the Hoopa Valley Reservation in Northwestern California 74-75 (Unpublished M.A. Thesis, University of Colorado 1983). Ownership of fishing rights associated with particular sites also may have given the owner control over downstream activities. Id. at 69.

According to one source:

> A key factor in [trading of fishing rights between tribes] appears to have been the number of salmon runs a tribe received each year. For example, the Chilula received only one run a year and they often either traded with the Hupa for fish or bartered for temporary fishing rights (Curtis 1924:4). The Chimariko "sometimes paid the Hupa for the privilege of fishing at the falls near Cedar Flats" (Nelson 1978: 25-26).

AITS (1982), supra note 11, at 73; see Egan-McKenna at 76.

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[12] AITS (1982) at 23, 49, 57, 72-73, 99, 105; Testimony of Dr. Arnold Pilling, Transcript of Proceedings at 55, California v. Eberhardt, No. 76-051-C (Cal. Super. Ct., County of Del Norte) (May 18, 1977).

[13] Declaration of Arnold R. Pilling at 3, People v. McCovey, No. A012716 (Cal. Ct. App., 1st App. Dist., Div. 3) (Dec. 10, 1982) (Exhibit 25 to State's Brief).

Although experts have disagreed on the extent that harvested salmon was used in trade,[14] the above example and other evidence indicate that such trading did occur. In years when salmon were plentiful throughout the Klamath-Trinity river system, there was little or no need to trade salmon to support the Indians' standard of living.[15] Salmon were dried and stored, however, and were used in trading partnerships in years when other Indians in the basin did not have access to salmon because of river blockage or low flows. Pilling Testimony, supra note 12, Transcript at 56, 102-03 ("[I]f you have lots of stored salmon [when the Klamath was blocked], why, you're in a position to make very good bargains with your trading partners."), 106-09. Gourmet items such as salmon cheeks were "great trade items." Id. at 58-59. The trading partnerships were part of a complex economic, social, and ceremonial system within the tribal society. Id. at 109-115; see also George Gibbs, Journal of the Expedition of Colonel Redick McKee. United States Indian Agent. Throush North-Western California, Performed in the Summer and Fall of 1851, in Henry R. Schoolcraft, Information Respecting the History. Condition and Prospects of the Indian Tribes of the United States 146 (1853) ("Some understanding, however, seems to exist as to opening

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[14] The ethnographic and archeological documentation appears somewhat limited on the issue of trade, although it has been asserted that the sale and trade of harvested salmon was not extensive among the tribes of the Klamath-Trinity basins. See AITS (1982) at 117, 173. In declarations introduced by the State of California in 1982 in People v. McCovey, Drs. William Wallace and Arnold Pilling criticized the AITS (1982) study. See Declaration of William J. Wallace, People v. McCovey, No. A012716 (Cal. Ct. App., 1st App. Dist., Div. 3) (Dec. 10, 1982) (Exhibit 24 to State's Brief); Declaration of Arnold Pilling, supra note 13; see also William J. Wallace, Detailed Account of Yurok Aboriginal Fishing Practices 17-18, attached as Exhibit 2 to Declaration of William J. Wallace, supra. In 1977, in California v. Eberhardt, Dr. Pilling had testified as a defense witness, and Dr. Wallace testified as a witness for the prosecution. In their declarations in 1982, both Wallace and Pilling criticized the AITS (1982) study's conclusion concerning the extent to which trade or sale of salmon played a role in aboriginal Yurok and Hoopa culture. Although a subsequent AITS study responded to that criticism, AITS (1984), at 45-46, determining the extent of the Tribes' legal rights does not require resolving that dispute, which focuses on a specific form of use rather than the degree of dependence as a source of livelihood and culture.

[15] See Pilling Testimony, supra note 12, Transcript at 106; Testimony of William J. Wallace, Transcript of Proceedings at 276, California v. Eberhardt, No. 76-051-C (Cal. Super. Ct., County of Del Norte) (May 19, 1977).

portions of [fish dams] at times, to allow the passage of fish for the supply of those above.").

In California v. Eberhardt,[16] the trial court relied on the testimony of Drs. Pilling and Wallace to recognize that "[i]t is probably true that there was some degree of mutual exchange between and among Yuroks themselves and with other tribes in which fish was one of the items of exchange." The court also stated that "the anthropological testimony is not persuasive that the nature of the aboriginal custom of the Yurok Indians in 'commercial fishing' as that term might have been considered in aboriginal times, is anything like the concept of commercial fishing in present times." Id. As discussed below,[17] the legal quantification of the reserved right depends not so much on the degree to which historic uses of salmon parallel modern uses, but on the degree of dependence on the salmon fishery.

Following non-Indian settlement in the area, the Indians of the Klamath-Trinity basin adapted to the new trading and economic opportunities presented. When non-Indians entered the area, there is some evidence that the Indians sold salmon to them. Pilling Testimony, supra note 12, Transcript at 61-62; Wallace Testimony, supra note 15, Transcript at 279. As the commercial fishing industry developed in the late 19th century, the Indians played an important role in supplying fish to and working at local canneries. See AITS (1982), supra note 11, at 119-21.

When the canneries developed, according to Dr. Pilling, the basic ownership right of access to the fishery seemed to be viewed by the cannery owners "as in Indian hands, and this was something that had to be negotiated. You had to meet specific contractual relationships, especially with the Spott family, to participate as canners on the lower Klamath, because it was essentially Indian territory. This is my understanding of the mercantilism." Pilling Testimony, supra note 12, Transcript at 69-70. The salmon cheeks were recognized as a luxury cut, which "[t]he cannery didn't get . . . unless the Indians waived [their] right" to keep the salmon heads. Id. at 58.

In 1876, the first commercial fishery was established on the Klamath by Martin V. Jones and George Richardson. Bearss, supra note 11, at 159-60. In 1879, in order to protect the Indian fishery from outside interference, the U.S. military sent a force to the Klamath Reservation with orders "[t]o suppress all fishing by whites and require all citizens residing on the Reservation to leave without delay." Id. at 146. The military construed this

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[16] Ruling on Motion to Dismiss for Lack of Jurisdiction, at 2, No. 76-051-C (July 18, 1977).

[17] See infra, at 18 to 22.

as extending to the expulsion of non-Indian fisheries from the river, even if they did not land on the shore, because under no circumstances were the Yuroks to be "deprived of the Salmon as it is their main subsistence." Id. at 148-49. After the expulsion of the Jones and Richardson commercial fishery from the Klamath reservation, a small military outpost was maintained at Requa "to protect the Yuroks in the enjoyment of their only industry--salmon fishing." Id. at 151. Jones then erected a cannery nearby. "The Indians would catch and deliver the salmon for so much a head. . . . As the cannery was off the reservation and the Indians were benefitted by its presence, the military took no action to interfere with its operation." Id. at 160-61.

In 1883, R.D. Hume sought to lease the Klamath fisheries from the United States. Because it considered the fishery to be within the Klamath Reservation and subject to federal protection of the Indians' access to their fishery, the Department of the Interior declined Mr. Hume's request.[18] The Indians apparently opposed R.D. Hume's efforts to establish a cannery operation because Hume's activities interfered with Yurok fishing and Hume wasn't interested in purchasing fish from the Indians but instead brought his own men to fish. AITS (19841, supra note 11, at 46.

By contrast, in 1886, John Bomhoff contracted with a number of Yuroks to supply his cannery with salmon. "By this agreement the Yuroks were not to fish for any other person nor give any other white the right to fish in the Klamath." Bearss at 163 (emphasis added); see AITS (1982), supra note 11, at 131. Bomhoff apparently also employed some Indians for wages. Bearss at 164. The Indian Bureau sanctioned Bomhoff's arrangement to purchase fish from the Indians. Id. at 186.

Eventually additional canneries were established in the area, and at the turn of the century, most of the commercial fishermen were Indians, some fishing at night and taking employment in the canneries during the day. See Bearss at 348; AITS (1982) at 121 & 131.

II. EXISTENCE AND CHARACTER OF YUROK AND HOOPA FEDERAL RESERVED INDIAN FISHING RIGHTS

The power of the United States to create or reserve fishing rights for Indian tribes is derived from its plenary power over

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[18] Appendix B to this opinion recounts the conflict that developed between the Government and Hume. After a court upheld Hume's resistance to expulsion, the United States expanded the Hoopa Valley Reservation to ensure that the original Klamath Reservation would have Indian reservation status. See Appendix B at 7-18.

Indian affairs, grounded in the Indian Commerce Clause,[19] and from the Interstate Commerce Clause.

In Mattz v. Superior Court, 46 Cal. 3d 355, 758 P.2d 606, 617 (1988), the Supreme Court of California squarely rejected the State's assertion that the Federal Government lacked the authority to reserve Indian fishing rights in the Klamath River fishery when it created the reservation. Notwithstanding the substantial body of case law recognizing the extended Hoopa Valley Reservation Indians' federally reserved fishing rights,[20] the State contended otherwise, arguing specifically that the Indians had no federally reserved right to fish commercially. The Supreme Court of California rejected the State's contention based on federal and state court precedent and upon its own substantive legal review of the merits of the State's argument. As the Court noted, the State's theory in essence sought a repudiation of the well-established federal reserved rights doctrine recognized by the Supreme Court in Arizona v. California, 373 U.S. 546 (1963). Mattz v. Superior Court, 758 P.2d at 617; see id. at 616 (right to take fish from the &math River was reserved for the Indians when the reservation was created).[21]

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[19] See Montana v. Blackfeet Tribe, 471 U.S. 759, 764 (1985) ("Constitution vests the Federal Government with exclusive authority over relations with Indian tribes); McClanahan v. Arizona State Tax Comm'n, 411 U.S. 164, 172 n.7 (1973); Hughes v. Oklahoma, 441 U.S. 322 (1979) (overruling Geer v. Connecticut, 161 U.S. 519 (1896)); Douglas v. Seacoast Prods., Inc., 431 U.S. 265, 281-82 (1977) (Congress' power under the Commerce Clause to regulate taking of fish in state waters where there is some effect on interstate commerce); Sohappy v. Smith, 302 F. Supp. 899, 912 (D. Or. 1969) ("Statehood does not deprive the Federal Government of the power to enter into treaties affecting fish and game within a state, especially migratory species.") (citing Missouri v. Holland, 252 U.S. 416 (1920)); see also Arizona v. California, 373 U.S. 546, 596-601 (1963) (post-statehood executive order reservations included federally reserved water rights); Toomer v. Witsell, 334 U.S. 385, 399-402 (1948).

[20] See note 2, supra.

[21] A few years earlier, the State had made a similar argument in another case. See Respondent's Supplemental Memorandum of Points and Authorities and Brief on Appeal, at 29-30, People v. McCovey, Crim. 23387 (Cal.) (Nov. 28 1983). The State contended that the federal power to appropriate or reserve proprietary interests, including Indian fishing rights, was limited to the pre-statehood period. That argument was implicitly rejected in the California Supreme Court's decision in that case. People v. McCovey, 36 Cal. 3d 517, 685 P.2d 687, 697,

In 1940, one of my predecessors issued an opinion concerning the right of the Indians of the extended Hoopa Valley Indian Reservation to fish in the Klamath River within the boundaries of the reservation. See Right of Hoopa Valley Indians to Fish in Klamath River Without California State Interference, I Op. Sol. (Indian Affs.) 945 (March 13, 1940). It assumed without much consideration that the Indians' rights depended on a determination of whether the United States owned the bed of the Klamath River, suggesting that if the State of California owned the bed, the Indians' fishing rights were subject to plenary state regulation. That opinion rested on the same mistaken premise unsuccessfully asserted by the State in People v. McCovey and Mattz v. Superior Court.[22] In light of subsequent federal and state court decisions[23] confirming the Indians' federal reserved fishing rights, that opinion must be overruled. Both the Commerce Clause and the Indian Commerce Clause provide constitutional authority for the United States to reserve fishing rights for Indians in migratory fishery resources, regardless of state ownership of a riverbed passing through the reservation. Therefore, this opinion does not address questions of navigability and title to the Klamath River.[24]

In short, it is now well-established that the Yurok and Hoopa Valley Indians have federal reserved fishing rights,[25] created in

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205 Cal. Rptr. 643 ("rights were granted by Congress when it authorized the President to create the reservation for Indian purposes"), cert. denied, 469 U.S. 1062 (1984).

[22] In Mattz v. Superior Court, the State specifically cited the 1940 opinion to support its argument. See 758 P.2d at 616 & n.8.

[23] See note 2, supra.

[24] The 1940 opinion did not determine whether the Klamath River was in fact navigable at statehood.

[25] A federally reserved fishing right is not one of ownership in particular fish, but a right to an opportunity to obtain possession of a portion of the resource, which can best be expressed by either the numbers of fish taken or an allocation of the harvestable resource. See United States v. Washington, 520 F.2d 676, 687 (9th Cir. 1975), cert. denied, 423 U.S. 1086 (1976); see also Puget Sound Gillnetters Ass'n v. U.S. Dist. Ct., 573 F.2d 1123, 1129 n.6 (9th Cir. 1978), vacated and remanded, Washington v. Washington State Commercial Passenger Fishing Vessel Ass'n, 443 U.S. 658 (1979) (vacating judgments of Ninth Circuit and state supreme court and remanding for further proceedings not inconsistent with the U.S. Supreme Court's opinion).

the nineteenth century when the lands they occupied were set aside as Indian reservations. Numerous court decisions have recognized that the United States intended to reserve for the Indians the rights and resources necessary for them to maintain their livelihood.[26] As the Ninth Circuit has stated the right includes "fishing for ceremonial, subsistence, and commercial purposes." United States v. Eberhardt, 789 F.2d 1354, 1359 (9th Cir. 1986).[27]

Appendix B to this opinion recounts and summarizes the history of the Klamath River and Hoopa Valley Reservations, reviewing in particular the Annual Reports of the Commissioner of Indian Affairs. As described there, at the time the reservations were created, the United States was well aware of the Indians' dependence upon the fishery. A specific, primary purpose for establishing the reservations was to secure to the Indians the access and right to fish without interference from others.[28] As

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[26] See cases cited supra, note 2; see also Menominee Tribe v. United States, 391 U.S. 404, 406 (1968); United States v. Adair, 723 F.2d 1394, 1408-10 (9th Cir. 1983) (reservation of water rights to accompany reserved rights to hunt, fish, and gather).

[27] See also Memorandum from Associate Solicitor, Division of Indian Affairs, to Assistant Secretary, Indian Affairs (May 4, 1978) (Indian fishing on Klamath and Trinity Rivers); United States v. Wilson, 611 F. Supp. 813, 817-18 (N.D. Cal. 1985), rev'd on other grounds sub no., United States v. Eberhardt, 789 F.2d 1354 (9th Cir. 1986) (same); People v. McCovey, 36 Cal. 3d 517, 685 P.2d 687, 690 (same), cert. denied, 469 U.S. 1062 (1984); and see Arnett v. 5 Gill Nets, 48 Cal. App. 3d 454, 458, 121 Cal. Rptr. 906, 909 (1975) (Indian commercial fishing early in 20th century), cert. denied, 425 U.S. 907 (1976).

[28] See Mattz v. Arnett, 412 U.S. 481, 487-88 (1973); Donnelly v. United States, 228 U.S. 243, 259, modified on other Grounds and rehearins denied, 228 U.S. 708 (1913); United States v. Eberhardt, 789 F.2d at 1360 (9th Cir. 1986) (Hoopa Valley Reservation Indian fishing rights were granted by Congress when it authorized President to create reservations for Indian purposes) (citing McCovey, 36 Cal. 3d at 534, 685 P.2d at 697; Wilson, 611 F. Supp. at 817-18 & n.5; Mattz v. Superior Court, 46 Cal. 3d 355, 758 P.2d 606, 618 (1988) (river and Indian fishing played a primary role in the 1891 extension of the Hoopa Valley Reservation to include the old Klamath Reservation and connecting strip); 5 Gill Nets, 48 Cal. App. 3d at 459-62, 121 Cal. Rptr. at 909-911 (Klamath); Donahue v. California Justice Court, 15 Cal. App. 3d 557, 562; 93 Cal. Rptr. 310, 313 (1971) (Hoopa Valley Reservation); Crichton v. Shelton, 33 I.D. 205, 217 (1904) ("the prevailing motive for setting apart the [Klamath River] reservation was to secure to the Indians the fishing privileges

against third parties, the Indians' reserved fishing rights were of no less weight because they were created by executive orders pursuant to statutory authority rather than by treaty.[29] Courts have uniformly rejected a "treaty vs. non-treaty" distinction as a basis for treating Hoopa and Yurok fishing rights differently from the treaty-reserved fishing rights of tribes in other areas of the United States.[30]

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of the Klamath river"); cf. Fishing Vessel Ass'n, 443 U.S. at 665 n.7, 666 n.8 (dependence of Stevens Treaty tribes on fishing); Colville Confederated Tribes v. Walton, 647 F.2d 42, 48 (9th Cir.) (executive order reservation for Indian purposes included purpose of preserving tribal access to fishing grounds and acted to reserve water rights necessary to maintain the fishery), cert. denied, 454 U.S. 1092 (1981); Quechan Tribe v. Rowe, 350 F. Supp. 106, 111 (S.D. Gal. 1972) (executive order reservation for "Indian purposes" necessarily included right to hunt, trap, and fish on the reservation).

[29] The congressional committee reports accompanying the 1988 Hoopa-Yurok Settlement Act concluded that, as against the plenary power of Congress to make further dispositions of the reservation property and resources; no constitutionally protected property rights had vested in any particular tribes or individuals when the reservation areas were established by executive order. S. Rep. No. 564, supra note 4, at 12; H. Rep. No. 938, pt. 1, supra note 4, at 18-19. That conclusion was based on "peculiar facts and law" relevant to the extended Hoopa Valley Reservation. S. Rep. No. 564, at 14. The same conclusion had been reached in the Court of Claims-more than a decade earlier. Short v. United States, 202 Ct. Cl. 870, 486 F.2d 561 (1973), cert. Denied, 416 U.S. 961 (1974).

This conclusion does not affect the present analysis. Short and related court decisions, as well as the legislative history of the 1988 Act, confirm that the Hoopa Valley Reservation was created for Indian purposes. See S. Rep. No. 564, at 12; H. Rep. No. 938, pt. 1, at 18. The absence of a compensable vested property interest as against congressional authority to allocate reservation resources among the tribes or tribal members settled thereon is not inconsistent with the history of the reservation demonstrating that the United States granted rights of use and occupancy to the Indians, including fishing rights, which were protected against third party or state interference while reserved for federal purposes. See Arnett v. 5 Gill Nets, 48 Cal. App. 3d 459, 121 Cal. Rptr. 906 (1975), cert. denied, 425 U.S. 907 (1976); People v. McCovey, 36 Cal. 3d 517, 685 P.2d 687 (Cal. 1984).

[30] See Blake v. Arnett, 663 F.2d 906, 909-910 (9th Cir. 1981); Wilson, 611 F. Supp. at 817-18; McCovey, 685 P.2d at 696-97; 5 Gill Nets, 48 Cal. App. 3d at 459-62, 121 Cal. Rptr. at

III. QUANTIFICATION OF THE FISHING RIGHT AND ALLOCATION OF HARVEST

A. Introduction

The legal measure of the Tribes' fishing rights depends primarily on the purpose of the United States in reserving such rights when it created the Klamath River, Hoopa Valley, and extended Hoopa Valley Reservations. See United States v. Walker River Irrigation Dist., 104 F.2d 334, 336 (9th Cir. 1939) (statute or executive order setting aside a reservation may be equally indicative of intent as treaty or agreement; intent is discerned by taking account, of the circumstances and needs of the Indians and the purpose for which the lands had been reserved); cf. Arizona v. California, 373 U.S. 546, 596-600 (1963).[31]

910-11. See also Antoine v. Washinston, 420 U.S. 194, 200-03 (1975). In response to California's petition for Supreme Court review of Arnett v. 5 Gill Nets, Solicitor General Bork's brief for the United States noted:

> That executive orders played a prominent role in the creation of the Reservation does not change this result [that the United States reserved to the Indians the right to fish on the Reservation without state interference]. Regardless of the manner in which a reservation is created the purpose is generally the same: to create a federally-protected refuge for the tribe. . . .
>
> With respect to fishing rights we see no reason why a reservation validly established by executive order should be treated differently from other reservations.

Memorandum for the United States as Amicus Curiae, at 5, Arnett v. 5 Gill Nets, (U.S. No. 75-527), cert. denied, 425 U.S. 907 (1976).

[31] The legal quantification of non-treaty federally reserved on-reservation Indian fishing rights to a specific share of an anadromous fishery resource appears to be a matter of first impression. It is well-settled, however, that non-treaty federally reserved rights, recognized when an Indian reservation is created, can affect off-reservation use of a natural resource. See, e.g., Arizona v. California, 373 U.S. at 596-600. In addition, the cases adjudicating the treaty fishing rights of the Northwest tribes have recognized that location-specific Indian reserved rights affect fishing taking place outside those locations. See, e.g., U.S. v. Washington, 459 F. Supp. 1020, 1070 (W.D. Wash. 1978); Sohappy v. Smith, 302 F. Supp. 899, 911 (D. Ore. 1969). As such, while the precise issue addressed in this opinion may be one of first impression, many of the principles applied are well-established.

The fishing rights now established in the Yurok and Hoopa Valley Tribes were reserved when the reservations were set aside for Indian purposes. See Act of April 8, 1864, § 2, 13 Stat. 39, 40 (reservations to be set aside "for the accommodation of the Indians," with "due regard to their adaptation to the purposes for which they are intended."). Because the rights arose by implication rather than by express language, the purposes of the reservation are discerned by examining the historical record and circumstances surrounding creation of the reservation.[32] Therefore, we must consider the evidence of the dependence of the Indians on the fishery "as a source of food, commerce, and cultural cohesion," Washington v. Washington State Commercial Fishing Vessel Ass'n, 443 U.S. 658, 686 (1979), and the Federal Government's awareness of the Indians' reliance on the fishery. The inquiry must also include recognition of the Indians' "need to maintain themselves under changed circumstances." Colville v. Confederated Tribes v. Walton, 647 F.2d 42, 47 & n.10 (9th Cir.), cert. denied, 454 U.S. 1092 (1981). Finally, the United States is presumed to have intended to deal fairly with the Indians. Arizona v. California, 373 U.S. at 600.

B. Quantification

The history of the creation of the Klamath River and Hoopa Valley Reservations, and the extension of the Hoopa Valley Reservation to include the Klamath River Reservation and connecting strip, plainly shows a purpose by the United States to reserve for the Indians what was necessary to preserve and protect their right to obtain a livelihood by fishing on the reservation. As discussed earlier, the Indians were highly dependent upon the fishery resource. As recounted in Appendix B, the United States was well aware of the importance of the fishery to the Indians and created the reservations to preserve their access to an adequate supply of fish. The historical record demonstrates the importance of the reservations to achieving the Federal Government's objectives of creating and maintaining peaceful relations between the Indian tribes and non-Indians, protecting the Indians from further encroachment and displacement by non-Indians, and obtaining the resources necessary for the Indians to maintain their livelihood and be self-sufficient on the reservation.[33] The United States

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[32] Indian hunting and fishing rights generally arise by implication when a reservation is set aside for Indian purposes. See, e.g., Ouechan Tribe v. Rowe, 350 F. Supp. 106, 111 (S.D. Cal. 1972). The precise extent of the right, however, is determined by examining the facts and circumstances of each case.

[33] As the court in United States v. Wilson, noted, "[i]n establishing the Hoopa Valley Reservation, Congress reserved those rights necessary for the Indians to maintain on the land ceded to them their way of life, which included hunting and

sought to isolate and protect the Indians from non-Indians who would otherwise appropriate the lands and the fishery resource upon which the Indians were so dependent for their: livelihood.

The physical locations of the reservations --one mile on each side of the Klamath, six miles on each side of the Trinity--plainly demonstrate the United States' awareness of the centrality of the rivers and the fisheries to the purposes for which the reservations were created. As the Supreme Court noted in Mattz v. Arnett, 412 U.S. 481 (1973), the Klamath River Reservation was ideal for the Indians because of the river's abundance of salmon and other fish. The United States was well aware of the Indians' dependence on the fishery resource and of the need to protect the Indians' use of the fishery from non-Indian encroachment. Id. at 487 & n.6; Crichton v. Shelton, 33 I.D. 205, 216-18 (1904).

While the United States also sought to introduce agriculture to the Indians, see, e.g., Appendix B at 4 & 7, it anticipated that the Indians would continue to rely on the reservation fishery. Thus, the fishery and agriculture may be said to be twin primary purposes for creating the reservation. cf. Walton, 647 F.2d at 47-48 (reserved water right for agriculture and fishing, based on primary purposes of reservation).[34]

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fishing." 611 F. Supp. 813, 817-18 (N.D. Cal. 1985), rev'd and remanded on other grounds sub nom., United States v. Eberhardt, 789 F.2d 1354 (9th Cir. 1986); see Blake v. Arnett, 663 F.2d 906, 909 (9th Cir. 1981).

[34] In his journal of the 1851 expedition visiting Indian tribes in Northwestern California, George Gibbs recognized the value of protecting the Indian fisheries within a reservation, even while pursuing other assimilationist objectives:

> The Indians of the Klamath and its vicinity afford a field for a new experiment. Their country furnishes food of different kinds and in quantity sufficient to supply their absolute wants. . . . If collected as occasion may offer, and its advantage be shown to them, upon reservations, where their fisheries can still be carried on, where tillage of the soil shall be gradually introduced, and where the inducements to violence or theft will be diminished or checked they may possibly be made both prosperous and useful to the country.

George Gibbs, Journal of the Expedition of Colonel Redick McKee, United States Indian Agent, Through North-Western California. Performed in the Summer and Fall of 1851, in Henry R. Schoolcraft, Information Respecting the History, Condition and Prospects of the Indian Tribes of the United States 142-43 (1853).

Upon establishment of the original Klamath Reservation in 1855, the Commissioner of Indian Affairs contemplated that the inclusion of the fishery would eliminate any need to provide the Indians with rations of beef, as was common on other Indian reservations. See Appendix B at 1. Between 1855 and 1891, when the Hoopa Valley Reservation was extended to ensure the reservation status of the lower Klamath area, the annual reports of the Commissioner are replete with references to the importance of the fishery for the continued livelihood and welfare of the Indians. See, e.g., id. at 3-4, 8-9.

In short, the fishery here, no less than the water in the arid southwest, was deemed "essential to the life of the Indian people" for whom the reservation was created. Arizona v. California, 373 U.S. 546, 599 (1963). The inclusion within the reservation of the fishery at the mouth of the Klamath within the boundaries of the reservation demonstrates the purpose to prevent non-Indians from establishing commercial fisheries there to supplant the Indian fishery. Thus here, no less than with the Pacific Northwest treaty tribes, the Government "recognized the vital importance of the fisheries to the Indians and wanted to protect them from the risk that non-Indian settlers might seek to monopolize their fisheries." Washington v. Washington State Commercial Passenger Fishing Vessel Ass'n, 443 U.S. 658, 666 (1979).

At the time the reservation was created, ocean trolling was of little commercial consequence and was not of sufficient magnitude to interfere with the in-river fishery. Bearss, supra note 11, at 235. Only with subsequent technological advances did the ocean fishery begin to have a significant impact on salmon runs. As a practical matter then, the reservation boundaries as established were substantially equivalent to protecting the Indian fishery from significant non-Indian encroachment.

The standard for determining the extent of the Pacific Northwest treaty tribes' fishing rights has been stated by the Supreme Court as one which will "assure[] that the Indians' reasonable livelihood needs [will] be met." Fishing Vessel Ass'n, 443 U.S. at 685 (citing Arizona v. California, 373 U.S. at 600; Winters v. United States, 207 U.S. 564 (1908)). The "central principle here must be that Indian . . . rights to a natural resource that once was thoroughly and exclusively exploited by the Indians secures so much as, but no more than, is necessary to provide the Indians with a livelihood--that is to say, a moderate living." Fishing Vessel Ass'n, 443 U.S. at 686.

With respect to the reserved fishing right, I can find no meaningful difference between the federal purpose in creating the reservations for the Yurok and Hoopa Valley Indians, and the bilateral intent in the treaties with the Pacific Northwest tribes to guarantee to the tribes "an adequate supply of fish."

United States v. Washington, 506 F. Supp. 187, 197 (W.D. Wash. 1980), aff'd in relevant part, 759 F.2d 1353 (9th Cir.), cert. denied, 474 U.S. 994 (1985). Although the circumstances of this case may differ in certain respects from those of the Pacific Northwest treaty tribes,[35] they are not relevant to the outcome. Therefore, I conclude that the Government intended to reserve for the tribes on the Hoopa and Yurok Reservations a fishing right which includes a right to harvest a sufficient share of the resource to sustain a moderate standard of living.

There is, as discussed earlier, some uncertainty over the extent to which salmon was traded or sold "commercially" in aboriginal Hoopa and Yurok culture. But the focus of the inquiry into the Tribes' legal rights is on the degree of dependence on the fishery resource at the time the reservation was created or expanded, rather than on what particular uses were made of the fish, which may or may not approximate patterns of use or trade in non-Indian culture. As the Court in Fishing Vessel Ass'n noted with respect to the tribes in western Washington, it is not possible to compare Indian uses of fish for trade in aboriginal times with the volume of present day commercial use of salmon. 443 U.S. at 665 n.7. The same could be said of comparisons of the uses of salmon in aboriginal times to support a "reasonable livelihood," as compared with modern-day uses to the same end.[36] Present-day tribal needs to support the livelihood of members may be more or less than the volume utilized in aboriginal times. Cf. Fishing Vessel Ass'n, 443 U.S. at 687. In short, the United States Supreme Court has rejected the notion that prehistoric patterns or volumes of use must mirror modern economic uses of salmon in order to find sufficient Indian dependence on the

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[35] For example, while the importance of salmon to the diet and cultural cohesion appears similar,' historical evidence more extensively documents the use of harvested salmon for trade by the Pacific Northwest treaty tribes than by the Yurok and Hoopa Tribes. Cf. AITS (1984), supra note 11, at 45 ("trade patterns of the Northwestern California tribes in general have received little attention from anthropologists and historians"). The Yurok and Hoopa Indians' concepts of private ownership of fishing access sites also appear to contrast with the culture of the Northwest tribes, which viewed fishing rights as more communal. See United States v. Washington, 384 F. Supp. 312, 353 (W.D. Wash. 1974), aff'd, 520 F.2d 676 (9th Cir. 1975), cert. denied, 423 U.S. 1086 (1976).

[36] Indeed, a "subsistence" right limited to quantities based on aboriginal consumption levels might well equal or exceed modern-day notions of moderate living needs as satisfied by both consumptive and commercial uses.

salmon fishery sufficient to justify application of the moderate living standard.[37]

The Yurok and Hoopa Indians had a "vital and unifying dependence on anadromous fish," compare Fishing Vessel Ass'n, 443 U.S. at 664, which the historical evidence demonstrates was well-known to the-united States. As with the Northwest treaty tribes, salmon was the great staple of their diet and livelihood. Although the anthropological evidence does not clearly demonstrate the use of dried fish -for trade in the same manner as was shown for the Northwest treaty tribes, it does demonstrate that anadromous fish constituted the primary means for the Indians' livelihood, and that fishing rights and the fishery were an integral part of the diet, economy, and culture of the tribes. Cf. United States v. Washington, 384 F. Supp. 312, 350-58, 406-07 (W.D. Wash. 1974), aff'd, 520 F.2d 676 (9th Cir. 1975), cert. denied, 423 U.S. 1086 (1976). There is some evidence of the Indians' readiness to capitalize on the economic value of the fishery by selling or bartering dried fish with non-Indians passing through the area, and certainly the Indians adapted their utilization of the fishery to provide fish to the non-Indian canneries.

In this case, considering the nature of the right, which the courts have already confirmed, and considering the Indians' historic dependence on the fishery and the federal purposes of the reservation, the "reasonable livelihood" needs must satisfy ceremonial, subsistence, and commercial fishing needs. See Fishing Vessel Ass'n, 443 U.S. at 686-88.

C. Allocation of the Harvest

While the moderate standard of living generally has been identified as the benchmark for identifying the quantity of tribal reserved fishing rights, see United States v. Washington, 506 F. Supp. 187, 198 (W.D. Wash. 1980), aff'd in relevant park, 759 F.2d 1353 (9th Cir.), cert. denied, 474 U.S. 994 (1985) various Indian fishing rights cases have also limited tribal

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[37] As the amicus brief for the United States in Arnett v. 5 Gill Nets stated,

> Petitioner cites no authority, and we know of none, that would limit an Indian's on-reservation hunting or fishing to subsistence. The purpose of a reservation is not to restrict Indians to a subsistence economy but to encourage them to use the assets at their disposal for their betterment.

Memorandum for the United States as Amicus Curiae 8, Arnett v. 5 Gill Nets (U.S. No. 75-527) (on petition for certiorari), cert. denied, 425 U.S. 907 (1976).

harvest rights by an allocation ceiling of no more than 50% of the harvestable numbers of fish, thus providing that the tribes share the resource with non-tribal fishers. The 50% allocation has been based on express treaty language in some cases. Even where a specific treaty does not refer to sharing of the resource, at least one court has reached the same result based on the intent of the parties.

In the Pacific Northwest treaties, the tribes reserved off-reservation fishing rights at their usual and accustomed fishing places "in common with" the citizens of the Territory. The courts held that this language justified limiting the tribes' entitlement for allocation purposes to 50% of the harvestable catch. See id., 506 F. Supp. at 195-98. Thus, even though the treaties were designed to guarantee the tribes an adequate supply of fish and even though the starting point for apportionment is assuring that the Indians' reasonable livelihood needs will be met, Fishing Vessel Ass'n, 443 U.S. at 685, the tribes' agreement to share the resource with non-Indian users justified limiting the tribes to a percentage allocation. See United States v. Washington, 384 F. Supp. 312, 343 (W.D. Wash. 1974), aff'd, 520 F.2d 676 (9th Cir. 1975), cert. denied, 423 U.S. 1086 (1976).[38] That is, the treaties protected and recognized the treaty-derived rights of both the tribes and the non-Indians to a share of the available fish. Fishing Vessel Ass'n, 443 U.S. at 684-85.

In Sohappy v. Smith, 529 F.2d 570 (9th Cir. 1976), the court of appeals refused to set aside the district court's 50% allocation 'formula, adopted to reflect the Columbia River treaty tribes' right to a fair share of the salmon harvest. In United States v. Oregon, the-parties agreed to a Columbia River Management Plan that allowed in-river harvesting on a 60% treaty/40% nontreaty basis, an allocation which deviated from the 50%-50% starting point in order to compensate for ocean fishing by non-Indians. 718 F.2d 299,, 301-02 & n.2 (9th Cir. 1983).

In United States v. Michigan, the district court contrasted treaty rights explicitly held "in common with" other citizens with the treaties of the Indian tribes in Michigan, which had no

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[38] Limiting the tribal allocation to a 50% share of the harvestable resource in any given year is distinct from determining 'whether the moderate standard of living component of the right is being satisfied. Given the current depressed condition of the Klamath basin fishery, this opinion need not address how to calculate the quantities of fish needed to support the Tribes' moderate living needs. Until the fishery resource is substantially restored to the point that the evidence establishes that a 50% share is more than is needed to support the Tribes' moderate living needs, the 50% allocation is the appropriate quantification of the Tribes' rights.

such language. See 505 F. Supp. 467, 472-73 (W.D. Mich. 1980), remanded, 623 F.2d 448 (6th Cir. 1980) (to consider preemptive effect of new federal regulations), modified, 653 F.2d 277 (1981), cert. denied, 454 U.S. 1124 (1981) Although not deciding the allocation issue itself, the district court observed:

> [T]he Indians of Michigan presently hold an unabridged, aboriginal, tribal right to fish derived from thousands of years of occupancy and use of the fishery of the waters of Michigan. That aboriginal right arose from the tribes' reliance upon the fishery for its livelihood, that is, from its dependence upon this fishery for food and trade. That right was confirmed in its entirety by the Treaty of Ghent and left whole by the Treaties of 1836 (7 Stat. 459) and 1855 (11 Stat. 621). Thus, today the Michigan tribes retain the right to fish Michigan treaty waters to the full extent necessary to meet the tribal members' needs.
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> This 50% maximum [for the Washington treaty tribes] arises directly from the "in common with" language in the Washington treaties. [Fishing Vessel Ass'n,] 443 U.S. 686. The 50% ceiling is suggested, if not necessarily dictated by, the word "common" as it appears in the Washington treaties. No such language is present in the Michigan treaties. 443 U.S. at 686 n.27.
>
> The general principle in Fishing Vessel is that Indian treaty rights to scarce natural resources are defined by what is necessary to assure that the Indians' reasonable livelihood expectations are met. 443 U.S. at 686. Where, as here, there was no negotiation resulting in a right held in common and the Indians implicitly reserved their aboriginal right in its entirety, this principle might, over time, mandate that the Indians have access to the entire available resource.

Id., 505 F. Supp. at 472-73.

In the lengthy Lac Courte Oreilles Band of Lake Superior Chippewa Indians v. Wisconsin litigation, the court also addressed Indian treaties with language different from those in the Pacific Northwest. The Treaty of 1837 with the Chippewas provided that the "privilege of hunting, fishing and gathering the wild rice [in the ceded area] is guarantied to the Indians, during the pleasure of the President of the United States.' Lac Courte Oreilles Band v. Wisconsin, 653 F. Supp. 1420, 1425 (W.D. Wisc. 1987) ("LCO III"). The Treaty of 1842 provided that "[t]he Indians stipulate for the right of hunting on the ceded territory, with the other usual privileges of occupancy, until required to remove by the President of the United States." Id. at 1425. Both treaties were silent concerning whether the Off-reservation reserved harvesting rights would be exclusive or in

common with other citizens. Lac Courte Oreilles Band v. Wisconsin, 686 F. Supp. 226, 232 (W.D. Wisc. 1988). Because of the absence of treaty language limiting the tribes" right as one "in common with" other users, the court was reluctant to follow the 50% allocation formula adopted in the Pacific Northwest treaty cases, focusing instead on the moderate living standard. Id.

Ultimately, however, when forced to allocate the harvest, the court concluded that "[t]he only reasonable and logical resolution is that the contending parties share the harvest equally." Lac Courte Oreilles Band v. Wisconsin, 740 F. Supp. 1400, 1417-18 (W.D. Wisc. 1990). The court noted that the treaties did not reserve to the Indians an exclusive right of harvesting in the ceded area. The court also found, though, that when the treaties were made, the Indians understood that the presence of non-Indian settlers would not require that the Indians forego the level of hunting, fishing, gathering, and trading necessary to provide them with a moderate living. Id. at 1415 (citing LCO III, 653 F. Supp. at 1426). The court then stated:

> This unexpected scarcity of resources makes it impossible to fulfill the tribes' understanding that they were guaranteed the permanent enjoyment of a moderate standard of living, whatever the harvesting competition from the non-Indians. It also makes it necessary to try to determine how the parties would have agreed to share the resources had they anticipated the need for doing so.

Id. at 1415. Based on the treating parties' understanding that there would be competition for the resource and the fact that the Chippewa Tribe did not retain exclusive-harvesting rights in the ceded territory, the court concluded

> that the parties did not intend that plaintiffs' reserved rights would entitle them to the full amount of the harvestable resources in the ceded territory, even if their modest living needs would otherwise require it. The non-Indians gained harvesting rights under those same treaties that must be recognized. The bargain between the parties included competition for the harvest.
>
> How to quantify the bargained-for competition is a difficult question. The only reasonable and logical resolution is that the contending parties share the harvest equally.

Id. at 1416 (emphasis added). While the court emphasized its view that the Chippewa treaties differed in significant respects from those of the Pacific Northwest tribes, it concluded that the

equal division was the "fairest" and "inevitable" result. Id. at 1417-18.

In United States v. Adair, 723 F.2d 1394 (9th Cir. 1983), in the context of addressing the relationship between reserved Indian fishing rights and federal reserved Indian water rights, the Ninth Circuit affirmed the district court's holding that the Klamath Tribe was "entitled to as much water on the Reservation lands as they need to protect their hunting and fishing rights . . . as currently exercised to maintain the livelihood of Tribe members." Id. at 1414. The court explained:

> Implicit in this "moderate living" standard is the conclusion that Indian tribes are not generally entitled to the same level of exclusive use and exploitation of a natural resource that they enjoyed at the time they entered into the treaty reserving their interest in the resource, unless, of course, no lesser level will supply them with a moderate living.

Id. at 1415 (citing Fishing Vessel Ass'n, 443 U.S. at 686) (emphasis added). Thus, the Ninth Circuit suggested, tribal fishing rights are not necessarily accompanied by a 50% allocation ceiling.

The Klamath River and Hoopa Valley reservations and accompanying federal rights were created by executive action pursuant to congressional statutory authorization, rather than through a bilateral, bargained-for agreement, as in the Pacific Northwest and the Great Lakes Tribes' fishing rights cases. Because the operative documents creating the reservation do not expressly reserve fishing rights, neither do they expressly limit the implied rights reserved for the Indians of the reservation. Thus, an argument could be made that the tribal moderate standard of living needs should be satisfied first, before other user groups can be afforded fishing privileges. Cf. State v. Tinno, 94 Idaho 759, 497 P.2d 1386 (1972) (unqualified treaty language contrasted with "in common with" treaty language, denoting a qualified right).

At the time the reservations were created, the United States doubtless contemplated that the reservation resources, and in particular the fishery, would be sufficient for the Indians to continue to be self-supporting, see Appendix B at 8, or in other words, to support a moderate standard of living. Furthermore, although there was competition for the fishery, the United States sought to reduce it by including what was then the location most desired by the early non-Indian fishing industry--the area at the mouth of the river--inside the reservation boundaries. The historical evidence does not indicate that either the United States or the Indians contemplated scarcity of the resource as a whole.

On the other hand, the Tribes' right to fish in this case does not extend beyond the reservation.' Moreover, the doctrine of implied reserved fishing rights has not been extended to provide an exclusive on-reservation right to a fishery resource such as anadromous fish that migrates off the reservation. To do so. could totally deprive off-reservation users of access until tribal rights are fully satisfied. The historical evidence that I have examined is not sufficient to infer that the United States, in creating the extended Hoopa Valley Reservation, contemplated that in times of scarcity, fishing by other user groups, wherever located, could be completely cut off until the Indians' total ceremonial, subsistence, and commercial needs are satisfied.[39]

While reservation purposes should be construed broadly, after considering the relevant history, I conclude that the United States did not intend to reserve for the Indians a right to the full amount of the harvestable resource, to the complete exclusion of non-Indian fishing off the reservation until the moderate living standard could be satisfied. Instead, the case law indicates that there should be a ceiling on the tribes' right to ensure that the resource is shared. In summary, the tribes are entitled to a sufficient quantity of fish to support a moderate standard of living, or 50% of the Klamath fishery harvest in any given year, whichever is less.[40]

The Tribes' fishing right is a "right to take a share of each run of fish that passes through tribal fishing areas." Fishing Vessel Ass'n, 443 U.S. at 679; Washington State Charterboat Ass'n v. Baldridge, 702 F.2d 820 (9th Cir. 1983), cert. denied, 464 U.S. 1053 (1984); Hoh Indian Tribe' v. Baldridge, 522 F. Supp. 683, 686-87, 689 (W.D. Wash. 1981). Thus, in the present case, it applies to Klamath River basin stocks that, absent interception, would pass through the Tribes' reservations. See U.S. v. Washington, 520 F.2d 676, 688-89 (9th Cir. 1975) (affirming 384 F. Supp. at 344), cert. denied, 423 U.S. 1086 (1976). In calculating the allocation, the numbers of fish harvested or intercepted by each user group is counted against

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[39] This is not to say, however, that in times of severe shortage, certain tribal ceremonial and subsistence needs may not take priority over the privileges of other user groups. This issue was left open by the Supreme Court in Fishing Vessel Ass'n, 443 U.S. at 688.

[40] This rule is not inflexible, and may be varied by agreement of the parties. See Hoh Indian Tribe v. Baldridge, 522 F. Supp. 683, 690 (W.D. Wash. 1981); United States v. Oregon, 699 F. Supp. 1456, 1463 (D. Ore. 1988), aff'd, 913 F.2d 576, 585 (9th Cir. 1990).

the respective party's share, regardless of where they are taken or for what purposes. Fishing Vessel Ass'n, 443 U.S. at 687-89.

Although the Tribes' rights in this case are geographically limited-to the on-reservation fishery, it is well-settled that tribal fishing rights have a geographical component that requires that fishing outside of those areas be managed in such a way to permit tribalaccess to their share of the fishery at those geographical locations. See Hoh Indian Tribe v. Baldridge, 522 F. Supp. at 687; SOhappy v. Smith, 302 F. Supp. 899, 910-911 (D. Ore. 1969) (state cannot so manage the fishery that little or no harvestable portion of the run reaches the Indian fishing areas).

Indian reserved fishing rights have both a geographical and a "fair share" aspect. Muckleshoot Indian Tribe v. Hall, 698 F. supp. 1504, 1511-14 (W.D. Wash. 1988). The right is not only one to harvest a particular share, but also to be able to harvest that share on the reservation or at other geographical locations linked to the reserved right. Thus, although the Northwest treaty tribes have fishing rights that attach both to reservations and to "usual and accustomed" locations, while the Yurok and Hoopa Valley Tribes' rights geographically are linked to their reservations, the underlying principle is the same. In each case, the tribal fishing rights are linked to specific geographic areas, and other fishing must not interfere with the Tribes' right to have the opportunity to catch their share.

IV. FEDERAL FISHERY REGULATION AND ACTIONS AFFECTING INDIAN FISHING RIGHTS

A. Federal Trust Responsibility

The United States is the trustee of Indian reserved rights, including fishing rights.[41] The role of the United States as trustee of Hoopa and Yurok Indian fishing rights has been recognized in various court decisions. See United States v. Eberhardt, 789 F.2d 1354, 1359-62 (9th Cir. 1986); id. at 1363 (Beezer, J., concurring); People v. McCovey, 36 Cal. 3d 517, 685 P.2d 687, 694, 205 Cal. Rptr. 643, cert. denied, 469 U.S. 1062 (1984). As recently as 1992, Congress explicitly acknowledged a trust responsibility in connection with the Indian fishery in the Trinity River. "[F]or the purposes of fishery restoration, propagation, and maintenance," and "in order to meet Federal trust responsibilities to protect the fishery resources of the Hoopa Valley Tribe, and to meet the fishery restoration goals of

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[41] See, e.g., Joint Bd. of Control v. United States, 862 F.2d 195, 198 (9th Cir. 1988); United States v. Michigan, 653 F.2d 277, 278-79 (6th Cir.), cert. denied, 454 U.S. 1124 (1981); Muckleshoot Indian Tribe v. Hall, 698 F. Supp. 1504, 1510-11 (W.D. Wash. 1988).

the Act of October 24, 1984, Public Law 98-541," Congress directed an instream release of water to the Trinity River of not less than 340,000 acre-feet per year. Central Valley Improvement Act, Pub. L. No. 102-575, Title XXXIV, § 3406(b) (23), 106 Stat. 4706, 4720 (1992).

The obligation of the United States as trustee of Indian resources and rights extends to all agencies and departments of the Executive Branch. See Pyramid Lake Paiute Tribe v. Department of the Navy, 898 F.2d 1410, 1420 (9th Cir. 1990); Covelo Indian Community v. FERC, 895 F.2d 581, 586 (9th Cir. 1990). As such, the Department; of Interior and Commerce, as well as other federal agencies whose actions affect the fishery resource, must ensure that their actions are consistent with the trust obligations of the United States to the Tribes.

Proper allocation of the harvest of Klamath River basin stocks is only part of the effort needed to protect the reserved fishing rights of the Tribes. The Secretary of the Interior has acted in the past to increase flows in the Trinity River, in part to improve-the fishery for the benefit of the Indians.[42] This was a recognition that protection of the fishery itself is necessary to make the tribal fishing right meaningful.

In order for both the purpose of the reservations and the objectives of the Magnuson Act[43] to be fulfilled, the fishery resource here must be rebuilt to sustain a viable fishery for all user groups, consistent with sound conservation practices. Cf. Hoh Indian Tribe v. Baldridge, 522 F. Supp. 683, 691 (W.D. Wash. 1981). The Trinity River Basin Restoration Act of 1984, Pub. L. No. 98-541, 98 Stat. 2721; the Klamath River Basin Fishery Resources Restoration Act of 1986, 16 U.S.C. § 460ss; and section 3406(b)(23) of the Central Valley Improvement Act of 1992, 106 Stat. at 4720; all reflect congressional intent to restore and protect the anadromous fishery in the Klamath and Trinity River basins.

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[42] See 1991 Trinity River Flows Decision, supra note 3; 1981 Secretarial Issue Document, supra note 3; see also Memorandum from the Associate Solicitor, Division of Indian Affairs to the Assistant Secretary - Indian Affairs, March 14, 1979 (quoted in 1981 Secretarial Issue Document).

[43] Magnuson Fishery Conservation and Management Act, Pub. L. No. 94-265, 90 Stat. 331, codified as amended at 16 U.S.C. §§ 1801 - 1882 (1988).

B . Regulation of the Klamath Fishery

The regulation of the Klamath River basin anadromous fishery resource is divided among a number of governments and agencies.[44] Within the three-mile territorial sea off the coast, the states have jurisdiction. Federal jurisdiction over management of the Klamath fishery resource is split between the Interior and Commerce Departments. The Tribes and the Department of the Interior have the authority to manage the in-river on-reservation tribal fishery.[45] See 25 C.F.R. Part 250. In the exclusive economic zone, generally three to two hundred miles offshore, the Department of Commerce has exclusive management and regulatory jurisdiction. See Magnuson Act, 16 U.S.C. §§ 1801 - 1882; Washington Crab Producers Inc. v. Mosbacher, 924 F.2d 1438, 1439 (9th Cir. 1991).

As a general matter, all parties that manage the fishery, or whose actions affect the fishery, have a responsibility to act in accordance with the fishing rights of the Tribes. This may go beyond safeguarding their right to an appropriate share of the harvest on their reservations, cf. U.S. v. Washington, 459 F. Supp. 1020, 1070 (W.D. Wash. 1978), to include a viable and adequate fishery from which to fulfill the Tribes' rights, whether those rights are fulfilled by a 50% share or by a lesser amount, if a lesser amount will satisfy fully the moderate living standard to which the Tribes are entitled. Cf. United States v. Washington, 506 F. Supp. 187, 197 (W.D. Wash. 1980) ("treaties were designed to guarantee the tribes an adequate supply of fish"), aff'd in relevant part, 759 F.2d 1353 (9th Cir.), cert. denied, 474 U.S. 994 (1985).

Because of the migratory nature of anadromous fish, ocean fishing has a direct impact on the available harvest in the Klamath and Trinity Rivers within the Tribes' reservations. The Magnuson Act provides:

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[44] The complicated jurisdictional- scheme for managing anadromous fishery resources was described in Washington Crab Producers. Inc. v. Mosbacher, 924 F.2d 1438, 1442 (9th Cir. 1991). The disjuncture between ocean and in-river fishing regulation authority over the Klamath basin fishery resource was noted with concern by Judge Beezer in his concurring opinion in United States v. Eberhardt, 789 F.2d 1354, 1363 (9th Cir. 1986) (Beezer, J., concurring).

[45] As a general matter, reasonable, necessary, and nondiscriminatory conservation measures may be imposed by the Federal Government or the states, as appropriate, on the exercise of tribal fishing rights in the absence of adequate tribal regulation. See Antoine v. Washington, 420 U.S. 194, 207 (1975); United States v. Eberhardt, 789 F.2d 1354 (9th Cir. 1986).

> Any fishery management plan which is prepared by any Council, or by the Secretary [of Commerce], with respect to any fishery, shall . . . contain the conservation and management measures, applicable to foreign fishing and fishing by vessels of the United States, which are . . . consistent with . . . any other applicable law.

16 U.S.C. § 1853(a)(1)(C) (1988) (emphasis added).

The Yurok and Hoopa Tribes' fishing rights are "applicable law" within the meaning of the Magnuson Act, because regardless of whether they were created by treaty or pursuant to statutory authority, they are rights that arise under federal law.[46] See Pacific Coast Federation v. Secretary of Commerce, 494 F. Supp. 626, 632 (N.D. Cal. 1980) ("It cannot be doubted that the Indians have a right to fish on the reservation. Congress has carefully preserved this right over the years, and the courts have consistently enforced it."); see also Washington State Charterboat Ass'n v. Baldridge, 702 F.2d 820, 823 (9th Cir. 1983) (treaty fishing rights as "applicable law"), cert. denied, 464 U.S. 1053 (1984); Hoh Indian Tribe v. Baldridge, 522 F. Supp. 683, 685 (W.D. Wash. 1981) (same). Furthermore: nowhere in the Magnuson Act has Congress stated an intent to interfere with Indian rights in the Klamath River area. Pacific Coast Federation, 494 F. Supp. at 633. Therefore, fishery management plans and ocean fishing regulations must be consistent with those rights. The Act, however, provides no authority to either the Pacific Fishery Management Council, see 16 U.S.C. § 1852(a)(6), or the Secretary of Commerce over in-river Indian fishing or in-river tribal harvest levels. Pacific Coast Federation, 494 F. Supp. at 632. Thus, in managing the ocean fisheries, the Secretary of Commerce must rely on management by the Department

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[46] The Magnuson Act expressly refers to Indian treaty fishing rights. Specifically, 16 U.S.C. § 1853(a)(2) requires that fishery management plans contain a description of "Indian treaty fishing rights, if any." Because the plans themselves are limited to management of the ocean fishery, however, this provision refers to Indian treaty fishing rights existing in ocean fishing areas, and not to in-river tribal fishing rights--treaty or otherwise. See Washington Troller's Ass'n v. Kreps, 466 F. Supp. 309, 313 (W.D. Wash. 1979) (description of in-river fishery not required by Magnuson Act). Section 1853(a)(2)'s failure to refer explicitly to other federally reserved Indian fishing rights does not affect our conclusion that § 1853(a)(1)(C) is the relevant provision requiring that fishery management plans substantively conform to Indian reserved rights. The status, scope, and character of those rights is determined by looking to their source--not to the Magnuson Act.

of the Interior or the Tribes of the in-river fishery. Cf. Washington Crab Producers, 924 F.2d at 1443.

Except for the general Magnuson Act requirement that ocean fishery plans be consistent with any other applicable law, the Act's provisions governing regulation of the ocean fishery do not extend to in-river Indian fisheries. Arguments to the contrary by both ocean fishermen and inland tribes have been rejected. Compare Washington Trollers Ass'n v. Kreps, 466 F. Supp. 309 (W.D. Wash. 1979) (rejecting ocean fishing association's argument that the fishery plan must describe inland fisheries); with Hoopa Valley Tribe v. Baldridge, No. C-82-3145, slip op. at 43-45 (N.D. Cal. June 25, 1984) (rejecting Tribe's argument that alleged discriminatory regulation of in-river tribal fishing violated the Magnuson Act's prohibition against discrimination in allocating the harvest).

V. CONCLUSION

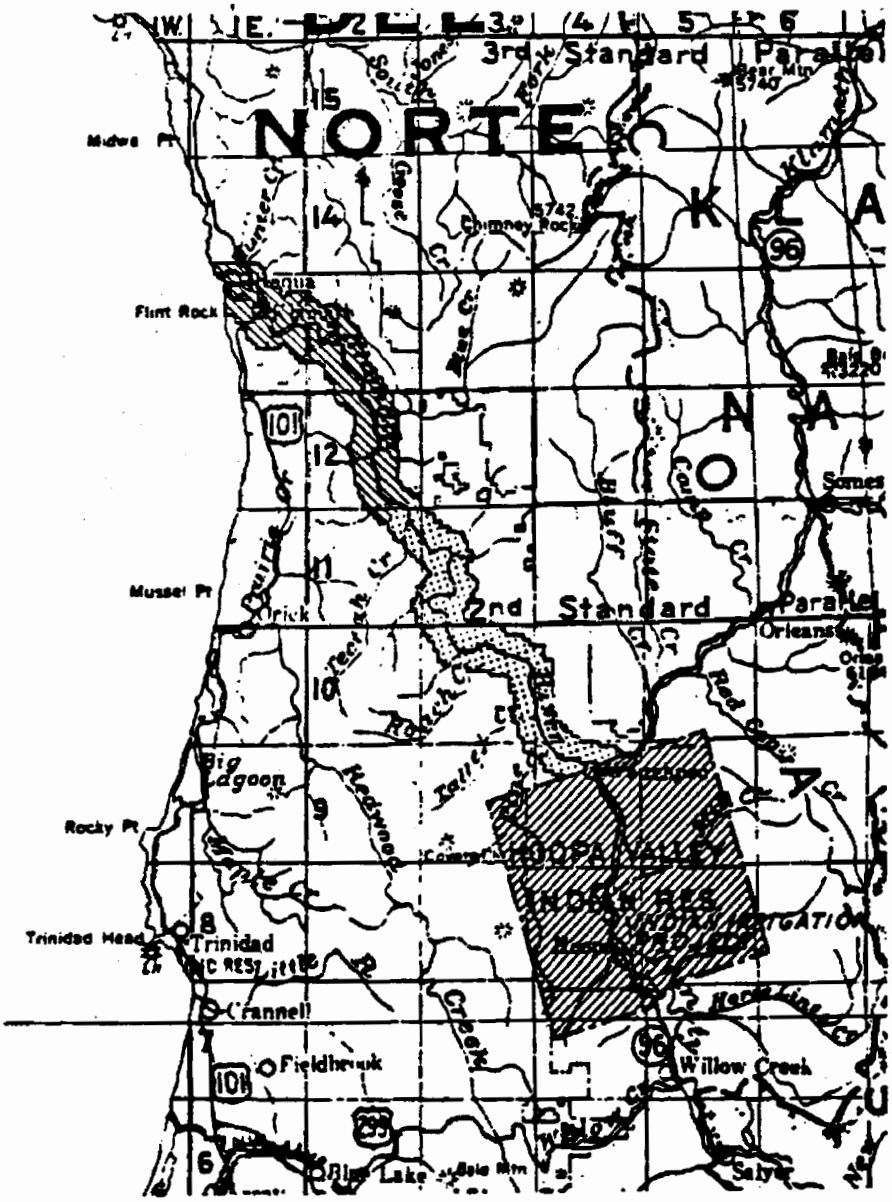
I conclude that when the United States set aside what are today the Hoopa Valley and Yurok Reservations, it reserved for the Indians of the reservations a federally protected right to the fishery resource sufficient to support a moderate standard of living. I also conclude, however, that the entitlement of the Yurok and Hoopa Valley Tribes is limited to the moderate living standard or 50% of the harvest of Klamath-Trinity basin salmon, whichever is less. Given the current depressed condition of the Klamath River basin fishery, and absent any agreement among the parties to the contrary, the Tribes are entitled to 50% of the harvest.

John D. Leshy
Solicitor

APPENDIX TO OPINION OF THE COURT

MAP OF HOOPA VALLEY INDIAN RESERVATION, CALIFORNIA*

Scale: 1 inch = 12 miles



LEGEND:
- Old Klamath River Reservation.
- Connecting Strip.
- Original Hoop Valley Reservation.

*United States Department of Interior, General Land Office 1944.

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APPENDIX B

Overview of the History of the
Klamath River and Hoopa Valley Reservations

The original Klamath River Reservation was established in 1855. The location had been selected pursuant to "directions [from the Secretary of the Interior] to select . . . reservations [in California] 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.'" I Kappler, Indian Affairs: Laws and Treaties 816 (1904) ("Kappler") (Letter from Commissioner of Indian Affairs to Secretary of the Interior, Nov. 10, 1855). In creating the reservation, President Pierce accepted the Interior Department's recommendation to set aside a strip of territory one mile wide on each side of the Klamath River, for a distance of twenty miles. See id. at 816-17.

In the 1856 Annual Report of the Commissioner of Indian Affairs, the Klamath reservation is described as follows:

> Klamath reservation is located on the river of that name, which discharges its waters into the Pacific ocean twenty miles south of Crescent city.
>
> The Indians at this place number about two thousand. They are proud and somewhat insolent, and not inclined to labor, alleging that as they have always heretofore lived upon the fish of the river, and the roots, berries, and seeds of their native hills, they can continue to do so if left unmolested by the whites, whose encroachments upon what they call their country they are disposed to resist. . . . The land on this river is peculiarly adapted to the growth of vegetables, and it is expected that potatoes and other vegetable food, which can be produced in any abundance, together with the salmon and other fish which abound plentifully in the Klamath river, shall constitute the principal food for these Indians. It is confidently expected in this way to avoid the purchase of beef, which forms so expensive an item at those places where there is no substitute for it. The establishment of the Klamath reserve has undoubtedly prevented the spread of the Indian wars of Oregon down into northern California.

Annual Report of the Commissioner of Indian Affairs ("Annual Report") 238-39 (1856).

The next year, the Government agent at the Klamath Reservation described the importance of the fishery to the Indians on both the Klamath and Trinity Rivers. Because of the harm caused to the fishery on the Trinity, he recommended relocation of those Indians to the Klamath Reservation:

> Salmon has been very abundant this season, and in the different villages upon the reservation there has not been less than seventy-five tons cured for winter use. . . .
>
> We are now engaged in clearing, with Indian labor, one hundred acres of land, which will be ready for crop by the middle of October. . . .
>
> The Indians are located at different points upon the Klamath river, which runs through the reservation, . . . for the convenience of fishing . . . . On this river, above Marippe Falls, the eastern boundary of the reserve, there are probably about fourteen hundred Indians; they subsist upon fish, game, and the natural products of the earth. Some few of them work **for** the settlers.
>
> In Hoopa valley, on Trinity river, there are about seven hundred Indians; they subsist by hunting, fishing, grass seeds, and acorns. Many of them work for the white settlers in the valley, and are well paid for their labor.
>
> On the Trinity river and its tributaries, above Hoopa, there are about five hundred Indians; their resources for fishing and gaining a livelihood have been destroyed by mining in the vicinity; . . . I would recommend their removal to this agency.

Annual Report 391 (1857) (Letter from Indian Sub-Agent Heintzelman to Sup't of Indian Affairs, July 13, 1857).

In 1858, the California Superintendent reported:

> It is proper to remark, that in almost every locality in California there is a sufficiency of the natural products of the country for the subsistence of Indians residing there, and they could support themselves quite well, were it not for the encroachments of the whites, and the consequent destruction of their food by the settlement of the country.
>
> * * * *

> Klamath reservation is progressing steadily and quite satisfactorily. The crop is good, and with the yield of salmon at the fisheries the Indians are contented and happy.

Annual Report 283, 285 (1858) (Letter from Sup't of Indian Affairs to Comm'r of Indian Affairs, Sept. 4, 1858).

The Klamath Reservation sub-agent reported on the "abundance of [the Indians'] natural food," and also indicated the unlikelihood of extensive agricultural production on the Klamath reservation:

> One great difficulty this reservation labors under is the small amount of land that can be brought under cultivation. The Klamath river runs through a canon, the entire length, and the reservation being located upon each side of it, the only land suitable for cultivation is in the bottoms, ranging in size from one acre to seventy.

Id. at 286 (Letter from Indian Sub-agent Heintzelman to Sup't of Indian Affairs, July 1, 1858).

In 1859, the Klamath Reservation's Indian agent reported about two thousand Indians "on this reservation proper" and about four thousand more "who inhabit the mountain streams, and subsist principally on fish and game, which are very abundant, and seem inexhaustible." Annual Report 437 (1859) (Letter from Indian Agent Buel to Jas. Y. McDuffie, Esq. (undated)).

The agent's report in 1861 continues to reflect the importance of the reservation and its fishery to the Indians:

> [The Klamath] reservation is well located, and the improvements are suitable and of considerablevalue. There is an abundance of excellent timber for fencing and all other purposes, and at the mouth of the Klamath river there is a salmon fishery of great value to the Indians. The number **of** Indians here is not far from' eighteen hundred.
>
> * * * *
>
> I suggest, as this reservation has never been surveyed, that it should be so laid out as to embrace the island and fishery at the mouth of the Klamath, and extend a mile in width each side of the river, to a point one mile above Wakel, and a half a mile in width each side of the river, from that point to the mouth of the Trinity river.

Annual Report 147 (1861) (Letter from Superintending Agent Geo. M. Hanson to Comm'r of Indian Affairs, July 15, 1861).

In December, 1861, the Klamath agent reported the entire loss of the agricultural developments on the Klamath Reservation by an "unparalleled freshet." Annual Report 313 (1862) (Letter from Agent Hanson to Comm'r of Indian Affairs Dec. 31, 1861). As a result of the 1861 flood, the Superintendent and one group of the Indians moved to the Smith River reservation. Most, however, remained on the Klamath Reservation or in an area up the river. Nearly all eventually returned to the Klamath River and vicinity. See Letter from Comm'r of Indian Affairs to Secretary of the Interior, April 4, 1888, reprinted in S. Exec. Doc. No. 140, 50th Cong., 2d Sess. 19-22 (1889); Mattz v. Arnett, 412 U.S. 481, 487 (1973); Short v. United States, 202 Cl. Ct. 870, 887 (1973), cert. denied, 416 U.S. 961 (1974).

By 1862, the Indian Superintendent was recommending the sale of the Klamath Reservation and relocation of the Indians to another suitable reservation. See Annual Report 40-41 (1862). While Government officials now spoke of the Klamath Reservation as "almost worthless," and as "almost entirely abandoned by the Indians," it sought to relocate the Indians to another reservation which would continue to provide the Indians with a fishery, in addition to agricultural lands. See Annual Report 8-10 (1863). The 1863 Commissioner's report referred to the "abundance of fish" on the Round Valley reservation and noted that the Smith River valley, a recommended site, was isolated from non-Indians and would furnish the "best of fisheries" from the Pacific Ocean. Id. at 9-10.

As part of an effort to consolidate and reduce the number of Indian reservations in California, Congress in 1864 passed an act authorizing the President to set apart up to four tracts of land in California for the purposes of Indian reservations.. See Act of April 8, 1864, § 2, 13 Stat. 39, 40; Donnelly v. United States, 228 U.S. 243, 257, modified and rehearsing denied, 228 U.S. 708 (1913); Mattz v. Superior Court, 46 Cal. 3d 355, 758 P.2d 606, 610, 250 Cal. Rptr. 278 (1988).

In 1864, the Klamath, Redwood, and Trinity Indians were reported to still be at war with the forces of the United States. Annual Report 13 (1864); see Short, 202 Ct. Cl. at 889. Austin Wiley, an attorney, was appointed Superintendent of Indian Affairs- for California. In order to restore and establish peaceful relations with the tribes, Superintendent Wiley entered into negotiations and concluded a treaty with the Indians, which provided for locating the Indians in the Hoopa Valley. See Annual Report 12-14 (1864); Short, 202 Ct. Cl. at 891. Although the treaty was. never ratified, and there is doubt whether the Indians really

understood the terms of Wiley's treaty, see id. at 895, Wiley proceeded, consistent with the proposed treaty, to locate the Hoopa Valley Reservation. Id. at 891-92. By treating with the Indians and establishing the reservation, Superintendent Wiley "thereby brought to an end the war with the Indians of Humboldt, Klamath and Trinity counties." Id. at 896.

By 1865, the Government's original intention to remove the Klamath River Indians to the Smith River reservation had changed and refocused on use of the Klamath Reservation:

> It was intended to remove the Indians from the Smith River reservation, and place them at the old Klamath reservation, still owned by government, but to place the occupants under the charge of an employee of the Hoopa Valley agency. No definite suggestions were made as to the selection of the other two permanent reservations.

Annual Report 11 (1865).

Superintendent Maltby, who had replaced Superintendent Wiley, reported on the newly located Hoopa Valley reservation, and expressed his expectation that the "Klamath Indians in the vicinity, numbering eighteen hundred, will . . . most of them move to the [Hoopa Valley] reservation." Id. at 113 (Letter from Sup't of Indian Affairs to Comm'r of Indian Affairs, Sept. 15, 1865). The same year, the Government surgeon living on the Hoopa Valley reservation along the Trinity River reported on the Indians' reliance on the salmon fishery, and the difficulties resulting from harm to, the resource caused by local mining:

> They no longer sport on the banks of clear streams literally alive with salmon and other fish, but gaze sadly into the muddy waters, despoiled almost of -their finny prey by the impurities from the sluice-boxes of the miners at the head of the stream. In this consists one of the greatest calamities inflicted upon the Indians of recent years. Their salmon fishing is destroyed to a very great extent, and with it one of their chief means of subsistence. Those who saw the Klamath and Trinity rivers in early days say that during the summer months they ran as clear as crystal, and thronged with salmon from the sea; now they are muddy streams and almost deserted by this fish.

Id. at 116-17. The Government surgeon nonetheless noted that the Indians continued to secure "all the fish they can," id. at 117, and remarked at "the large quantity of fish oil they consume as food," id. at 118.

In 1866, Robert J. Stevens was appointed special commissioner to investigate and report on Indian affairs in California. His report dated January 1, 1867, and addressed to the' Commissioner of Indian Affairs, is contained in the 1867 Annual Report 117-48. Commissioner Stevens reported on continuing difficulties in maintaining peace between the Indians and non-Indians, and of the need for reservations for the exclusive use and occupancy of the Indians. He discussed the Hoopa Valley reservation in connection with Superintendent Wiley's "treaty," and the establishment of peaceful relations with the Indians. Commissioner Stevens travelled from the Hoopa Valley reservation down the Trinity to the Klamath River, making the following report:

> On the banks of the Klamath the villages were more numerous. . . .
>
> The salmon fisheries of the river have been very much injured by the former mining operations. Only now and then one of their ingenious weirs is seen. . . .
>
> * * * *
>
> The count of Indians on the Klamath, made officially, but little over a year previous to my visit, gave a census of 2,217 below the mouth of the Trinity.
>
> At this point I wish to submit my observations as to the character of the country through which flows the Klamath river. For 10 miles or more on each side to a point about 30 miles above its mouth, following its course, it is unsettled and wild, peopled almost exclusively by Indians, to whose wants and habits it is well adapted, supplying wild food and fish in abundance. Very little of it is tillable land, and whites will never care to settle upon it.
>
> My attention had been particularly directed to this region by Major Bowman while with him at Fort Humboldt. The following is his suggestion:
>
> "Extend the Hoopa reservation on its northern boundary, so as to include not less than six miles along the northern bank of the Klamath to the sea-shore, thence down the sea-shore to the mouth of Redwood creek, thence up Redwood creek to the point nearest to the head of Willow creek, thence down Willow creek to the boundary of the Hoopa reservation."
>
> He adds:
>
> "Very little of this tract is suitable for cultivation, and consequently not desirable for the settlements of white men, but will furnish sufficient tillable land, I think, for the wants of all the Indians that may be placed there, and range for necessary stock. . . ."

"The miners engaged on the river banks within the described limits are but few, and are daily diminishing in numbers."

Id. at 127-29. Commissioner Stevens recommended the withdrawal for Indian use, "not only the tract on the Klamath, . . . but an enlargement thereof." Id. at 145.

In 1868, the Indian agent at the Hoopa Valley Reservation remarked in his report that establishment of the reservation "was right and its location good," and that "it would be almost impossible to remove [the Indians] to any other locality, and then only by a great expense, endangering the peace of this section while it was being done." Annual Report 133 (1868) (Letter from Indian Agent Pratt to Comm'r of Indian Affairs, July 20, 1868).

For a number of years, the reports from the Hoopa Valley Reservation discussed the attempts to begin agriculture livestock raising, and ranged from the optimistic to the pessimistic. Compare Annual Report 16 (1869) (Hoopa Valley reservation "under. a fine state of cultivation and highly prosperous"), with Annual Report 78 (1870) (Letter from Sup't of Indian Affairs to Comm'r of Indian Affairs, July 13, 1870) (Hoopa Valley reservation "has but a poor prospect of becoming self-sustaining;" "the soil at Hoopa is so poor that it is incapable of raising produce sufficient to feed 1,000 Indians").

In 1882, the Commissioner's report, while noting that "Indian farming has increased satisfactorily," noted that the salmon fishery still comprised one-third of the subsistence of Indians located on the Hoopa Valley reservation. Annual Report 10 (1882).

In 1883, a commercial fisherman named Hume contacted the Secretary of the Interior and proposed to lease the salmon fisheries of the Klamath River, within the Klamath River Reservation. The Acting Commissioner of Indian Affairs replied:

> [N]o such proposition can be entertained. It would be against usage and at variance with the policy of the Department in the control and management of Indian affairs.
>
> The permanent settlement of the Indians residing upon said reservation, and the disposal of so much of the reservation as may not be needed for that purpose, are matters engaging the attention of the Department at this time. . . .

> The reservation is still in a state of Indian reservation, and must so remain, uninterfered with, until otherwise ordered by competent authority.

Letter from Acting Comm'r of Indian Affairs to D.B.[1] Hume (July 23, 1883), reprinted in S. Exec. Doc. No. 140, 50th Cong., 2d Sess. 11 (1889).

Two years later, Special Agent Paris Folsom investigated and reported on the "Condition and Needs of Non-Reservation Klamath Indians in California," noting the particular suitability of the Klamath River fisheries for satisfying the needs of the Indians:

> The distance from the line of the Hoopa Valley Reservation, at the juncture of the Klamath and Trinity Rivers, to the Klamath River Reservation, upper line, by way of the river, is some 18 miles, and it is within these limits that the non-reservation Klamath Indians are located.
>
> Nature seems to have done her best here to fashion a perfect paradise for these Indians, and to repel the approach of the white man. She filled the mouth of the Klamath River with a sand-bar and huge rocks, rendering ordinary navigation impossible, . . .
>
> . . . [The Indians] form a very respectable peasantry, supporting themselves without aid from the Government by fishing, hunting, raising a little stock, cultivating patches of soil, and by day's labor at the Arcata lumber-mills. . . .
>
> * * * *
>
> . . . . Fisheries, staging for holding the fishermen and their nets, are dotted along the river. Indians have had general and actual, though unrecorded, possession and occupation of the whole river line here for years and years. Their dwellings are scattered and permanent. They wish to remain here; here they are self-supporting --actually self-sustaining. This is their old home, and home is very dear to them-- treasured above everything else. No place can be found so well adapted to these Indians, and to which they themselves are so well adapted, as this very spot. No possessions of the Government can be better spared to

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[1] This appears to be an error. Hume's initials apparently were "R.D." For historical works about Hume, see A Pygmy Monopolist: The Life and Doings of R.D. Hume Written by Himself and Dedicated to His Neighbors (Gordon B. Dodds, ed.) (Univ. of Wisconsin 1961); Gordon B. Dodds, The Salmon King of Oregon. R.D. Hume and the Pacific Fisheries (Univ. of North Carolina 1959).

them. No territory offers more to these Indians and very little territory offers less to the white man.

* * * *

I have the honor to further recommend that these same provisions be extended to the Indians on the Klamath River Reservation immediately adjoining the land here considered, and that the lower and remaining portion of that reservation be thrown again with the public lands, providing security and protection to the fisheries of the Indians above the mouth of the Klamath River.

Report of Special Agent on Condition and Needs of Non-Reservation Klamath Indians in California (June 25, 1885), reprinted in S. Exec. Doc. No. 140, 50th Cong., 2d Sess. 7-11 (1889).

In 1886, the Acting Agent for the Hoopa Valley Reservation reported on the "Klamath Reservation:"

My duties, as both agent and commanding officer, require me to exercise a supervision over the reservation on the Klamath. A small outpost is maintained at the mouth of that river to prevent intrusion on the Indian lands, and protect the Indians in their only industry-- that of fishing for salmon.

Those Indians are also anxious for a subdivision of their lands, but before this can be done the lines of the reservation must be fixed determinately. . . .

The people, like the Hoopas, are friendly and well disposed, and maintain amicable relations with the white people about them, but should the military power of the Government be removed from this valley, both reservations would soon be overrun, and the Indians dispossessed. The Klamaths live almost exclusively on the salmon, though a few plant a little.

Annual Report 43 (1886) (Letter from Acting Agent Wm. E. Dougherty, Capt. First Infantry, to Comm'r of Indian Affairs, Aug. 15, 1886).

The following year, in 1887, Acting Agent Dougherty reported on a controversy that had arisen with the commercial fisherman Hume at the mouth of the Klamath:

There are believed to be on the Klamath river about 1,200 Indians of that name. The live in villages on the river bank, a few miles apart, from far up it to its mouth, and have always been self-sustaining, relying to a great extent for subsistence upon the salmon. . . .

* * * *

> In May last, R.D. Hume, of Ellenburgh, Oreg., entered the mouth of the Klamath river, with a light-draft steamboat and a gang of fishermen brought from the north, and established a floating cannery on the fishing grounds near the mouth of the river. The Indians along the river are much disturbed at what they deem to be an intrusion that will deprive them to a great extent of their means of subsistence, and I think that unless some remedial measure is applied by the Government necessity will actuate them to seek a remedy in their own way.

Annual Report 9 (1887) (Letter from Acting Agent Wm. E. Dougherty, Captain U.S. Army, to Comm'r of Indian Affairs, July 5, 1887).

Concerned about the intrusion of R.D. Hume's steamer into the Klamath River within the Klamath Reservation, the Interior Department sought to obtain relief for the Indians and protection for their fishery. In June, 1887, the Secretary of the Interior, sought an opinion from the Attorney General concerning the Government's power to protect the Indians and their unimpaired access to the fishery within the boundaries of the reservation. The Secretary's inquiry prompted exchanges between the Interior and Justice Departments on the authority of the United States to exclude Hume from the Indian fishery at the mouth of the Klamath River. Much to the consternation of the Interior Department, the Justice Department took a narrow 'view of the Federal Government's power to protect the Indians.

The Attorney General concluded that "so long as the acts of persons resorting to these waters to take fish fall short of invading the right of Congress to regulate commerce with foreign nations or among the several States, no case for Federal interference can be said to exist." Letter from Attorney General to Secretary of the Interior, June 11, 1887, reprinted in S. Exec. Doc. No. 140, 50th Cong., 2d Sess. 13 (1889). In reaching his conclusion, the Attorney General discussed principles of state ownership of the beds of tide-waters and of fish running in them, noted that the State had declared the Klamath River to be navigable, and found that power over the fisheries had not been granted to the United States and thus remained under the exclusive control of the State.

The Interior Department continued to press its case to establish and protect the rights of the Indians. On June 21, 1887, the Commissioner of Indian Affairs submitted a brief setting forth arguments supporting the Indians' right to the fishery, see S. Exec. Doc. No. 140, supra, at 14-16, which the Secretary

submitted to the Attorney General. Interior's brief contended that the Indians,

> have had exclusive use of the fisheries in the Klamath River, from which they have supported themselves, entirely unaided by the Government, at least since the freshet of 1861.
>
> * * * *
>
> Have not the Indians acquired private rights in their fisheries by prescription?
>
> * * * *
>
> Can the legislature of the State of California by declaring the Klamath River navigable, when in fact it is not navigable, deprive the Indians of the exclusive use of fisheries?
>
> * * * *
>
> The Klamath Reservation having been declared by the President, in pursuance of an act of Congress, for Indian purposes exclusively, can the State of California so far defeat the purposes of said act of Congress as to grant liberty to any and all of her citizens to enter within its boundaries and engage in the business of catching and curing fish, to the injury of the Indians for whom the reservation was created?
>
> * * * *
>
> By seining near the mouth of the river the whites would obstruct the passage of the salmon and cut the Indians off from their accustomed supply.
>
> Section 2149 of the Revised Statutes provides as follows:
>
> "The Commissioner of Indian Affairs is authorized and required, with the approval of the Secretary of the Interior, to remove from any tribal reservation any person * * * within the limits of the reservation whose presence may, in the judgment of the Commissioner, be detrimental to the peace and welfare of the Indians."
>
> The presence of Hume and his party within the limits of the Klamath River Reservation is manifestly detrimental to the peace and welfare of the Klamath River Indians, in that it is likely to provoke open hostilities between them; and if they are permitted to remain the whites will deprive the Indians of their means of support. Certainly nothing could be more detrimental to their peace and welfare.
>
> The right to navigate the river is not denied, but anchoring floats with a view to erecting buildings thereon for the accommodation of extensive business operations during an entire season is another thing.

> Captain Dougherty, the acting agent in charge, is an Army officer of large experience amongst the Indians, and good judgment.
>
> He asks that "the highest power be invoked to protect the Indians in the possession of their only (food) resource."
>
> * * * *
>
> A small military force has for a long time been stationed at the mouth of the Klamath to protect the Indians in their fishing privileges.

Id.

Two days after submitting the brief to the Secretary, the Commissioner sent him another letter discussing the similarity of the Klamath case with a court decision issued concerning Pyramid Lake:

> Referring to my letter . . . and accompanying paper relative to the Klamath River Reservation in California, and the attempted dispossession of the resident Indians of their fishing grounds by a gang of white men under one Hume, I have the honor to draw your attention to a case [concerning the Pyramid Lake Reservation.]
>
> [The non-Indian defendants in the case were charged with trespass for fishing on Pyramid Lake, and contended that the taking of fish inside the reservation was not unlawful], upon which the court said:
>
> "If this argument is sound the whole purpose of the law, in setting apart lands for the separate use of the Indians, is defeated . . . . We know that the lake was included in the reservation that it might be a fishing ground for the Indians. . . . It is plain that nothing of value to the Indians will be left of their reservation if all the whites who choose may resort there to fish. In my judgment those who thus encroach on the reservation and fishing ground violate the order setting apart for the use of the Indians, and consequently do so contrary to law."
>
> It can be said with equal truth . . . that the Klamath River was included in the reservation, "that it might be a fishing ground for the Indians." True, the executive order does not so state in terms, neither does the order setting apart the Pyramid Lake Reservation. But it is manifest from the description of the boundaries of the Klamath Reservation that it was the purpose and intention to exclude white people

from fishing in the river, from its mouth to the upper extremity of the reservation.

Should the whites be permitted to enter the river to fish, but little if anything of it will be left of the reservation and the whole purpose of the law will be defeated.

Letter from Comm'r of Indian Affairs to Secretary of the Interior, June 23, 1887, reprinted in S. Exec. Doc. No. 140, supra, at 16.

On June 23, 1887, the Attorney General asked for a more precise statement of the case and the question for which Interior was soliciting an opinion. The Commissioner of Indian Affairs then wrote the Secretary of Interior stating the case and questions he recommended be sent to the Attorney General:

> So far as we can ascertain the Klamath River Indians in California have held and enjoyed exclusive fishery privileges in the Klamath River from time immemorial, and were in full possession of them at the date of the Guadalupe Hidalgo treaty, by which the territory embracing the Klamath River and the State of California was acquired by the United States.
>
> This exclusive possession has never been disturbed, and until recently never challenged.

Letter from Comm'r of Indian Affairs to Secretary of the Interior, July 6, 1887, reprinted in S. Exec. Doc. No. 140, supra, at 17. The Commissioner posited five questions for the Attorney General:

> (1) Did not the Klamath River Indians acquire by prescription and hold at the date of the Guadalupe Hidalgo treaty, title or property in the fisheries of the Klamath River?
>
> (2) Was not such title or property recognized and guarantied by the provisions of said treaty?
>
> (3) Was not the legislative and executive action which fixed the present reservation on either side of the Klamath River a recognition of the Indians' right and title to the exclusive fishery privileges of Klamath River within the boundaries thereof?
>
> (4) If the Indians have rights under the Guadalupe Hidalgo treaty, or have acquired rights by prescription since the date of that treaty, can the State of California by direct or indirect means divest them of those rights?
>
> (5) If the Indians have the exclusive right to fish in the Klamath River within the boundaries of

> their reservation, can not the Department, through this Bureau and its agents, protect those rights within said boundaries by the enforcement of the laws and regulations made in pursuance thereof for the maintenance of peace and order on Indian reservations?

Id.

The Attorney General replied that he deemed Interior's questions "clearly justiciable" and more properly presented to a court than to him. Letter from Attorney General to Secretary of the Interior, July 11, 1887, reprinted in S. Exec. Doc. No. 140, supra, at 17-18. On October 4, 1887, the Acting Commissioner of Indian Affairs recommended to the Secretary of the Interior that the United States bring suit on behalf of the Indians to judicially determine their rights in the fisheries. Letter from Acting Comm'r of Indian Affairs to Secretary of the Interior, Oct. 4, 1887, reprinted in S. Exec. Doc. No. 140, supra, at 18. The lawsuit against Hume followed, and the Interior Department's position that the Klamath River Reservation remained an Indian reservation was set forth in a letter from the Commissioner to the Secretary of the Interior, dated April 4, 1888. See S. Exec. Doc. No. 140, supra, at 19-22 (1889).

In 1888, even while the controversy with Hume continued, Acting Agent Dougherty reported that the Indians had negotiated a commercial agreement to supply a non-Indian cannery operation with fish:

> The question of the prescriptive rights of the Lower Klamaths to the fisheries of the Klamath River is still in abeyance, and I do not think that any action has yet been taken on the instructions given by the honorable the Attorney-General, in October last, to institute proceedings in this case.
>
> Meantime the Indians have made a co-operative partnership with Mr. John Bornhoff[2] of Crescent City, who has supplied them with boats, nets, etc., and the plant for a cannery, which is now in operation at the mouth of the Klamath. This enterprise gives occupation to all the Indians at that place, and for some distance up the river, ...
>
> Mr. Hume's party from Oregon is again in the river fishing. The Indians complain as before, of this intrusion, and are awaiting with some anxiety the decision that will

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[2] Bearss, supra note 11 in Opinion, at 163, gives the name as John Bomhoff, which is consistent with Dodds, The Salmon King of Oreaon, supra note 1 in Appendix B, at 180.

determine whether the exclusive right claimed by them will be sustained or not."

Annual Report 10 (1888) (Letter from Acting Agent Wm. E. Dougherty, Captain U.S. Army, to Comm'r of Indian Affairs, Sept. 20, 1888).

The action eventually brought against Hume was prosecution of libel against his goods, for unlicensed trading in Indian country in violation of Revised Statutes § 2133, as amended. 22 Stat. 179 (1882).[3] The court rejected the claim that the area in question was within an Indian reservation. While the court agreed that the area was still a federal reservation not open to public entry, it also concluded that the Government had abandoned it as an "Indian reservation." Therefore, notwithstanding its federal reservation status, the court held that it did not qualify as an Indian reservation or as Indian country for purposes of R.S. § 2133. United States v. Forty-Eight Pounds of Rising Star Tea, 35 F. 403, 406 (D.C.N.D. Cal. 1888), aff'd, 38 F. 400 (C.C.N.D. Cal. 1889); see Short v. United States, 202 Ct. Cl. 870, 912-16 (1973) (description of controversy and decision) cert. denied, 416 U.S. 961 (1974). The court never addressed or

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[3] Revised Statutes § 2133, as amended, provided:

> Any person other than an Indian of the full blood who shall attempt to reside in the Indian country, or on any Indian reservation, as a trader, or to introduce goods, or to trade therein, without [an Indian traders] license, shall forfeit all merchandise offered for sale to the Indians or found in his possession, and shall moreover be liable to a penalty of five hundred dollars.

Act of July 31, 1882, ch. 360, 22 Stat. 179.

Much to the consternation of the Indian agent, Captain Wm. Dougherty, when the case against Hume came to trial in district court, "[t]he United States attorney did not appear . . . and the Government was not represented. His honor stated that it was the sixth time the case had been set for hearing, and decided to go on with it, and hear the Government's argument later." Letter from Agent Wm. E. Dougherty to Comm'r of Indian Affairs, May 29, 1888, reprinted in S. Exec. Doc. No. 140, 50th Cong., 2d Sess. 23 (1889).

adjudicated the questions raised by the Interior Department to the Attorney General.[4]

After losing in district court, the Secretary of the Interior requested an appeal and reported that in order to protect the Indians, authority was needed at once "to set apart these lands as a reservation and thus remove all doubt." Short, 202 Ct. Cl. at 914. On April 1, 1889, the circuit court affirmed the district court's decision, and concurred in the district court's analysis. 38 F. 400 (C.C.N.D. Cal. 1889).

Soon thereafter, Congress took up the question whether to open the reservation lands to non-Indian settlement. In 1890, the House of Representatives passed a bill rejecting allotments for the Indians on the Klamath River Reservation, and providing for public sale of the reservation lands. See Short, 202 Ct. Cl. at 917-18. Although a similar bill was introduced in the Senate, the Senate took no action on either the House-passed bill or the Senate bill. Id.

The setback in the courts and the activity in Congress prompted the Interior Department immediately to review its authority for establishing Indian reservations in California to determine whether it could better protect the Indians along the Klamath. The Department sought a legal opinion from the Assistant Attorney General. On January 20, 1891, the Assistant Attorney General replied that in his view, under the special circumstances of the case, the Department had retained the Klamath River Reservation under the 1864 four reservations Act and that it was a part of the Hoopa Valley Reservation. Letter from Assistant Attorney-General to Secretary of the Interior, January 20, 1891 (copy on file in Office of the Solicitor, U.S. Department of the Interior). In response to the decision in Forty-Eight Pounds of

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[4] The district court did note the Indians' involvement in commercial fishing:

> At the proper season, [Hume] proceeds with his vessel to the river, and employs the Indians to fish for him, supplying them with seines and other appliances. He pays them 'in trade,' furnishing them with various articles composing the cargo of his vessel.

United States Forty-Eisht Pounds of Rising Star Tea, 35 F. 403, 406 (D.C.N.D. Cal. 1888), aff'd, 38 F. 400 (C.C.N.D. Cal. 1889).

Rising Star Tea, the Assistant Attorney-General noted his disagreement with the reasoning,[5] but concluded that

> [t]his difficulty may yet be removed by the President issuing a-formal order, out of abundant caution, setting apart the Klamath river reservation, under the act of 1864, as part of the Hoopa Valley reservation, or extending the lines of the latter reservation so as to include, within its boundaries, the land covered by the former reservation, and the intermediate lands, if the title to the last be yet in the United States.

Letter from Assistant Attorney-General, supra, at 28-29.

On January 21, 1891, the Secretary requested the Commissioner to prepare the necessary orders for extension of the Hoopa Valley Reservation, and on October 16, 1891, President Harrison signed the executive order extending the boundaries of the Hoopa Valley Reservation to include the Klamath River Reservation and the Connecting Strip between the two reservations. I Kappler 815; see also Mattz v. Arnett, 412 U.S. 481, 493 (1973), Donnelly v. United States, 228 U.S. 243, 255-59, modified and rehearing denied, 228 U.S. 708 (1913); Short, 202 Ct. Cl. at 920-23.

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[5] The Assistant Attorney-General did agree with the result. Following the reasoning adopted by the Attorney General in his June 11, 1887, letter, the Assistant Attorney General considered the Klamath River as not within the Klamath Reservation, and therefore beyond the authority of the United States to exclude persons fishing on the waters of the Klamath River. Letter from Assistant Attorney-General to the Secretary of the Interior, January 20, 1891, at 24-27.

In Mattz v. Superior Court, the State of California submitted this letter to establish that the Federal Government lacked the authority to reserve Indian fishing rights in the Klamath River or at least lacked the intent to reserve fishing rights for the Indians of the reservation. The Supreme Court of California rejected those arguments. 46 Cal. 3d 355, 758 P.2d 606, 616-18, 250 Cal. Rptr. 278 (1988).

D. 2006 DOI Cooperative Agreement: Cooperative Management of Tribal and Federal Lands and Resources in the Klamath River Basin in California

COOPERATIVE AGREEMENT
between
UNITED STATES DEPARTMENT OF THE INTERIOR
and
YUROK TRIBE
for the
COOPERATIVE MANAGEMENT OF TRIBAL AND FEDERAL LANDS AND RESOURCES IN THE KLAMATH RIVER BASIN OF CALIFORNIA

I. STATEMENT OF JOINT OBJECTIVES:

A. Purpose. This Cooperative Agreement (Agreement) is made and entered into between the United States Department of the Interior (DOI) and the Yurok Tribe (Tribe) to coordinate and cooperatively manage Federal and Tribal lands and resources within the Klamath Basin in California, both within the Yurok Reservation as well as the related basin, upstream river, and Pacific Ocean resources subject to the jurisdiction or authorities of various DOI agencies and bureaus. This Agreement will provide more consistent, economical, effective, and collaborative management of Federal and Tribal lands and natural resources while furthering the Trust relationship that exists between DOI and the Tribe. This Agreement will also greatly expand the resources available to address the shared goals of DOI and the Tribe to improve our collective understanding of the river system and its dynamics, improve the health and vitality of the fishery, and identify and develop programs for natural resource management and service delivery in order to provide long-term benefits to the Tribe, local communities, and the general public and to improve the condition of the basin's natural resources. DOI and the Tribe anticipate that this Agreement will be the foundation for subsequent, continuing, and specific collaborative programs in natural resource management, including but not limited to land and water management, fisheries management, water quality monitoring, land use planning, data gap analysis, interpretation and outreach, and Tribal-interagency management initiatives which will enhance the opportunity to identify and resolve issues critical to the success and survival of a healthy river-based ecosystem in the lower Klamath Basin.

B. Objective. DOI and the Tribe intend to establish an ongoing collaborative government-to-government relationship for management of land, water and other natural resources which will inure to the benefit of DOI, the Tribe, and the communities, as well as the ecosystem and economy of the Klamath River Basin. This Agreement provides a

mechanism to coordinate natural resource management programs, develop joint planning and management initiatives, and coordinate program and budget priorities through the cooperative allocation of resources and the development of long-term resource management and programmatic goals between the signatories. The Agreement will improve DOI and Tribal services to the Tribal and local communities and the general public by improving Klamath River resources management, addressing the health of the fishery, and establishing related programs for restoration and management of natural resources. The Agreement will provide an opportunity for the Tribe to bring to bear its acknowledged scientific expertise, its knowledge of the basin, and the wealth of its culture and traditions to its collaborative relationship with DOI. The Agreement will provide a mechanism by which the Tribe and DOI may further the protection and preservation of Tribal cultural values and practices while collaborating on management of basin natural resources. The Agreement will accomplish these objectives by developing mechanisms for increasing the potential contribution and participation in federal programs by the Tribe while also realizing broader benefits to Klamath Basin communities, the general public, federal agencies and the scientific community.

C. Authority. The Federal Land Policy and Management Act of 1976, 43 U.S.C. § 1737(b); Endangered Species Act, 16 U.S.C. § 1531 *et seq.*; Fish and Wildlife Coordination Act, 16 U.S.C. § 661 *et seq.*; National Park Service Organic Act, 16 U.S.C. 1 *et seq*; and Klamath River Basin Fisheries Resource Restoration Act , 16 U.S.C. § 460ss *et seq.*, among others, provide that the Secretary of the Interior may undertake programs of resource management through Cooperative Agreements.

D. Benefits. Cooperative undertakings withing the scope of this agreement will result in increased public management effectiveness, enhancement of natural resource program coordination, opportunity for joint public outreach, and a greater level of consistency and effectiveness in public and Tribal land use planning. This cooperative relationship provides DOI with access to resources and services not otherwise available, as well as the benefit of continued contributions by and involvement of Tribal officials, planners, resource specialists and the general Tribal membership in public land management. This broader partnership to further the federal-Tribal relationship is critical to providing a higher level of public service and to involving the Tribal government and the public in the development and coordination of resource management programs and cooperative land-use planning and management opportunities.

II. DEFINITIONS:

A. DOI: Means United States Department of the Interior, including its agencies, offices, and bureaus.

B. TRIBE: Means the Tribal Government, the Executive Offices, and/or authorized staff and agents of the Yurok Tribe.

C. AGREEMENT: Means this Cooperative Agreement.

III. SCOPE:

A. DOI agrees to:

Coordinate and consult with the Tribe, as frequently as required by DOI agencies and at least annually, through the Assistant Secretary, Policy Management and Budget or his/her designee and/or appropriate regional and other officials to identify opportunities for the development of land and resource management programs and coordination of resource program priorities and initiatives.

Identify opportunities for development of cooperative initiatives for coordinated management of land and water resources, beneficial data collection, fisheries or other natural resource management programs, land management initiatives, public outreach and such other programs which may offer opportunities for more efficient resource management.

Seek specific opportunities to involve the Tribe in DOI land and resource management activities in a more active role in furtherance of the federal-Tribal relationship and the partnership established under this Agreement.

Coordinate, organize, and assure appropriate government professional and management involvement in programs within the scope of this Agreement.

B. The TRIBE agrees to:

Coordinate and consult with the DOI, as often as necessary and at least annually, to identify Tribal land management priorities, resources and opportunities for joint Tribal-DOI program development.

Coordinate, organize, and assure appropriate Tribal governmental, Tribal member, professional, and executive involvement in programs within the scope of this Agreement.

Seek to identify opportunities for governmental partnerships and cooperative programs, including the identification of Tribal resources available for such initiatives.

Identify and provide appropriate staff and other resources for planning and implementation of initiatives developed pursuant to this Agreement.

C. DOI and the TRIBE agree to:

Establish an on-going joint management group to cooperate in identifying opportunities for collaborative projects pursuant to this Agreement, including program development, budget preparation, planning, and all other aspects necessary to make effective the purposes and objectives of this Agreement.

Conduct and collaborate on specific programs to further the goals and objectives of this Agreement and improve resource conditions, and in doing so: identify and achieve managerial efficiencies; identify and cooperatively address data gaps on fisheries, land, water and other natural resources and systems; involve where appropriate other parties to achieve critical resource management; and accomplish Tribal and agency program priorities and address comprehensive program issues.

Meet as necessary and at least annually to identify specific resource management, planning, scientific, economic, and other appropriate joint management opportunities.

Enter into separate agreements ("Task Orders") with respect to specific resource management projects, identifying the project goals, contributions of both parties, tasks to be performed, completion dates, and related matters as appropriate to the project; comply with the terms of the Task Orders developed in accordance with this Agreement; enter into initial task orders simultaneous with the signing of this Agreement; and identify, prepare, and carry out future task orders as the parties and circumstances determine.

Cooperatively seek additional partnerships, and where appropriate funds, and authorities to achieve shared Tribal and DOI management goals and work to identify additional resources, agencies, and authorities that can facilitate the goals of the parties set forth in this Agreement.

IV. TERM OF THE AGREEMENT:

This Agreement shall become effective on the date of signature (a) by the Secretary of the Interior or his authorized representative and (b) by the Tribal Chairman or his designee. This Agreement shall remain in effect until canceled or modified as provided in Section VI.

V. FINANCIAL SUPPORT:

This document does not authorize the transfer of funds or anything of intrinsic monetary value, nor does it confer upon any of the signatories the authority to commit the federal government or the Tribe to the expenditure of funds. Nothing in this Agreement shall be construed to commit a federal official to expend funds not appropriated by Congress. To the extent that the

expenditure or advance of money or the performance of any obligation of the United States under this Agreement is to be funded by appropriation of funds by Congress, the expenditure, advance, or performance shall be contingent upon the appropriation of funds by Congress that are available for this purpose and the apportionment of such funds by the Office of Management and Budget. No breach of this Agreement shall result and no liability shall accrue to the United States in the event that funds are not appropriated or apportioned.

It is anticipated by the signatories that, at a future date, the transfer of funds, dedication of equipment, delegation or assignment of personnel, and other tangible commitment of fiscal, labor and non-labor resources will be necessary to implement the intent of this Agreement. Such commitments and transfers shall be specifically developed and described through individual task orders or other appropriate instruments implementing this Agreement, and transfers shall be accomplished by separate procurement, financial assistance, or other appropriate instruments, which will be approved and issued by appropriate officials of the Tribe and DOI and be subject to the standard terms and conditions for such instruments.

VI. MODIFICATION AND TERMINATION:

This Agreement may be modified, amended, or supplemented by mutual consent of the parties. Either party may propose modification by notifying the other in writing. Termination may be requested by either party through notification of the other signatory. The notified party shall respond within 30 days. The parties agree to seek a mutually acceptable schedule to negotiate any modifications in the Agreement. In the event that this Agreement is terminated by either or both of the parties, the parties shall have a continuing obligation to comply with the terms of task orders or other instruments covering existing or ongoing specific collaborative projects.

VII. GENERAL PROVISIONS:

Nothing in this Agreement shall modify or abrogate the statutory or other authorities of either party signatory to this Agreement.

Each of the signatories warrants that he or she is authorized to enter into this Agreement on behalf of the party for whom the signatory has executed the Agreement.

VIII. COUNTERPARTS:

This Agreement may be executed in counterpart originals and each copy will have the same force and effect as if signed by all parties.

IN WITNESS WHEREOF, the parties have executed this Agreement:

APPROVALS:

U.S. DEPARTMENT OF THE INTERIOR

By: _____
Assistant Secretary-Policy, Management and Budget Date

YUROK TRIBE

By: Howard McConnell 6-16-06
Tribal Chairman Date

IN WITNESS WHEREOF, the parties have executed this Agreement:

APPROVALS:

U.S. DEPARTMENT OF THE INTERIOR

By: R. Thomas Weimer 6/12/06
Assistant Secretary-Policy, Management and Budget Date

YUROK TRIBE

By: _____
Tribal Chairman Date

U.S. Department of Justice

Environment and Natural Resources Division

JAB
90-8-6-05335

Appellate Section
P.O. Box 23795
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June 19, 2006

Scott W. Williams
Curtis G. Berkey
Alexander, Berkey, Williams & Weathers LLP
2030 Addison Street, Suite 410
Berkley, CA 94704

Re: Pacific Coast Federation of Fishermen's Associations et al., v. U.S. Bureau of Reclamation, et al., 9th Cir. Nos. 05-15856, 05-16027

Dear Mr. Williams and Mr. Berkey,

This letter will memorialize the agreement between your client, the Yurok Tribe, plaintiff-intervenor-appellant in the above captioned case in appeal No. 05-15856, and the United States Bureau of Reclamation, defendant-appellee, regarding the disposition of your client's appeal.

In consideration of the execution on this same date of the "Cooperative Agreement between United States Department of the Interior and Yurok Tribe for the Cooperative Management of Tribal and Federal Lands and Resources in the Klamath River Basin of California," and in consideration of the agreement on principles for consultation between the Department of the Interior and the Yurok Tribe regarding Klamath Irrigation Project Operations set out in ¶ A below, the Yurok Tribe and the United States Bureau of Reclamation agree that on or before October 15, 2006 and upon satisfaction of conditions set forth below in ¶ B, counsel for the Yurok Tribe will file, under Rule 42(b), Fed. R. App. P., a motion to dismiss the appeal in No. 05-15856, reciting that each party will bear its own costs and attorney's fees for the litigation of the Yurok Tribe's Fourth Claim for Relief in the Complaint in Intervention, filed in this case October 22, 2002. The

motion shall be in substantially the same form as Attachment A to this letter agreement. Alternatively, in the event the Klamath Water Users Association will join in a stipulated dismissal under Rule 42(b), Fed. R. App. P., of the appeal in No. 05-15856 and the cross-appeal in No. 05-16027, counsel for the Yurok Tribe and the Bureau of Reclamation will execute and file such a dismissal in substantially the same form as Attachment B to this letter agreement.

A. Principles for consultation on Klamath Irrigation Project Operations. – The Department of the Interior and the Yurok Tribe agree that the following principles shall be used to establish a structure for consultation on Klamath Irrigation Project Operations. The Department of the Interior and the Yurok Tribe further agree to seek agreement on such a structure in good faith and that satisfactory progress on such an agreement shall not be a condition precedent for dismissal of the Yurok Tribe's appeal as provided for above.

1. Consistent with its responsibilities to carry out the government-to-government relationship with Indian tribes, the Department of the Interior will consult with the Yurok Tribe in a timely and meaningful manner with regard to any planning, operational or management actions concerning the Klamath Irrigation Project that affect the Tribe's fishery within the Klamath River Basin.

2. The Department of the Interior and the Yurok Tribe understand timely and meaningful consultation in this context to mean that the Department of the Interior will seek information, analysis and comments from the Tribe at the earliest reasonable time in order to ensure that such information, analysis and views are considered before decisions affecting the Tribe's Klamath River fishery are made. The Department of the Interior and the Yurok Tribe understand that the creation of a joint technical committee is necessary to carry out these principles.

B. Conditions precedent to dismissal. – The only conditions precedent to dismissal of the Tribe's lawsuit and appeal are as set forth here:

1. The signing simultaneously with the "Cooperative Agreement" and this letter agreement of agreements on specific collaborative projects ("task orders") previously identified and to which the parties have previously agreed;

2. The signing of additional task orders on or before September 30, 2006;

3. The convening of a joint management group (Cooperative Agreement at ¶ III.C.) within 30 days of the signing of the Cooperative Agreement and that has met and discussed budgeting further collaborative projects for the fiscal year 2007 budget (to the extent feasible), the 2008 budget and out years; and

4. A meeting between designated representatives of the Yurok Tribe and designated representatives of the Bureau of Reclamation and its contractor for the study known as "Life History Model for Coho Salmon in the Klamath Basin" for the Yurok Tribe to present scientific and technical information for consideration by the Bureau of Reclamation and its contractor. The meeting will take place within 30 days of the signing of the Cooperative Agreement or the award of the contract, whichever is later.

Each signatory to this agreement certifies that he is authorized to enter into the terms and conditions of this agreement and to bind legally the party represented by him.

Please indicate your client's agreement by countersigning in the space designated below on the two counterparts of this agreement and return one original to me.

Sincerely yours,

John A. Bryson
Environment and Natural Resources Division
Counsel for the defendant-appellee
United States Bureau of Reclamation

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Attorneys for plaintiff-appellant Yurok Tribe

ATTACHMENT A

IN THE UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT

Nos. 05-15856, 05-16027

PACIFIC COAST FEDERATION OF
FISHERMEN'S ASSOCIATIONS, ET AL.,

Plaintiffs,

and

YUROK TRIBE,

Plaintiff-Intervenor-Appellant and Cross-Appellee.

v.

UNITED STATES BUREAU OF RECLAMATION , ET AL.,

Defendants-Appellees-Cross-Appellees,

and

KLAMATH WATER USERS ASSOCIATION, ET AL.,

Defendants-Intervenors-Appellees and Cross-Appellants.

MOTION FOR VOLUNTARY DISMISSAL

Pursuant to Fed. R. App. P. 42(b), the Yurok Tribe, plaintiff-intervenor-

appellant, hereby moves for dismissal of its appeal in No. 05-15856. The United States Bureau of Reclamation, defendant-appellee, does not oppose this motion. The Yurok Tribe and the United States Bureau of Reclamation, defendant-appellee, have agreed that each of them will bear its own costs and attorneys' fees on appeal and for the litigation of plaintiff-intervenor-appellant's Fourth Claim for Relief in the Yurok Tribe's Complaint in Intervention, filed in this case October 22, 2002.

WHEREFORE, plaintiff-intervenor-appellant Yurok Tribe requests that the motion be granted and its appeal in No. 05-15856 be dismissed.

Respectfully submitted,

SCOTT W. WILLIAMS
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2030 Addison Street, Suite 410
Berkley, CA 94704

Attorneys for the Yurok Tribe, plaintiff-intervenor-appellant.

DATED this _____ day of _____, 2006.

ATTACHMENT B

IN THE UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT

Nos. 05-15856, 05-16027

PACIFIC COAST FEDERATION OF
FISHERMEN'S ASSOCIATIONS, ET AL.,

Plaintiffs,

and

YUROK TRIBE,

Plaintiff-Intervenor-Appellant and Cross-Appellee.

v.

UNITED STATES BUREAU OF RECLAMATION , ET AL.,

Defendants-Appellees-Cross-Appellees,

and

KLAMATH WATER USERS ASSOCIATION, ET AL.,

Defendants-Intervenors-Appellees and Cross-Appellants.

STIPULATION FOR DISMISSAL PURSUANT TO RULE 42(b),
FEDERAL RULES OF APPELLATE PROCEDURE

Pursuant to Fed. R. App. P. 42(b), the Yurok Tribe, plaintiff-intervenor-

appellant, the United States Bureau of Reclamation, et al., defendants-appellees, and the Klamath Water Users Association, et al., defendants-intervenors-appellees and cross-appellants, stipulate to the dismissal of the appeal and cross-appeal in Nos. 05-1585 and 05-16027. The parties have agreed that each party will bear its own costs and attorneys' fees on appeal and for the litigation of plaintiff-intervenor-appellant's Fourth Claim for Relief in the Yurok Tribe's Complaint in Intervention, filed in this case October 22, 2002.

DATED this _____ day of _____, 2006.

JOHN A. BRYSON
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Water Quality Data

YTEP has collected a significant amount of water quality, habitat, and physical data (parameters listed in table below) within the Yurok Reservation over many years (several parameters starting in 2003) which will be made available to the Water Board. YTEP will coordinate with the Board to share and transfer data (raw or analyzed) as needed. Please contact Louisa McCovey, Environmental Director (lomccovey@yuroktribe.nsn.us) or Micah Gibson, YTEP Assistant Director for the Water Division (Micah@yuroktribe.nsn.us) for more information.

Probes	Conventional WQ	Algae	Bacterial	Habitat	Sediment	Weather	Flow	Other
Temp H2O (hobo)	Ammonia	Phytoplankton	E coli	Fish Disease	Turbidity	Air Temp	Storage	Pesticides
Temp H2O (sonde)	Nitrite	Chlorophyll-a	Enterococcus	Fish Studies	TSS	Relative Humidity	Inflow	Herbicides
Conductivity	Nitrite+Nitrate	Phaeophytin	Coliform	Macroinverts	VSS	Wind	Outflow	SUVA
pH	Nitrate	Periphyton		Zooplankton	Total Dissolved Solids	Rain	Discharge	Other
DO	Particulate Nitrogen	Antoxin-a			Secchi	Snow	Gauge Height	
Turbidity (sonde)	Total Nitrogen	Microcystis			Sediment			
BGA (sonde)	Total Phoshate	Microcystin			Subsurface Sediment			
Chlorophyll (sonde)	SRP				Surface Sediment			
PAR	PO4							
Other Probes	TOC							
	DOC							
	Particulate Carbon							
	BOD							
	Alkalinity							
	Calcium							
	Magnesium							
	Silica							
	Iron Filtered							

KLAMATH HYDROELECTRIC PROJECT FERC NO. P-2082-027

ETHNOGRAPHIC RIVERSCAPE: KLAMATH RIVER
YUROK TRIBE ETHNOGRAPHIC INVENTORY

(Contract #P13342 – FERC Project No. 2082)

Prepared by: Yurok Tribe Culture Department
Prepared for: PacifiCorp

Kathleen Sloan, M.A.I.S
Yurok Tribal Archeologist

Draft
November 2003

CONFIDENTIALITY STATEMENT

Archaeological and traditional property locations are considered confidential and public access to such information is restricted by law (Section 304 of the National Historic Preservation Act; Section 9(a) of the Archaeological Resources Protection Act; Executive Order 13007; Section 6254.10 of the California State Government Code).

TABLE OF CONTENTS

1. Introduction

This section provides the context for this document, the purpose and scope of work for the project and an overview of the project participants, and the relevance of this document for the evaluation of the Klamath River as a Traditional Cultural Landscape (Riverscape).

1.0 Project Description

1.1 Scope of Work

This ethnographic inventory has been conducted by the Yurok Tribe Culture Department under contract with PacifiCorp as part of a federal relicensing application for the Klamath Hydroelectric Project (FERC Project No. 2082) for a series of hydroelectric dams on the Klamath River. As part of the relicensing process with the Federal Energy Regulatory Commission (FERC), PacifiCorp is required to assess the potential environmental and social effects of the Project on the surrounding environment. FERC requires that Exhibit E of the license application include surveys, inventories, impact assessments, management plans, and agency correspondence for cultural resources within the FERC boundary in order for it to meet its responsibilities under NEPA and NHPA.

The information provided in this ethnographic document will be used in the development of Exhibit E of the FERC license application, Cultural Resources Final Technical Report, and the Historic Properties Management Plan (HPMP) for the Klamath Hydroelectric Project. The information provided in this document will be integrated with other resource study results to address concerns the Cultural Resources Working Group has identified regarding the potential impacts of the Project on culturally significant resources.

1.2 Cultural Resources Working Group

The Cultural Resources Working Group for this project was organized by PacifiCorp for the purposes of identifying potential effects on cultural resources within the Project area as required under Section 106 of the National Historic Preservation Act (NHPA) and the National Environmental Policy Act (NEPA). Participants in this group included the five Klamath River Native American Tribes (Klamath Tribes, Shasta Nation, Karuk Tribe, the Hupa Tribe, and the Yurok Tribe), the California State Historic Preservation Office, the Oregon State Historic Preservation Office, the Yurok Tribe Heritage Preservation Office, the Bureau of Indian Affairs (BIA), the Bureau of Reclamation (BOR), the Bureau of Land Management (BLM), the Klamath River Inter-Tribal Fish and Water Commission, US Fish and Wildlife Service, Oregon Department of Fish and Wildlife, Oregon Parks and Recreation, Oregon Water Resources Department, Humboldt County Public Works, FERC, CH2Mhill, Kearns and West, and others. The Cultural Resources Working Group has worked to identify and define the Project's Area of Potential Effect (APE) on cultural resources within the 500 year flood plain of the Klamath River.

1.3 Native American Participants

Five Klamath Basin Native American Tribes have been included in the Cultural Resources Working Group: The Klamath Tribes of Oregon, the Shasta Nation of California, the Shasta Nation, Inc. of California, the Karuk Tribe of California, and the Yurok Tribe of California. PacifiCorp has contracted each of these Tribes to conduct an ethnographic study on their respective ancestral territories as it relates to the development of a HPMP and the preparation of

Exhibit E of the FERC license application. The five Tribes were contracted by PacifiCorp for the purposes of identifying cultural resources within the Klamath Hydroelectric Project including Traditional Cultural Properties (TCPs) and /or Sensitive Cultural Resources (SCRs) within the Project's APE. The tribal studies evaluated the following cultural components: water, fish, gathering areas, transportation, habitation, and sacred/ceremonial areas associated with the River.

1.4 Document Purpose: Synthesis

This document has been prepared by the Yurok Tribe Culture Department for the purpose of identifying ethnographic sources and information to be used in the creation of a final synthesis document for the preparation of Exhibit E of the FERC license application as previously described. It is not to be considered a read-through or stand-alone document, but rather a component of a larger document to be created upon the completion of the ethnographic inventories by each of the five of the participant Tribes. This document will be integrated with the other four tribal studies into a final synthesis document that will be used to identify cultural resource concerns within the Project's APE for the purpose of evaluating the Klamath River as a Traditional Cultural Landscape.

1.5 Regulatory Analysis

The regulatory analysis is a document that will be used in the preparation of the synthesis document for the purposes of assessing the Klamath River's eligibility to the National Register as a Cultural Landscape, or Ethnographic Riverscape. An Ethnographic Landscape (Riverscape) is defined as:

> A land (river)-scape containing a variety of natural and cultural resources that associated People define as heritage resources. Examples are contemporary settlements, religious sacred sties, and massive geological structures. Small plant communities, animals (fish), subsistence and ceremonial grounds are often components (NPS Preservation Brief 36).

The cultural components of the Klamath Ethnographic Riverscape include: water, fish, gathering, transportation, human habitation and ceremonial resources. The regulatory analysis is the framework provided for the purpose of evaluating the significance and integrity of the Klamath Riverscape and has provided the format for the individual tribal reports on cultural resources within the River corridor. It includes nomenclature and information on defining, identifying, and evaluating Cultural Landscapes under the NHPA.

1.6 Methodology

This document was prepared following an outline shared between the five Tribes conducting ethnographic studies and inventories for this process. The outline is based upon the criteria for defining the Klamath Riverscape as a Cultural Landscape as detailed in the Regulatory Analysis. This document includes ethnographic information on Yurok traditional and contemporary culture, archival and published literature, and Yurok oral histories and interviews with tribal elders on the Yurok relationship with the River. The information was reviewed and relevant passages and excerpts have been selected as they relate outline for the Riverscape analysis.

1.7 Document Organization

The format used in this document is based upon the outline developed to provide uniformity to the content and information provided for use in the generation of the final synthesis document.

The sections in this document provide information on various aspects of Yurok Culture in relation to the River. The sections in this document are presented in the following order:

- 1. Introduction. Scope of work, participants, and purpose.
- 2. Yurok Culture. A brief summary of Yurok traditional and contemporary culture as it relates to the Klamath River.
- 3. Ethnographic Literature. A literature review of historic and archival sources on Yurok traditional culture and the Yurok relationship to the River for the purposes of evaluating and defining the Klamath Riverscape.
- 4. Interviews with Yurok Elders. Excerpts from six interviews conducted with Yurok elders on personal experiences on and recollections about the River.
- 5. Conclusion. A brief summary of the relationship between Yurok and the River based upon the sources reviewed for this document.
- Bibliography. A list of reference used to compile this document.

This document should not be considered an authoritative or exhaustive document on Yurok Culture or the Yurok relationship with the River. Rather, it should be considered a cursory overview of published and unpublished sources, oral history, personal experiences, and archival literature as it relates to the scope of this Project, and the limitations in resources (funding and time) allotted for this study under the terms of the contract with PacifiCorp. The Yurok relationship with the River is well established in the information provided in this document, but in reality, the relationship between Yurok and the River is so profound that it cannot be encapsulated or adequately reflected in a document of this nature.

2. Yurok Cultural Values

This section provides an overview of the history of the Yurok Tribe, and examples of the traditional and contemporary relationship between Yurok and the River. It includes information on the political organization and history of the Yurok Tribe, aspects of Yurok language, oral traditions, ceremonial life, traditional life ways, Yurok geography, and contemporary resource use and subsistence as it relates to the River.

2.0 Traditional and Contemporary Culture

2.1 Yurok Culture

PREAMBLE OF THE CONSTITUTION OF THE YUROK TRIBE
Approved by the Interim Council on November 24, 1993

> Our people have always lived on this sacred and wondrous land along the Pacific Coast and inland on the Klamath River, since the Spirit People, *Wo'ge*' made things ready for us and the Creator, *Ko-won-no-ekc-on Ne ka-nup-ceo*, placed us here. From the beginning, we have followed all the laws of the Creator, which became the whole fabric of our tribal sovereignty. In times past and now Yurok people bless the deep river, the tall redwood trees, the rocks, the mounds, and the trails. We pray for the health of all the animals, and prudently harvest and manage the great salmon runs and herds of deer and elk. We never waste and use every bit of the salmon, deer, elk, sturgeon, eels, seaweed, mussels, candlefish, otters, sea lions, seals, whales, and other ocean and river animals. We also have practiced our stewardship of the land in the prairies and forests through controlled burns that improve wildlife habitat and enhance the health and growth of the tan oak acorns, hazelnuts, pepperwood nuts, berries, grasses and bushes, all of which are used and provide materials for baskets, fabrics, and utensils.

For millennia our religion and sovereignty have been pervasive throughout all of our traditional villages. Our intricate way of life requires the use of the sweathouse, extensive spiritual training, and sacrifice. Until recently there was little crime, because Yurok law is firm and requires full compensation to the family whenever there is an injury or insult. If there is not agreement as to the settlement, a mediator would resolve the dispute. Our Indian doctors, ***Keg-ae***, have cared for our people and treated them when they became ill. In times of difficulty village headmen gather together to resolve problems affecting the Yurok Tribe.

Our people have always carried on extensive trade and social relations throughout our territory and beyond. Our commerce includes a monetary system based on the use of dentalium shells, ***Terk-n-term***, and other items as currency. The Klamath River was and remains our highway, and we from time beginning utilized the river and the ocean in dugout canoes, ***Alth-wayoch***, carved from the redwood by Yurok craftsmen, masterpieces of efficiency and ingenuity and have always been sold or traded to others outside the tribe. Our people come together from many villages to perform ceremonial construction of our fish dams, ***Lohg-en***. Our traditional ceremonies -- the Deerskin Dance, Doctor Dance, Jump Dance, Brush Dance, Kick Dance, Flower Dance and others -- have always drawn hundreds, and sometimes thousands, of Yuroks and members of neighboring tribes together for renewal, healing, and prayer. We also have always traveled to the North and East to the high mountains on our traditional trails to worship the Creator at our sacred sites, -- Doctor Rock, Chimney Rock, ***Thklamah*** (the stepping stones for ascent into the sky world), and many others.

This whole land, this Yurok country, stayed in balance, kept that way by our good stewardship, hard work, wise laws, and constant prayers to the Creator.

Our social and ecological balance, thousands and thousands of years old, was shattered by the invasion of the non-Indians. We lost three-fourths or more of our people through unprovoked massacres by vigilantes and the intrusion of fatal European diseases. The introduction of alcohol weakened our social structure, as did the forced removal of our children to government boarding schools, where many were beaten, punished for speaking their language, and denied the right to practice their cultural heritage. After goldminers swarmed over our land we agreed to sign a "Treaty of Peace and Friendship" with representatives of the President of the United States in 1851, but the United States Senate failed to ratify the treaty. Then in 1855, the Unites States ordered us to be confined on the Klamath River Reserve, created by Executive Order (pursuant to the Act of March 3, 1853, 10 Stat. 226, 238) within our own territory.

In 1864 a small part of our Ancestral land became a part of the Hoopa Valley Indian Reservation which was set apart for Yuroks and other Indians in Northern California. This became known as the 12-mile "Square." In 1891, a further small part of our Ancestral land was added when "The Extension" to the Hoopa Valley Indian Reservation was set aside by executive order authorized by the 1864 statute, which created the Hoopa Valley Indian Reservation. This statutory reservation extension extended from the mouth of the Klamath River, including the old Klamath River Reserve, about 50 miles inland and encompassed the river and its bed, along with one mile of land on both sides of the river.

But even this small remnant of our ancestral land was not to last for long. In the 1890's, individual Indians received allotments from tribal land located in the Klamath River Reserve portion of the Hoopa Valley Reservation and almost all of the remainder of the Reserve was declared "surplus" and opened for homesteading by non-Indians. The forests were logged excessively and the wildlife was depleted. Even the great salmon runs went into deep decline due to over-fishing and habitat destruction. In the mid 1930's the State of California attempted illegally to terminate traditional fishing by Yurok people, the river's original --and only -- stewards from Bluff Creek to the Pacific Ocean. Our fishing rights were judicially reaffirmed in the 1970's and the 1980's after many legal and physical battles.

Throughout the first 140 years of our tribe's dealings with the United States, we never adopted a written form of government. We had not needed a formal structure and were reluctant to change. The United States had decimated the Yurok population, land base, and natural resources and our people were deeply distrustful of the federal government. Yet we, the Yurok people, know that this is the time to exercise our inherent tribal sovereignty and formally organize under this Constitution. We do this to provide for the administration and governance of the modern Yurok Tribe that has emerged, strong and proud, from the tragedies and wrongs of the years since the arrival of the non-Indians into our land. Our sacred and vibrant traditions have survived and are now growing stronger and richer each year.

The Yurok Tribe is the largest Indian tribe in California, and, while much land has been lost, the spirit of the Creator and our inherent tribal sovereignty still thrives in the hearts and minds of our people as well as in the strong currents, deep canyons, thick forests, and high mountains of our ancestral lands.

Therefore, in order to exercise the inherent sovereignty of the Yurok Tribe, we adopt this Constitution in order to:

1) Preserve forever the survival of our tribe and protect it from forces which may threaten its existence;

2) Uphold and protect our tribal sovereignty which has existed from time immemorial and which remains undiminished;

3) Reclaim the tribal land base within the Yurok Reservation and enlarge the Reservation boundaries to the maximum extent possible within the ancestral lands of our tribe and/or within any compensatory land area;

4) Preserve and promote our culture, language, and religious beliefs and practices, and pass them on to our children, our grandchildren, and to their children and grandchildren, on and on, forever;

5) Provide for the health, education, economy, and social well being of our members and future members;

6) Restore, enhance, and manage the tribal fishery, tribal water rights, tribal forests, and all other natural resources; and

7) Insure peace, harmony, and protection of individual human rights among our members and among others who may come within the jurisdiction of our tribal government.

(Yurok Tribe Constitution 1993)

From time immemorial Yurok people have lived along the Klamath River from the mouth of the river up to the Karuk boundary. Nearly every aspect of Yurok life, language, ceremonies, society, and economy, was, and continues to be, bound by the river. The River, being so basic that it has no specific Yurok word designation, is euphemistically referred to in its lower stretch as the "Yurok highway". At the mouth of the River, Yurok also refer to the Klamath River as *HeL kik a wroi* or "watercourse coming from way back in the mountains." It is not surprising that Yurok culture reflects a strong connection to the riverine environment. In contemporary times the Klamath River is referred to as "the main vein" emphasizing its comparison to a blood vessel that provides the main flow of sustenance.

The Yurok people are named and live in relation to the rivers and the sustenance that those quality flows provide. Residency, natural and cultural resource sites, ceremonial practices, oral history, transportation route, economic and sociological dependence, indeed the Yurok identity, are all intricately woven into the ecosystems of the Trinity and Klamath Rivers. Of 72 village sites in Yurok ancestral lands, the Yurok continue to live upon many of the 44 village sites that line the Klamath and Lower Trinity Rivers. These are places where Yurok have been born, lived, fished, gathered, prayed and have been buried.

Each generation was taught the appropriate respect for each other and everything in the Yurok World. Respect for the River was of particular importance because Yurok and the River are intertwined with sustaining the balance of life. The River is the main stem of Yurok life ways. Nearly every aspect of Yurok life was and continues to be bound to the River and surrounding landscapes that are defined by the actions of these waters. Yurok people and the River provide important roles in Yurok ceremonies, in defining proper methods for treating the deceased, religiously sanctified methods for taking fish at certain locations, gathering the necessary plant products for the manufacture of Yurok material culture and in maintaining the central transportation route.

A Yurok elder said, "without this river we would not know who we are, where we're from or where we're going." Other Native Americans track directionality based on cardinal directions. In a steep riverine environment with a temperate rainforest climate, the suns' rising and setting points are not accurate ways of tracking time and direction. Instead, the flow of the river is most essential for telling time and direction. River flow rates under natural conditions indicate both seasonality and time of day. The capability to estimate time of day and year is enhanced in the estuary where the river is subject to tidal fluctuations. A good Yurok boatman is rated by his ability to navigate the River in the dark. The boatman does this by correlating the location and swiftness of the current and the back eddy of the river in relation to the sound of the river that is uniquely created in each bend, slick and riffle of the riverine environment. Every type of unique feature of the water's movement and characteristics are named. Even when away from the water directionality is measured by the river flow, requiring people to always know where they are in relation to the river. For example it is not uncommon to refer to burners on one side of a kitchen stove as up or down-river burners.

Not only are the Rivers' fluctuations known by characteristics of water content but is also know by what the water flows additionally provide Yurok people. For example it is known that the spring run of salmon will come soon after the budding of the thimbleberry that grows along the Rivers' courses. It is know that after a good flooding 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. After a flood event, specific gravel bars are searched for new deposits of granite boulders used for porch rocks in Yurok traditional homes. It is known that in a drought year, flooding occurs in the lower portions of the River because of sandbar buildup at the mouth of the River. And for all of these natural occurrences Yuroks know of appropriate ceremonies that officiate the human communication with these river processes.

A Yurok elder recounts how as a boy in the 1920's he assisted in a propitiating ceremony held at the mouth of the River during the summer. He recalls going down river in a traditional Yurok dugout canoe powered by an outboard motor and guided by his father. As they approached within five miles of the coast they noticed that the River was backed up and stagnant because the sand buildup prevented the River from flowing out to the ocean. Prayers and offerings were made on the sandbar. A day later a spirit guardian represented as a large rock granted the request and the

River broke through the sand bar, alleviate flooding, and allowed fish to once again enter the River.

Various ethnographic sources show a wide diversity and abundance of cultural sites located along the River. For example in 1909 the anthropologist Thomas Waterman documented 82 various cultural places, 41 rocks of cultural significance, 97 fishing spots, and 44 villages all located in the river channel, river flood-plane or just above the high water mark. The 82 places are places significant to Yurok history (both historic and legendary), ceremony, gathering, and hunting. In addition to these 264 sites, the Yurok Tribe Heritage Preservation Office has documented approximately 100 additional sites that were either missed by Waterman or have been established since his early century visit to the territories of the Yurok people.

Yurok political organization is highly defined. It was in the past and has been additionally organized by the recently established Yurok Tribal government. It is just that in its traditional forms it is not defined according to the political systems of the clan based tribes to the north or according to U.S. governmental organization. Traditional political organization and the accompanying judicial system is established by Creator's Law, is institutionalized in the Yurok ceremonial system, and the determination of fault and compensation occurs in very exacting ways. Traditional Law operates on principles of payment rather than punitive penalty. It is because this is such an efficient means of political jurisprudence, sanctified by religion that the Yurok people are considered to be the least warlike. In addition, this system of jurisprudence is interrelated with the harvesting of fish through both individual fishing places as well as the annual community construction of the fish dam. As these traditional forms of communal fishing, traditional use of the river and traditional forms of jurisprudence were disrupted by non-Indian intervention so also did Yuroks become involved in the Indian wars of the 1860s and the Yurok fish wars of the1970s. Likewise, the traditional and stabilized living patterns were disrupted and Yuroks began to shift from permanent dwelling lifestyles (with bi annual migrations) to multiple and migratory dwelling lifestyle. These new lifestyles also led to a change of traditional life ways.

2.2 History of the Yurok – European Contact

Historical documents record that the coastal Yurok had initial contact with Europeans as a result of Spanish expeditions spanning the mid 1500s to the late 1700s (McBeth 1950:2; Bearss 1969). Various Spanish-led expeditions and ships came up to northern California along the coast, followed later by American vessels as early as 1803 and 1805 (McBeth 1950:2: Bearss 1969). By 1828, the Klamath River had been documented and visited by ships from Britain, Spain, Russia and America (McBeth 1950:3; Bearss 1969).

First contact between Europeans and Yurok people on the upper Klamath River was documented to have occurred in 1827 when traders for the Hudson's Bay Company traveled downriver in search of furs and trade (Bearss 1969). First contact within the project vicinity occurred in February 1827, when men from Peter Skene Odgen's party encountered Yurok in the Martins Ferry area. While these are the first documented encounters by non-Indians within the upriver areas of Yurok territory, the Hudson's Bay Company party documented the presence of European trade goods being used and sought by Yurok people, indicating prior interaction through trade or travel by Yurok people (Murray 1943:21-24; Bearss 1969; Pilling 1978:140).

In 1828, Jedediah Smith led an American party of beaver trapping men down the Trinity River, to the Klamath and the up the Pacific Coast (Goddard 1904; Bearss 1969; Eidsness 2001:7). As a result of the discovery of gold in the Trinity River, gold prospectors inundated the region by 1848 (Eidsness and McConnell 2001). Upriver Yurok settlements were severely impacted by the

incursion of gold prospectors in the 1850s, resulting in displacement and relocation away from some Yurok traditional villages along the Klamath River (Bearss 1969; Pilling 1978:140).

In 1851 a "Treaty of Peace and Friendship" was signed between the United States Government and the Klamath River Indians under the direction of U.S. Indian Agent Col. Reddick McKee. The United States Congress did not ratify this treaty. Non-Indian incursions and resultant conflict continued and an Indian Agency and military fort were established on the River to mediate the conflict. The Agency was located on the south bank of the Klamath River, in the area known as *Waukel* (also spelled *Wo'kel* and Waukell) across the River from the military fort, Fort Terwer. In spite of the creation of these government posts, gold prospectors, miners, farmers, and settlers continued to encroach on Indian lands, often resulting in conflicts and violence. On November 16,1855, the Klamath River Reserve (also known as the Klamath Indian Reservation) was created by Executive Order (pursuant to the Act of March 3, 1853, 10 Stat 226,238). This Order designated the reservation lands from the mouth of the Klamath River, one mile on each side extending approximately 20 miles upriver to Tectah Creek. The Klamath Reserve was established for several tribes because the treaty of 1851 was not ratified and the military was increasingly called to intervene between miners, settlers and Indians. It was the U.S. intent to move the Tolowa and Yurok onto it, but the Tolowa left soon after they were relocated (Bearss 1969).

In 1855, a letter was written to the Commissioner of Indian Affairs by Special Agent Whipple, the first Indian Agent on the Klamath River Reserve. This letter is important because it clearly describes several aspects of Yurok land use and their relationship to the River. In recommending the reservation boundaries extend five miles away from the River, Whipple recognized the Yurok use of the entire watershed associated with the River. He describes the salmon as "the staff of life" for the Yurok Indians. He also describes the Lower Klamath as the best salmon fishing grounds in northern California. Whipple describes large alluvial terraces along the floodplain of the River that were used to gather a wide variety of plants, roots, and berries for food and supplies (Whipple 1855).

Both Fort Terwer and the Indian Agency at Waukel were destroyed in the floods of 1861 and 1862. As a result of the flood damage the U.S. government abandoned these facilities. The Smith River Reservation, occupied primarily by Tolowa, was created in 1862 to supplement the loss of agricultural lands as a result of the floods. In 1865 the Hoopa Valley Indian Reservation was established with the intent of relocating all northwestern California Indians to this reservation (Bearss 1969; Eidsness 1988:29).

Escalating conflict between Indians and non-Indians over encroachment onto the Klamath Indian Reserve resulted in the gradual displacement of Lower Klamath Indians further upriver during the 1860s and 1870s (Eidsness 1988: 29; Bearss 1969; McBeth 1950:44). In spite of the area being within the boundaries of the Klamath River Reserve, the area was occupied by non-Indians in defiance of the 1855 Executive Order and an 1877 order by the Department of the Interior, that explicitly ordered non-Indian settlers off the reservation (McBeth 1950:46; Bearss 1969). Squatters resisted government attempts to remove them from the reservation and even when evicted by United States soldiers under orders in 1879, they quickly returned to the homes and farms they had established on Indian lands (McBeth 1950:53; Bearss 1969).

In 1891, President Harrison issued an order to expand the existing Hoopa Valley Indian Reservation to include lands one mile on either side of the Klamath River from the Pacific Ocean to the Hoopa Valley, thereby including the Klamath Indian Reserve (Bearss 1969; Eidsness 1988:29). In order to do this, he created the "extension", extending the Klamath River Reserve upriver until it reached the Hoopa Square. The "extension" was established in relation to the

Dawes Act as a ploy to open up much of the land that was not claimed as allotments by resident Indians. Thus began the history of checkerboard ownerships of the Yurok portions of the Klamath Reservation and Extension. The result of Harrison's order was the essentially the creation of a new reservation by combining two existing ones. The new reservation consisted of the old Klamath River Reserve, the "extension", and the Hoopa Square and was referred to in its entirety as the Hoopa Valley Indian Reservation. On June 25, 1892, President Harrison singed a bill passed by Congress to open the reservation for non-Indian settlement. The bill declared all surplus lands open to settlers, "reserving to the Indians only such land as they require for village purposes" (McBeth 1950:48; Bearss 1969). The process of assigning Indian allotments within the reservation took two years. After decades of conflict, the Klamath Indian Reservation was legally opened up for non-Indian settlement on May 21, 1894 for homesteading (McBeth 1950:48; Bearss 1969). As a result, many Yurok people were displaced from their traditional villages along the Klamath River.

After decades of struggle to regain their traditional homelands, the Yurok Tribe was re-organized and granted its own reservation in 1988. As a result of the 1988 Hoopa-Yurok Settlement Act (PL-100-580), the Yurok Indian Reservation was established, comprised of the old Klamath Reserve of 1855 and the "extension" of 1891. The current reservation is comprised of trust land, tribal allotments, fee land, and privately owned land.

Under re-organization the Yurok tribe has emerged as the largest tribe in California, with over 4,500 enrolled tribal members, and over 200 tribal government employees. The Yurok Tribe has a growing tribal population and is actively pursuing economic development and resource management both on the reservation and Yurok ancestral lands. The Yurok Tribe has a Natural Resources Department with the largest governmental fisheries program in the state of California. Other programs include the Yurok Tribe Watershed Restoration Program, devoted to restoring fish habitat, the Yurok Tribe Environmental Program, devoted to establishing and monitoring clean air, water, and land, and the Yurok Tribe Culture Department devoted to preserving Yurok culture. These departments assist the Tribal Council in its work to protect and maintain Yurok values as articulated in the Preamble Objectives of the Yurok Constitution (See page 3). The River continues to be the foundation of Yurok culture, economy, and tradition.

2.3 Traditional Yurok Language

The Yurok language is adapted to the riverine environment. There are numerous words for all aspects of the River's characteristics, rate of flow, back flows, eddies, boils, riffles and slicks, and color. Locations and directions are linguistically identified in relation to the river. For example, *poh* refers to 'down river' and *pech* refers to up river. This is why the original Yurok word denotating the Yurok people is '*Poh lik lah*' or "down river people." Even places away from the river, such as the high country is referenced as "way back from" the River or "*heL kau*." It has been reported that an elderly Yurok woman referred to her stove burners and knobs as the up-river and down river burners, effectively aligning the cook, stove, and house in relation to the directional flow of the river (Hinton 1994).

Language analysis can show the long-term values and emphasis of a people. For example while there is no specific name word for the Klamath River, the word for 'river' is *la yoh,* and translates as "to run" in reference to liquids. Another word for river, *?ume?wo* is in reference to the fish dams that are placed across the river. The English word 'salmon', denoting several types of anadromous fish does not readily translate into the Yurok word '*ne po y*', "that which is eaten." *'Ne po y'* denotes more than 'fish', but also includes connotations of Yurok reverence for a creature that provides sustenance to a people and way of life. Yurok places are sometimes named

after the way the river moves in a particular stretch. For example the town of '*Rekwoi*" denotes the mouth of the river; the town of '*AyoL'* denotes a wide curve in the River and the town of '*Olegel*' denotes a particularly twisty stretch of the River.

2.4 Yurok Oral Traditions

Among the oral traditions are accounts how the River came to flow the way it does, of Yurok ocean travel to the home of salmon, construction of the fish dams, locations and origins of ceremonies held along the River, where the first salmon was created, what is supposed to be done with salmon when caught at certain locations, and in the proper method for transporting a corpse up the River. There are Yurok stories that reinforce the Yurok belief that the River was created in a distinct way in order to provide Yurok people with the best of worlds. For example, *Wohpekumeu* said, "let the river run downstream" and that is how the River came to flow the direction it does. In the story *No'ots*, a young man went out on the River and took his paddle and rode about on the River. That is why it is crooked at *Olege'l*.

When the world was made ready for Yurok to inhabit, immortals (*woge*) who occupied the land and River came together for discussion. There was indecision as to whether the Yurok people should be taught the knowledge of immortality. It was decided that instead the people should know mortality. Those *woge* who felt sorry for Yurok decided to transform into rocks along the River that would help Yurok with the suffering of death. The last journey of the deceased involves a boat trip up-river with ritual stops at various rocks at the River's edge.

The anthropologist Alfred Kroeber traveled throughout the Yurok territory in the early 1900's interviewing various Yurok people and documenting a Yurok way of life. In *Yurok Myths* (Kroeber, 1978), it is obvious that the River was as important to the people from that era as it is to Yurok people now. Out of the 169 stories in Yurok Myths, there are 77 that make direct reference to the River. Yurok words that name places, plants, animals, and things associated with the River are detailed throughout Yurok stories.

When *Wesona-me'getoL* (the one up-above) created the world, the homes of the supernatural and the people were segregated. The ocean *Pish kaL* separated the two homes. The region on the other side is further divided into *tsi'k-tsik-oL* the home of money, culture hero *Wopekamaw's* home, *Pulekuk*, home of gambling, and the home of *Koowetsik*, the dwelling place of Salmon. Salmon and humans were created to interact with one another and accordingly the River was created to provide a zone of interaction. There are Yurok stories that reinforce the Yurok belief that the River was created in a distinct way in order to provide Yurok people with the best of worlds. For example, *Wopekamaw* said, "let the River run downstream" and that is how the River came to flow the direction it does (Kroeber 1978).

The story *The Salmon and Koowetsik* depicts the location of where the first salmon originated (Kroeber 1978). When *Wohpekamaw* first came to the Klamath River, he saw that there was no food for the people. There were only two women who had salmon. *Wohpekamaw* took the salmon from the women and let them go. *Wohpekamaw* said the people would never catch the Great Salmon (*Nepwo*). When *Nepwo* comes up, he will swim in the middle of the River so he isn't caught with the nets. The Immortals (*woge*) only wanted salmon to go up on one side of the River to make sure they knew where they could get salmon. But they never caught anything so they made it so the salmon would come up both sides. A man from the village of *Welkwau* (south side of the mouth of the Klamath River) wanted to learn how to fish at the mouth of the River so he went to *Koowetsik* and asked the headman to show him how to harpoon fish. The headman agreed to show the man from *Welkwau*. When *Nepwo* came through the mouth of the River, the

headman acted as if he was going to spear it. He would make thrusting motions with his spear but not actually spearing it, at the same time, he was praying for more salmon to come up the River.

These ritual actions demonstrated to *Nepwo* that Yurok were sincere in the proper treatment of salmon and *Nepwo* informed the other salmon that it was good to come into the Klamath River. More salmon came up the River. The headman speared some salmon and the man from *Welkwau* saw that he handled the fish in a particular way. The headman explained that if salmon was caught at the mouth, a man was not to use a wooden club to kill it; he was to use a stone to hit it in the head. But upstream from the mouth everyone else would use wooden clubs. If a salmon is caught at the mouth it must be buried with only its tail sticking out. People who use a spear to catch fish at the mouth must practice certain medicine before catching salmon. The lamprey eel was also made at *Koowetsik* and there are certain rules one must follow when catching them. This Yurok story is the explanation for the origin of the first fish ceremony.

In the story *Cappel fish dam or Tsurau man*, a young man from *Tsurai* (a Yurok village near the present day coastal town of Trinidad) longed to be around people (Kroeber 1978). He made a place where he could get woodpecker crests and money *'OL we-tsik'*. In order to get those things he would need to wash his hands in certain springs. While he was sitting near the springs, a stick spoke to him and informed the man to build a sweathouse. After the man built the sweathouse, he came back and the stick had turned into a man whose name was *Tohstek*. *Tohstek* told the man to follow certain rules and he would become rich and would be able to do anything else he desired. The man slept in the sweathouse and began to dream. He dreamed of the Deerskin, Jumping, and Brush ceremonies and he thought that these are the types of things he wants to see. He went to get wood and when he came back to the sweathouse there were ten wooden trunks. Inside the trunks, were all of the things he would need to hold the ceremonies he dreamed about. He traveled up the Klamath River stopping along the way to hold the ceremonies. His final destination was *Cappell*. When he arrived, the people were in the process of building the fish dam but they did not have the proper medicine to finish the dam. *Tsurau* man conducted a ceremony there and the people were able to finish the dam. The headman from *Cappell* gave *Tsurau* man his best boat (*yoch*) so he could return home. Every autumn when the Fish Dam was built, *Tsurau* man traveled up the Klamath River to help the people conduct the ceremony.

These selected oral traditions and corresponding ritual practices, of which there are many more, tell of the Yurok reverence for fish and creator and if adhered to, provide the Yurok with abundance of salmon, and a place for salmon and people to inhabit.

2.5 Traditional Yurok Ceremonies

Fish dams *'?umyo?'* were built in order to make sure there was enough fish for everybody. The *Cappell* fish dam was constructed annually in the early to mid-fall contingent upon the success of the first fish ceremony held in the spring. The dam, built 33 miles up river from the mouth, stretched across the entire width of the River. The dam was constructed with much ceremony, cultural taboo, and inter-village effort. Pens on the weir dam trapped salmon that were then selected for by Yurok fisherman. Fish were selected for subsistence take or allowed to continue up river for the purpose of giving up-river people the chance at the fishery and for allowing spawning to occur. Fish were also procured for trade. The right to take fish from the dam was held by affluent families who then allowed less wealthy people to fish.

After the fish dam was installed and prior to the onset of late fall rains the Jump and Deerskin ceremonies were held. The same affluent and religious people conducted these ceremonies partially to give thanks for the abundance as well as to assure the continuance of that abundance for the next year. As part of the ceremonies, wealthy people were expected to feed salmon to all that attended.

Canoes are important elements in Yurok ceremonial life. An important component of Yurok Ceremonial life is the Boat Ceremony. The boat ceremony is part of the Deerskin ceremony held to thank the Earth and Creator for continued sustenance. In this ceremony, several boats filled with ceremonialists in full regalia traveled down river, making a ceremonial crossing. The ceremonialists thank the River for continuing to flow and providing the pulse of life that sustains the Yurok world. The Boat Ceremony required adequate flows of water at particular times of the year. This is still true today. Therefore, diverting the water chokes the life out of the Klamath River environment. As a result, the Boat Ceremony becomes a hollow ceremony. Currently the Tribes have to call the Bureau of Reclamation (BOR) in order to get increased water flows for holding a Boat Ceremony. This disconnect between nature and ceremony underscore this sense of hollowness. To many it appears that the BOR has placed itself in the role of Creator.

The Brush Ceremony, still held in several of the traditional villages along the Klamath River requires the proper scenic river qualities and the availability of river resources. As a Brush Ceremony unfolds over a four-day period it attests to the wealth that the riverine environment provides. Baskets made of plant materials collected at the water's edge are used to hold food and ceremonial medicine. Acorns, cooked in the baskets, are converted to a nourishing mush that is rendered by placing several hot rocks (cooking rocks), gathered off of specific river bars, into the acorn flour and water that is placed into the baskets. Regalia that adorn the ceremonialists is constructed out of various plant and animal products that the riverine environment provides. Ceremonial bathing in the River and its tributary creeks is a requirement for some of the participants. Ceremonialists also prepare themselves by listening to the River's sounds. While many guests today arrive by car, many more arrive by traditional transportation: boats.

2.6 Traditional Technology and Use

The technological expertise of Yurok people presents a direct link to how and why tools were made. Specific types of implements or devices were made to fit a particular environment and type of fishing. For example, specific types of nets were made for river fishing and other types were made for ocean fishing. Tools or devices were not made simply to take river or ocean resources, but some were created specifically to signify the time of sacred ceremonies. The fixed weir is one such example. The most important Yurok fish weir (dam) is known as the Cappell Fish Dam, which signified the time to hold the Deerskin and Jump ceremonies, which in turn insured the abundance of health and resources for all the people. As described in *Fishing Among the Indians of Northwestern California* (Kroeber & Barrett, 12:1960):

> The weir was an elaborate structure built in ten named sections by ten groups of men, all working under the actual, as well as the ceremonial, direction of one formulist. Each section was built with an enclosure provided with a gate, which could be closed when the fish entered. The fish were then easily removed with dip nets.... All told, the full ceremonial cycle connected with the Kepel dam covered some fifty to sixty days. It was the most elaborate undertaking of any kind among the tribes of this Northwestern California region.

While the Fish Dam allowed for community fishing activities, Yurok fishing technology also allows for individual fishing activities. Landing, lifting, flat, and cylindrical nets are used to take a variety of fish. Trap baskets are used to catch eels. Mesh size was determined by the size of fish taken. Some nets were equipped with trigger mechanisms that trapped incoming fish. River & ocean going boats, nets hooks, lines, rope, sinkers, bait, harpoons, clubs fishing baskets and carrying baskets are just some of the technological adaptations employed by the Yurok to assist in the taking of fish.

One of the most important technological advancements of Yurok culture is the construction of river and ocean goings canoes. Canoes, or *yoch,* were carved from selected redwood trees. The ocean going Yurok canoe was from 30 to 40 feet in length, six to eight feet in width and three feet deep. It could haul up to five tons of cargo (usually seal carcasses) and was customarily paddled by five to 20 paddlers and an oarsman who steered the boat from the back. The oarsman was also the headman or, *poyweson,* who had the financial and persuasive background to coordinate ocean-going expeditions. There are historic accounts of expeditions traveling 180 miles along the coast (Powers 1871, Gould 1968). Canoes were also used for gathering, fishing, and hunting and general travel along the River. River canoes average from 16 to 20 feet in length and are three to four feet in width. Canoes were customarily paddled and/or pushed with a long pole.

In proto-historic times canoes were also rigged with sails. The double ender canoe was introduced for travel on the estuary near the mouth of the River. Double ender canoes introduced by Yurok carvers in the early 20th century are easier to make and could be adapted to the outboard motor. As redwood logs and access to suitable logs for making a traditional Yurok canoe decreased, the Yurok utilized non-traditional boats to continue their use of and travel on the River. As the motorboat was introduced to the Klamath River, motors were also adapted to fit onto traditional canoes. More recently, modern aluminum boats have been designed specifically for use on the Klamath River, these are often referred to as "Klamath River Sleds" because their design allows them to travel well in various River depths and currents. Today the best boatmen of the Lower Klamath River, utilizing various watercraft, are predominately Yurok.

The skill of the Yurok fishermen can be measured by the ability to navigate the Klamath in the dark. Navigation is not done by the stars or cardinal directions, but by correlating the location and swiftness of the current and back eddy of the River with the sounds that are unique to each memorized bend, slick or riffle.

2.7 Traditional Fishing and Gathering

The river is lined with numerous fishing and gathering sites. The river is also lined with numerous gathering areas associated with plants adapted to flow levels of the river. Various plants are used as food and material to make ceremonial regalia, baskets, cloths, houses, boats, nets, and other everyday household utensils. For example it is well known that a specific type of willow root is best gathered in long narrow stretches of the river where the rivers scouring effect exposes the material sought. There are also places along the river where weavers traditionally meet to avoid the hot summer sun and weave together.

A fishing place can be a place where there is good river access, a deep hole, or good back eddy allows for fish to rest on the way up-river. Fishing places are designated fishing areas on the river, a pool, a rock, and eddy. Often times large projecting river rocks both provide such a place for fish and a place where Yurok fishermen can build scaffolds that allow for the establishment of fish netting areas. Fishing places are a form of real property in Yurok culture. Fishing places can be owned; by individuals, families, or a group of individuals. Fishing places are borrowed, leased,

inherited and bought and sold. If shared, each owner has a right to fish there. Some ownership rights at fishing places depend on species of fish caught, salmon, eels, or sturgeon. Others depend on the water level, with individuals owning the right to fish at that place if the River is below or above a certain level. Ownership of a fishing place is not necessarily linked to ownership of adjacent property, as individuals who live away from the River can have ownership in a fishing place. Siltation and changes in the River have always affected the quality and use of fishing places. Some fishing places are abandoned during times when the productivity of a particular place was poor (Waterman 1920:219). Yurok people still recognize this traditional form of resource management and use on the River. Families and individuals continue to use and own rights to fishing places on the River. An entire traditional etiquette and jurisprudence has been developed to regulate the orderly taking of fish.

2.8 Place Names Associated with River

That the River is integral to Yurok Culture and life ways is reflected in the following site estimates compiled from the Yurok Tribe Heritage Preservation files. The Yurok Heritage Preservation Office does not make a distinction between Archeological sites and Traditional Cultural Properties. Instead all places that are important to the continuation of Yurok culture are called sites. Those sites that have archeological components are not those that have artifacts or other evidence of human occupation but rather have evidence of archeological excavation.

Yurok people have place names for numerous features and locations on the River and within their landscape. Many of these place-names were documented in T.T. Waterman's geographical research (Waterman 1920). Fishing places had names, rock out crops had names, villages, trails, and gathering areas all had Yurok names. Place names were often descriptive, others were references to creation stories, or stories about events that had occurred there. The number of place names given to locations on and around the river and surrounding landscape speak to the intimate relationship between Yurok and their environment, as well as their long-term presence within it.

Many of these place names reflect geographic placement in relation to the River. For example the Yurok center of the world is named *Kenek*. A place immediately down-river from the town of *Kenek* is named *Kenek-pul*; '*pul*' translates as 'down-river'. A place up the hill from *Kenek-pul* is named *Kenek-pul hi-won*; '*hi-won'* translates as 'little way up hill'. Another town, named *Ayolth*, denotes a sweeping bend in the River. The village is named after that type bend. The Yurok Village of *Rekwo*i, located at the mouth of the Klamath River, translates as "Mouth of the river." Other examples abound. The word 'Yurok' is a Karuk word for 'down river'. The Yurok people call them selves *Poh-lik Lah*; translated as 'down-river people'. Whether the Karuk or Yurok words are used, it is very clear that a people are named and identify with the river and its particular place in the world.

2.9 Contemporary Culture and History

Traditional ceremonies, either never stopped or recently reintroduced, are the Brush, Jump, Deerskin, and Boat ceremonies. All four ceremonies require a close proximity to the River and the ceremonial meanings integrally link to aspects of riverine health. The First Fish ceremony and the Cappell Fish Dam are currently not held. The death ritual of taking the deceased up river in respect to the death purification rocks still continues for those buried in the traditional fashion. Yurok culture has recently had a resurgence of the traditional stick games, a ceremonial sport that combines aspects of wrestling and lacrosse. The playing fields are constructed on sandy beaches along the river during the summer months and often in conjunction with the Brush dance ceremony.

Traditional gill nets, woven of iris fibers, have been replaced with more durable nylon filament gillnets. Despite the materials that make up nets, the strategies by which fish are taken remain the same with the exception that scaffolds with dip nets are no longer constructed. Fish is the primary food source for those Yurok living along the River. While the Cappell fish weir has not been constructed since the early 1900's, traditionally minded Yurok talk of the possibility of bringing the ceremony and dam construction back as part of the larger movement to revitalize Yurok religion.

Traditional gathering continues, primarily by contemporary basket weavers and despite the increasingly difficult task of finding adequate plant population of good quality. Increased restrictions on accessing private and federal properties, increased timber production, and increased use of herbicides and pesticides have all limited the traditional gatherers' efforts to revitalize traditional weaving.

The River remains the main transportation thoroughfare of the Yurok Reservation. Vehicular travel from one end of the reservation to the other routinely takes two hours. By boat the trip is reduced to one hour. Most Yurok who live along the River own powerboats and pride themselves as keen river navigators and boat mechanics. There is still existent knowledge of traditional boat carving and traditional river-going canoes continue to be produced.

In contemporary times older traditions continue in ways that allow Yurok to maintain lives as participants in dominant social life yet maintain connections to Yurok Culture and the River. Today Yurok speech on and about the River is predominately conducted in English. A Yurok language Immersion Camp is annually held at a campground adjacent to the River and the river provides a basis for the cultural activities conducted that require the participants to engage in traditional Yurok language speech.

Many place names along the River and throughout Yurok ancestral lands continue to retain traditional Yurok names. In addition many old places and newer contemporary places are referred to by contemporary English names that uniquely reference a solely Yurok identity with place. For example the traditional place along the river called *Ha wok* by older Yurok is also referred to as the McCovey Ranch and named after one lineage of a very largeYurok McCovey family. Many non–Yurok people however refer to the same place as the "mouth of Omogar Creek."

3. Ethnographic Literature

The following section is a summary of ethnographic sources on the Yurok relationship with the Klamath River. The categories are thematic (natural features, cultural features, and other features) and the excerpts and summaries tend to be written in the past tense, as they were originally recorded. This section is not intended to be a read-through document, but rather a summary of ethnographic sources to be used in the final synthesis document. The citations are listed in chronological order and at times may be redundant. The redundancy is a reflection of the emphasis placed upon particular aspects of Yurok culture by the ethnographers and anthropologists who documented and published these accounts. It is important to note that not all accounts are accurate, some are in fact contradictory, but they are included as originally published by the authors. Differences in the spelling of Yurok place names and words are due to differences in published accounts, as written by the authors. What is consistent in the ethnographic literature is the significance of the River in Yurok life, and the intimate relationship between the Yurok and the River throughout time.

3.0 Klamath River Ethnographic Landscape (Riverscape)

3.1 Natural Features

3.1.1 Water

Gibbs (1853 reprinted in 1973)
Early accounts by George Gibbs, recorded in the 1800s provide a detailed description of Klamath River and surrounding valley and forests. Gibbs recorded a mixed wood forest of oak, madrone, maple, bay, alder, and near the coast, redwoods that covered the steep slopes leading down to the River. These were broken by broad river terraces on which Yurok settlements were located, separated from the River by extensive gravel bars with very few trees, and no vegetation. He also explained that the natural cycle of the River included periodic high water events in the winter rainy season (up to 100 feet), and partial rises in the spring (runoff), which did not subside until late July (Gibbs 1973:5).

Waterman (1920)
The traditional Yurok belief at the time of European Contact was that the world is a flat extent surrounded by ocean and bisected by the River. The role of the River to Yurok culture was not limited to transportation, but was an integral part of the social network both within Yurok and between their neighbors. Extensive visiting between villages, families and outside villages occurred via the river. Travelers would come from up and down river to participate or attend various ceremonies and gatherings so much that the primary Yurok ceremonial sites include houses for visitors from Hupa and Karok communities. Likewise the Karok and Hupa have houses for visiting Yurok for similar ceremonies. Although each group had its own unique aspects of ritual, language and material culture, the river provided a common cultural framework that was integrated in socioeconomic and spiritual life for all three groups (Waterman 1920:186).

Waterman reported that the Yurok had no name for the River because in Yurok terms, it is the only river. Streams and creeks are often named descriptively, after a character, story or nearby village, or not at all (Waterman 1920:196). (Note: Waterman's conclusion that there was no Yurok name for River is not accurate. The Yurok word for the River is *HeL kik a wroi* or "watercourse coming from way back in the mountains.")

The River is a force to be respected. There were prayers or formulas that were used to speak with the river and with one's boat to perform well in those areas of the river commanding respect (Waterman 1920).

Merriam (1967)
The significance of the River in Yurok culture extends beyond the living to the imagery and beliefs related to the dead. According to Merriam, Yurok believe that the dead travel across the River before arriving at *Cher-rik-kuk*. The spirit travels across the river of the dead in a half-canoe. At the opposite shore, the spirit is met by the other spirits of the dead who check to see if the spirit belongs with them. If the spirit is recognized, it is accepted in *Cher-rik-kuk* (Merriam 1967:176)

Beals and Hester (1974)
In addition to being the primary source of food, the primary means of trade, travel and social networks was the River. Yurok preferred traveling by canoe. They also had a greater knowledge of their upriver neighbors, even those far away, than of their nearer coastal neighbors, in part due

to the rugged landscape, but also due to the fact that the River was the primary route of all trade and communication (Beals and Hester 1974:48-49).

Kroeber (1976)
The significance of the River to Klamath culture and thought is illustrated in Yurok geography. The Yurok had no cardinal directions (north, south, east or west) but instead oriented themselves in terms of the River and flow of water.

"*Pul*" means up river or up stream, "*pets*" means downriver or downstream, "*hiko*" means across the stream, "*won*" means away from the stream and "*wohpe*" means across the ocean (Kroeber 1976:15). The word "*Yurok*" is the Karok word for "downstream". All features of homes and landscape are described in terms of their relationship to the River, either upstream or downstream, towards or away.

The River was considered the center of the Yurok universe, both practically and spiritually. The River provided access to the primary food, salmon. It also served as the primary route for transportation, communication, and trade in an area known for its rugged terrain and dense forests. Trade and social networks between coastal Yurok and River Yurok allowed for the distribution of food and resources between the two groups. Coastal Yurok relied on the River Yurok for salmon, eels, and sturgeon in exchange for shellfish and seaweed. The River connected people between upstream and downstream villages for social and ceremonial gatherings. Yurok culture shares many common features with upriver neighbors, the Karok, Hupa and Klamath River tribes into Oregon. The commonality of culture, art and adaptations indicate that the River was the central unifying feature for these groups. The River provided a common way of life and worldview that existed cross-culturally in spite of linguistic differences, and geographic distance.

3.1.2 Fish

Gibbs (1853 reprinted 1973)
Salmon is the most important item of subsistence. Spring runs would begin in May, and were distinguished by being very rich and fatty. The Klamath River posed no insurmountable obstacles to fish in their annual migration up the river. Salmon runs in the late summer and fall were less rich and fatty, and were often smoked or dried for winter food supply. The fall runs would spawn in the creeks and streams while the spring runs spawned primarily within the main stem of the river (Gibbs 1973:6).

Waterman (1920)
The word for salmon is "*nepu*'" which literally means, "that which is eaten".
(Waterman 1920:185)

Kroeber and Barrett (1960)
Two species of Pacific Salmon dominated the salmon population on the Klamath river, *Oncorhychus tschawytscha*, commonly known as King or Chinook, and *Oncorhynchus Kisutch*, known as Coho or Silver salmon. In addition, steelhead trout were common in the Klamath River, and its tributaries up to Klamath Lake. (Kroeber and Barrett 1960:4-5).

Two annual salmon runs were normal on the Klamath River, in the spring and fall. Yurok called the spring run of Chinook salmon "numi nepui" or true salmon, named after their mythical leader "*nepewo*". This spring run of Chinook is commemorated by the Yurok in their First Salmon ceremony, held in April at the mouth of the Klamath.

The Yurok name for the late summer/fall run of Chinook is "*ohpes*" or summer salmon. This later run could begin as early as July.

The Yurok name for Silver or Coho salmon is "*tsegwun*" or "*tsegun*", meaning silversides, and traditionally ran from September to November on the Klamath. (Kroeber and Barrett 1960:5)

Two species of steelhead were common on the Klamath. The Yurok name for both rainbow and cutthroat was "*tskwol*" and ran in the winter and summer on the Klamath. (Kroeber and Barrett 1960:5)

Sturgeon were limited to the lower Klamath, below the rapids and were not known to occur beyond Ike's Fall, a mile below the mouth of the Salmon River on the Klamath in Karuk territory. Two species of sturgeon, *Acipenser transmontanus*, or white sturgeon and *Acipenser medirostris*, or green sturgeon, were fished extensively by Yurok as they occurred primarily within their portions of the river. (Kroeber and Barrett 1960:5)

The Pacific lamprey eel, *Entosphenus tridentatus*, also migrated up the Klamath all the way to Klamath Lakes. Yurok harvested eel every year and had specialized baskets and nets for catching eel during their annual migration. (Kroeber and Barrett 1960:5).

Bearss (1981)
Numerous accounts by Indian Agents, military officers traveling through the Klamath River area between the mid 1800s through the 1930s reported that Yurok people were self-sustaining due to their reliance on river resources, primarily salmon. Even though they were considered poor, they were not dependent on government commodities and support, as many other Native communities had become. This was attributed to their ability to maintain their subsistence practices of gathering and fishing. The annual reliance on bountiful salmon runs, and the ability to harvest for storage, and trade for other necessities enabled Yurok people to maintain their traditional way of life in spite of many disruptions and loss of land. In the late 1800s commercial fisheries were established at the mouth of the Klamath River. Although the tribe challenged the legality of these fisheries, the fisheries and canneries persisted. Eventually the commercial canneries near the mouth of the Klamath provided jobs and income for Yurok people. The 1934 U.S. government's decision to ban all fishing on the Klamath river, and closure of the canneries were devastating to Yurok people who relied on the annual salmon runs for their subsistence needs as well as their economic survival (Bearss 1981).

Perry (1988)
Trade and exchange within Yurok territory relied on fish, and they type of fish and where they were caught. For instance, fish caught near the mouth of the River had a higher fat content than those caught upriver. For this reason, the dried fish from the mouth of the River are considered to taste better and are a desired trade item for people who live upriver (Perry 1988:13).

3.1.3 Gravel bars

Gibbs (1853 reprinted 1973)
Early accounts by Gibbs of the River corridor, describe extensive gravel bars along the flood plain of the river separating the broad terraces where the Yurok villages were located from the river. Gibbs describes these gravel bars as devoid of vegetation, apparently stripped away during the peak flows of the winter (Gibbs 1973:5).

3.1.4 Rock promontories/rock canyon walls

Gates (personal communication 2003)
Just as children are born into the Yurok world by being introduced in various ways to the River and the culture that surrounds the riverine way of life, so do the elderly depart from this world via the River and it's features. Rocks located in the River and at its edge are spirit people who guide Yurok knowledge concerning proper burial procedures. The deceased last worldly journey is a boat ride up-river. At each of eighteen rocks from the mouth up to Slate Creek and up the Trinity, various burial rites and proscriptions are observed to assure the best departure for the deceased as well as those that remain in this world. There are several rocks in the mid section of the River that contain rare petroglyphs that indicate instructions from the Creator to the Yurok people. One such instruction is a warning that when the River stops flowing it will mark the end of the Yurok world. Some elders have prophesied that the manipulation of water flows through the dams is the beginning of the end for Yurok culture.

3.1.5 Willow/riparian

Kroeber (1976)
New shoots of willow were gathered every year from the riparian areas of the River for basketry materials. The normal cycle of the river would wash out the willow in the high water periods and allow for new shoots to grow every year.
(Kroeber 1976:90).

3.1.6 Riverside vegetation

Gibbs (1853 reprinted 1973)
The banks of the Klamath River were used by Yurok as gathering areas for various edible plants such as berries, and grass seeds that were gathered and stored for winter foods (Gibbs 1973:9).

Kroeber (1976)
Wild tobacco, *Nicotianas*, occurs naturally on sandy bars adjacent to the River but was not utilized by Yurok for smoking for fear that it had grown in association with burials (Kroeber 1976:88)

The riparian zone of the River is the source of many materials used for Yurok basketry. Young willow shoots were harvested along the riverbank. Many roots were collected from the banks of the river, which allowed access to the roots without harmful digging and damage to the trees. Pine, redwood, and spruce roots, in addition to willow and grapevine are basic basketry materials used in basket weaving (Kroeber 1976:90).

O'Neal (1995)
Tree roots for basketry were gathered and prepared along the River. Near the coast, redwood and spruce roots were gathered. Upriver, primary roots collected were sugar pine, alder, will, cottonwood and wild grape (O'Neale 1995:17).

3.1.7 Upslope vegetation

Gibbs (1853 reprinted 1973)
Many berry bushes grow on the banks of creeks and tributaries flowing into the Klamath River. These include salmon berry, huckleberry, gooseberry, sallal, currant, and grapes. Further upslope,

filberts and acorns could be gathered, along with several species of fungus, and edible roots (Gibbs 1973:9)

Beals and Hester (1974)
Gathering areas located near Yurok villages were not privately owned, but hunting and snaring places were. Beyond a one-mile distance from villages, most areas were not owned but were open to use by anyone. Plants that were gathered for food in areas above the River included "Indian potatoes" or bulbs (*hr'Lkr and otoi'*), grass seed (*legeL*), wild sunflower (*petso'lo*), clover (*kla'po*) as well as acorns (Beals and Hester 1974:58)

Kroeber (1976)
Hazel shoots are the primary basketry material used for the warp of a Yurok basket. Traditional burning of hillsides containing hazel patches occurred annually and the new shoots would be harvested and used for basketry. Other upslope vegetation used for basketry includes bear grass, black maidenhair fern, giant fern, and woodwardia for color and designs created by twining techniques.

3.2 Cultural Features

3.2.1 Ceremonial

Curtis (1924)
Yurok held an annual ceremony for the purpose of "cleaning off the earth". They also held a salmon ceremony at the beginning of the spring run. People traveled from far and wide, often on the river to attend and participate in these ceremonies. Some of the Brush, Deerskin and Jump Ceremonies were conducted on the shores of the Klamath River. In these instances, the river bar was a vital feature of the ceremony (Curtis 1924:61-63).

Yurok settlements along the River fell into three ceremonial clusters. From Bluff Creek down to Tule Creek (*Atsepar* to *Kenek*), the confluence of the Trinity and Klamath Rivers at *Weitspus* was considered the central location for ceremonial matters. Similarly, from *Merip* to *Erner*, *Kepel* was the central ceremonial location. *Rekwoi* was the ceremonial center for villages from *Turip* to the Pacific Ocean (Curtis 1924:40)

Bearss (1969)
Yurok ceremonies were designed and performed with the intent of restoring, renewing and maintaining world order. General George Crook, stationed at Fort Terwer, recorded a yearly ceremony associated with the construction of the Kepel fish weir, at which all wealth was displayed publicly and all past feuds and conflicts of those in attendance would be erased (Bearss 1969:5).

Kroeber (1976)
The ceremonial calendar of the Yurok was tied to the River. The First Salmon ceremony occurred at *Welkwau* and the Fish Weir at *Kepel*. The ceremonial calendar for Yurok began with the first salmon run in April and concluded in late September near the end of the fall salmon run. The ceremonial cycle of the Yurok was for the purposes of world renewal or purification to ensure good health, prosperity, and abundant food for the people (Kroeber 1976:53). In each of the world renewal ceremonies, the Brush, the Deerskin, and the Jump ceremonies, the River served an important function, either for transportation, or purification.

The River played an important role in Yurok funeral rites and purification rituals associated with death and the dead. Certain rock features in the river were associated with the proper handling of a corpse and require strict adherence. At some localities, mourners purified themselves after burial, a custom that is still practiced today (Kroeber 1976:68-69)

Kroeber (1978)
Out of the 169 stories in *Yurok Myths*, there are 77 that make direct reference to the River. For example the Yurok word *'ne po y'* is loosely translated as "salmon." Closer linguistic analysis shows that the word is more accurately translated as "that which we eat." *'ne po y'* denotes more than 'fish', but also includes connotations of Yurok reverence for a creature that provides sustenance to a people and way of life. Yurok words that name places, plants, animals, and things associated with the river are detailed throughout Yurok stories.

3.2.1.1 Grounds

Waterman (1920)
Yurok ceremonies were held only in certain towns. The Deer-skin Ceremony was only held at *We'itspus* (Weitchpec) and *Pe'kwan* (Pekwan), and the Jump Ceremony was only held at *We'itspus*, *Wo'xtek* (Wautec), *Re'kwoi* (Requa), *Ore'q* (Orick) and *Oke-to* (Waterman 1920:203-204).

3.2.1.2 Boat ceremony

Bearss (1969)
The River has a vital role in both Jump and the Deerskin ceremonies. In the Jump Ceremony, two large canoes are used for a boat dance that marks the climax of the ceremony. In the Deerskin Ceremony held at *Wetlkwau*, ceremonialists from *Turip*, *Rekwoi* and *Wetlkwau* would dance in several canoes as they approached *Rekwoi* (Bearss 1969:6). Boat ceremonies are still practiced today.

Gates (personal communication 2003)
The Yurok Tribe re-introduced the Boat Ceremony on the Klamath River at Weitchpec in 2002. The water level and river flow are critical elements of this ceremony. If there is not enough water in the River, it disrupts the ceremony by causing an unpredictable current. This occurred in 2202 and was attributed to low water causing a centering problem for the boats when they hit the rocky bottom and went off course. The Boat Ceremony in many ways represents the significance of the River in Yurok Ceremonial life and world view.

3.2.1.3 First Fish

Roberts (1932)
An elaborate ceremony marked the passing of the first salmon up the Klamath River. This salmon was allowed to pass all the way up the River to its spawning ground. It was believed that this fish would leave its scales at each spawning location for the fish that would follow it up stream. It was believed that by allowing the first salmon to pass through the River, an abundance of salmon would follow (Roberts 1932:286).

Waterman and Kroeber (1938)
The first salmon in the River each year was considered taboo and would cause convulsions and even death if eaten. The purpose of the first salmon ceremony was to lift the taboo from the fish passing upstream allowing them to be eaten without harm.

Spott and Kroeber (1942)
The first salmon rite held at the Yurok village of *Welkwau* is associated with the Yurok story of *helku wenekuni ne'pui* "the salmon spearing from shore".

> This rite concerned the spearing of the first spring salmon (*ne'pe'wo*) in the seventh month (*tserwerh'sik*); as the year began with the winter solstice, this would be about June-July. Beginning with the first month until this seventh month no salmon caught at the mouth of the River were allowed to be eaten. They said that if one ate them he would bleed to death. Only the aged, men and women of sixty or sixty-five or older, might eat them. The rule applied only to salmon; sturgeon, lamprey eels, surf fish and candlefish could be caught and eaten at all times.
>
> The mouth of the River was defined as ending at *Tmeri Wroi* (Cannery Creek), between the Indian town of *Rekwoi* an the modern American town of Requa. If a salmon came ashore right across the mouth of Cannery Creek, its upriver portion, whether head or tail, might be eaten but the down river half of it was not touched. This law, however, did not mean that people in *Rekwoi* and *Welkwau* had to do entirely without fresh salmon during the first six months. They could eat them, provided they had been caught above Cannery Creek and then brought down to the settlements at the mouth
>
> (Spott and Kroeber 1942:172)

The first salmon rite is a complex ritual surrounding the start of the salmon run. In this ritual the first salmon is allowed to pass up the River unharmed. The ritual spearing of the next salmon up the river, and the ceremony that follows marks the beginning of the fishing season at the mouth of the river (Spott and Kroeber 1942).

Bearss (1969)
General George Crook reported that those who attended the annual ceremony at Kepel Fish Dam would have all past blood feuds erased. The weir was built in ten named sections by designated groups of ten men (Bearss 1969:5).

Morris (n.d.)
Salmon defined the Yurok relationship to nature and life. The First Salmon ceremony is a common feature of all salmon based cultures in the Pacific Northwest, and was an important aspect of Yurok ceremonial life. A single salmon in the River was considered "proof of Nature trying to fulfill an agreement that was made in the beginning of time between the River, the Ocean, the People and the Creator" (Morris n.d.: 1)

> In the very beginning of time, the ocean, the River, the salmon, the original people of this land, and the True Creator, all agreed to something. The Ocean, the River, the salmon, and the True Creator all agreed the salmon should come up the river and feed the people. Human beings agreed to do our part, with our First Salmon Ceremony. The void we create in the world when we take these salmon from the River to feed the people, we fill with our respect. This salmon, lying here, is proof that Nature is still abiding by that original agreement. It is up to you to decide if you will carry out your part. You can never say you don't have proof of Nature's commitment to do Its' part. We will build a fire and cook this fish. It will become a part of you.
>
> (Doc Thompson as retold by Calvin Rube, Morris, n.d.: 1-2).

The bones of the fish that were eaten in the First Salmon Ceremony were thrown back into the River where they turned back into fish, and swam away (Morris n.d.: 4).

3.2.1.4 Fish Dam ceremony

Gunther (1928)
A ceremony marking the arrival of the first salmon of the year is a common cultural practice in the Pacific Northwest. The ceremony is not, however, practiced everywhere where salmon is caught. When the first salmon comes upstream the catch of this fish is ritually celebrated through ceremony, although not all ceremonies are alike (Gunther 1928:135). The knowledge of the salmon ceremony is similar between the Karuk, the Hupa and the Yurok indicating a shared ceremonial pattern. The Shasta did not hold the same ceremonies as the Yurok, Hupa and Karuk but they did participate in these activities even if they did not conduct them (Gunther 1928:144).

The ceremonial eating of the first caught salmon is a common feature in all first salmon ceremonies. In Yurok, Hupa and Karuk cultures the first salmon caught was eaten by the medicine man (or formulist) and his assistant (Gunther 1928:148). Throughout the Pacific Northwest, salmon are believed to be people, who live similar lives to those on land, while out at sea. The salmon have a chief or leader who leads them upriver and it is this being that is honored in the ceremony. Proper respect for these beings must be demonstrated in preparing and conducting the ceremony in order to insure an abundance of salmon in the annual run (Gunther 1928:150). In the Yurok ceremony, the story of the salmon leader, and his return to the sea is recounted (Gunther 1928:152).

Van Stralen (1942)
"To dance in the fish dam ceremony you must go through awful hardships" (Van Stralen 1942:81).

"The fish dam used to be made every year. It is part of the White Deerskin Dance and is always built before the dance" (Van Stralen 1942:81).

"Every year when it is time to build the dam and hold the dances (White Deerskin, Jumping and Brush dances) they would send word up and down the river, even as far as Trinidad, for all the people to settle their quarrels and come and take part in the ceremonies and dances. Some of the people would camp at *Kepel* and some at *Sa'a*, where the chief, who had charge of the ceremonies would stay" (Van Stralen 1942:81).

"There were many people camped all around where we were, five different kinds of Indians. They all wanted to join in the big time we had. All the different people at the camps were asked to join in the dancing. It did not matter what village they came from nor what kind of Indians they were" (Van Stralen 1942:83).

"They all visited from camp to camp, and some from far off could not speak one another's language, so they talked with their hands, sign talk. The visiting Indians brought with them great baskets heaped full of good things to eat-acorns, hazelnuts, berries, dried fish, seaweed and lots of other things" (Van Stralen 1942:83).

The fish dam was allowed to operate for ten days and people could take as much fish as they wanted. After ten days the people assembled at the dance ground and the strict rules were lifted. The fish dam ceremonies followed. The next day, the ceremonial grounds were cleaned off and prepared for the White Deerskin ceremony to begin. The Fish Dam ceremonialists remained in

the fish camp and were allowed to eat and play without restrictions. They remained at the camp until the next heavy rain washed the fish dam away (Van Stralen 1942:85-86).

3.2.1.5 Bathing

Curtis (1924)
Ritual bathing in the River is an integral part of most Yurok ceremonies and is particularly important in the handling of a corpse, preparation for burial, and purification after burial (Curtis 1924:43). The purification through bathing in the river of those who have handled a corpse and prepared it for burial is still an important practice in Yurok tradition.

Van Stralen (1942)
During the fish dam ceremonies at *Kepel*, young girls were selected by the medicine man to participate in the ceremonies. Once selected, they were sent to the river to bathe and then were dressed in full regalia they would wear during the ceremonies. Then they were sent home to their families, and were required to fast and bathe in the river every day (Van Stralen 1942:83-84).

3.2.1.6 Visual

Gates (personal communication 2003)
Visual components of the River are related to traditional Yurok forms of meditation. Medicine women would meditate on specific locations on the river, at specific points in the river, at certain times of the day. In this way both water quality and flow pattern were important aspects of this meditation.

3.2.2 Fishing Places

Waterman (1920)
Fishing places were considered real property. The primary form of fishing was using a dip net in a deep hole or eddy that would form naturally behind a large rock or boulder in the River. A scaffold or platform would be built to access the fishing hole, and are called in Yurok, "*kworl*". Fishing places were considered to be owned by individuals or families. They could be sold, traded, or passed on to others. The value of the fishing hole would be based upon its productivity, how many fish could be caught there in terms of Indian money (dentalia). The value of the fishing place would fluctuate depending on its condition as it would be impacted by annual river flows that could cause gravel or silt to alter its productivity (Waterman 1920:219)

Fishing places could be shared between individuals who negotiated turns and shared equipment. A very good fishing place might be owned by five to ten men, who would rotate days and times of day to fish. Others fishing places were owned by one person for salmon, and another person for eel or sturgeon. Another fishing place might be owned to a certain water level, with one owning the right to fish when the water was above or below a certain level. Some fishing places might be abandoned due to siltation or some other factor that made it undesirable. If left abandoned so long that the owner was forgotten it could be claimed by a new owner. The Yurok word for that kind of fishing place is "*weq sisiik*". It was generally accepted in Yurok culture that all fishing places along the river were owned by individuals, families or groups of individuals who had the primary right fish there (Waterman 1920:220).

Waterman (1920) documented a total of 94 Yurok fishing places on the Klamath River. Each of these sites had a name and an identified owner or owners. The distribution of these sites on Waterman's maps indicate a gap in his own field data as he notes only one fishing site existing

down river of *Turip*, near the mouth at *Rekwo*i. Contemporary ethnographic information, as well as oral history indicates that there are numerous Yurok fishing sites between *Rekwoi* and *Turip* that were not included in Waterman's inventory. Instead his field data appears to have been collected for areas upriver from *Turip* with the majority recorded between Cappell Creek and *Weistpus* at the mouth of the Trinity River.

Roberts (1932)
While fishing places were owned, those who did not have a fishing place could work for the owner in exchange for some of the fish caught there. In this way it was possible for all Yurok to participate in the annual fishing season, and receive a share of the harvest, even if they did not possess a fishing place of their own (Roberts 1932:287).

Kroeber and Barrett (1960)
The best fishing places on the River were privately owned by single individuals, or a group of individuals who rotated fishing at a specific location. Fishing places were recognized as personal property and could be sold, given away or passed on by inheritance. Fishing rights on the River extended beyond the Yurok who lived in river villages. For instance, Yurok who lived in coastal villages away from the River were still recognized as having ownership of fishing sites on the river. (Kroeber and Barrett 1960:3)

Specialized methods for harvesting fish and eel from the River were utilized to maximize the success of fishing at different localities on the river. Specific attributes of the river, riffles, shallows, eddies, falls, deep pools, and creeks each had unique attributes for which the Yurok developed specialized equipment or fishing methods to ensure a successful harvest.

Riffles: harpoons and gaffs were used along with specialized traps.

Shallows: fish weirs were often built in these areas, with impounding pens for spearing, dip netting, gaffing and trapping. Kepel fish dam was in one of these areas on the Klamath.

Eddies: platform fishing with triggered lifting nets were used in these areas.

Falls or cascades: plunge nets, traps, harpoons, and gaffs were used to harvest fish that were trapped below these natural river features.

Deep pools: diving, bow and arrow, snaring, poisoning and sturgeon riding were used in these still and deep areas of the river.

Creeks, streams and tributaries: short fish weirs, basket traps, and hook and line fishing techniques were common in these areas.

Lamprey were harvested by use of lifting nets, dip nets, and basketry eel traps, gaffs and hand catching in certain areas. (Kroeber and Barrett 1960:8)

Fishing techniques were highly specialized to take advantage of specific characteristics of river morphology, as well as species behavior in their annual migration up the Klamath River. The importance of these river resources for Yurok people, and other Klamath River tribes is evident in the complex fishing methods, schedules, rituals and the use of specialized equipment and technique for each species. (Kroeber and Barrett 1960:8)

Bearss (1969)
Several individuals might own a fishing place, which they used in rotation for one or more days according to their share of ownership in the site. Establishing a new fishing place, or fishing below an existing hole was not allowed. Ownership of existing fishing places was an economic matter, allowing for sale, trade or inheritance. This strict management of fishing places guaranteed the value and the viability of existing fishing places owned by individuals, groups, or families (Bearss 1969:3).

Lampreys, sturgeon and salmon were staples of the Yurok diet. Lamprey eels were prized for their grease. Lampreys and salmon were slit for drying. Most were smoked and stored in baskets. Specialized nets were made for each type of fish, with each requiring a specific web and strength. Fishing techniques included netting and harpooning depending on the species and the water conditions on the River (Bearss 1969:9).

Perry (1988)
Yurok fishing practices were severely impacted by several historical events following white settlement. In the late 1800s commercial fisheries and canneries opened at the mouth of the Klamath River. Many Yurok relocated in order to work at these canneries. The harvesting practices of these commercial fisheries resulted in the depletion of the resource so that the commercial fishing, and the use of gill nets were outlawed in 1934. This included Indian fishing, and literally blocked access to a traditional source of food, as well as the core of the Yurok economy. In 1970 a federal court ruling allowed for Indians to once again use their gill nets and sell their fish, but the Bureau of Indian Affairs (BIA) defied the order and banned Indian fishing in 1978. When Indians protested the illegal closure, conflicts and violence between Indian fishers and the BIA followed. The BIA closure lasted ten years, during which time traditional Indian fishing practices were deemed illegal and subject to arrest, fines and punishment by the BIA. In 1987 commercial fishing near the mouth of the Klamath resumed. Traditional Indian fishing is now regulated at the mouth, and the commercial fishing season is relatively brief (Perry 1988:13-14).

3.2.2.1 Net setting

Kroeber and Barrett (1960)
Specialized nets were designed and used by Yurok to take advantage of unique features in river morphology, flow and current on the Klamath.

Conical nets, or lifting nets, were constructed by attaching a woven conical net, or pouch onto a large A-frame of poles and was usually operated from a platform or scaffold built over an eddy or backwater where salmon would congregate, or rest, before proceeding with their upstream migration (Kroeber and Barrett 1960:32). These types of nets were used to catch salmon, lamprey and sturgeon. The weave of the net was specifically designed for each type.

The construction of a large, A-frame dip net was ritualized, requiring special songs and prayers as well as technique. The singing that accompanied the making of such a net was called "*Rekwoi*" (the same name as the Yurok village at the mouth of the River), translated by Kroeber as "entering from the ocean". The setting of the net in the River is also ritualized and if done improperly, is assumed to have a negative result on the harvest at that site (Kroeber and Barrett 1960:35).

Other types of traditional fishing nets were conical dragnets, drifting nets, plunge nets, scoop nets, arc nets, seine, gill nets, drift nets, and hoop nets. Each were designed and constructed to work with a specific feature of river morphology or current, or species.

Net making was also highly specialized, with specific types of nets and uses determining the materials to be used in construction, as well as the type of weaving technique used to make them. Coarse ropes were traditionally made by twisting grapevine and strips of willow bark and hazel withes. The finer netting was traditionally made from iris leaves, *Iris macrosiphon*. The individual leaf of an iris would produce only two fibers approximately one to two feet in length. The fibers were extracted from the leaf by women and rolled and twisted into a strong cord. The thickness of the cord was determined by the type of net being made and the appropriate number of fibers were used to obtain the desired thickness. The iris used to make these nets was harvested from high elevation sites in mountainous areas away from the river (Kroeber and Barrett 1960:57).

Traditionally, men were responsible for weaving and making nets used for fishing. This was considered a winter activity. The making of a net was also ritualized, and care was taken not to pass behind a weaver or speak loudly in the presence of a net being made, lest the salmon hear it and avoid the net (Kroeber and Barrett 1960:58).

Net making was a complex undertaking and required a specialized tool kit for various aspects of construction. Shuttles used for weaving were made from elk antler. Mesh measures were used to ensure that the weave was uniform and consistent throughout the net and were also made from elk antler. Some wood and bone meshes have been observed, but elk antler was considered to be the most desirable material (Kroeber and Barrett 1960:63).

3.2.2.2 Scaffolding

Kroeber and Barrett (1960)
The platform of scaffold built for fishing was a "combination gangplank and operating platform built out over the River". They were usually constructed from one or two planks and the necessary number of poles that extended from a rocky shoreline. Fishing platforms were specifically designed for a particularly fishing place, varying in size and construction (Kroeber and Barrett 1960:33).

Bearss (1969)
Scaffolds were built and used to support lift nets and dip nets used by Yurok fisherman on the river. Scaffolds were built out over the river, usually over an eddy or backwater. Fisherman would sit on a small wooden stool and operate the net from the scaffold (Bearss 1969:8).

3.2.2.3 Eel basket

Kroeber and Barrett (1960)
Basketry traps were primarily used for catching eels. These "eel pots" were woven from undressed withes of hazel or willow in a plain-twine technique. These large open weave baskets have a small opening for the eel to fit through. Bait would be set inside the trap and it would be placed and secured in the stream using a stake and rope to hold it in place. Historic records indicate that the Yurok use of an eel basket or eel pot was adapted after observing their use by displaced Wiyot who settled in *Weitspus* (Kroeber and Barrett 1960:71).

3.2.2.4 Fish weirs/dams

(Gibbs 1853 reprinted 1973)
The fish weir at *Heyomu* or *Lo'lego* was described by George Gibbs, a member of the McKee treaty expedition in 1850. Gibbs described a large fish weir, of elaborate construction crossing the entire width of the river at a village called "*Hai am mu*". Gibbs recorded that the fish weir was in use between June-July in 1850.

Curtis (1924)
The building of a fish weir was overseen by a Yurok ceremonialist. He conducted no physical work in the construction of the weir, but conducted ceremonies and offered prayers while it was being constructed by others. Two fish weirs were built by the Yurok on the River; one at *Lo'olego*, located two miles above the Trinity, and one at *Kepel.* The ceremonies at Kepel included visitors and participants from *Wa's'ai'* down river to *Wakhtek.* People from villages up river of the weir were allowed to come down to watch the ceremonies and to harvest as many fish as they needed (Curtis 1924:40)

Roberts (1932)
Salmon were allowed to pass up stream for half a moon before they were caught. The fish weirs were built at the peak of the salmon run, after many had already passed upstream to spawn (Roberts 1932:290). Most of the entire spring run was allowed to pass upstream, with fishing limited to what was needed. The late summer or fall sun was the one that was extensively harvested for drying and storing for winter months (Roberts 1932:290)

Fish weirs were considered community projects in which entire villages were entitled to a share of the harvest. Small fish weirs were made on streams and creeks by constructing a barrier made of green poles and filled with brush and rocks, leaving an opening to allow fish passage. The two Yurok fish weirs, at *Lo'ogelo* and *Kepel* were major feats of construction, ceremony and cooperation. The families that had primary fishing rights at these locations were allowed to take their share of fish each morning, and then the rest was open to those who had no fishing privileges to share the rest. People came from all villages up and down river to take part in the *Kepel* Fish weir harvest every year (Roberts 1932:288)

Waterman and Kroeber (1938)
The Kepel Fish Dam was a weir that was constructed every year near the mouth of Kepel Creek. People would begin gathering at *Kepel* and *Sa'a* in the early summer. In a collective effort they would build a complex fish weir of poles, logs and small stakes that extended across the entire width of the River. It was an effort that required many men and great skill to complete. The fish weir consisted of a fence of poles and stakes set into the bed of the stream and supported to hold up against the strong current of the river. A series of openings were left in the fence in order to allow fish to pass through and into holding pens where they could be easily removed with hand nets. The entire endeavor was a combination of ceremony and ritual, being built in ten days and operated only for ten days before being torn down (Waterman and Kroeber 1938:49-50).

The construction of the weir was highly ritualized, ceremonial and symbolic blending the mythological, the spiritual and practical aspects of its construction and the ceremony leading up to its completion and use. Traditional tools of stone pounders and elk horn wedges were used to make and set the stakes and construct the weir. Each day's work was closely monitored and each day a specific amount of supplies was ordered for use in the next day's work. It was taboo for travelers to see the unfinished structure, and they were told not to look upon it or else it would spoil it. The entire construction could take ten days, not more or less. At the end of each workday

the people would return home in their canoes. On the trip home a men would conduct a Boat Ceremony and songs of the fish dam would be sung "*wi lo'gonewol*" (Waterman and Kroeber 1938:60). When finally completed the two sections of the weir was pushed out from either shore and joined in the middle of the River. The two sections extended diagonally upstream in a V-shaped form and were secured together completing the structure. This event was celebrated by the a collective cheer of "We are so glad!" (Waterman and Kroeber 1938:58)

Ten gates were built into the dam, each one leading to a pen or corral for the fish on the upstream side of the structure. The men who participated in building a pen shared the fish that were trapped in it. The final day was marked by many ceremonies, dances and singing. The final ceremony at the fish weir was a Deerskin Ceremony. People came from all over the region to participate in these ceremonies and activities at *Kepel* (Waterman and Kroeber 1938:61).

Kroeber and Barrett (1960)
In historic times, the Yurok constructed two elaborate fish weirs, or fish dams, on the Klamath River. Prior to non-Indian contact four fish weirs (presumably the *Turip*, *Kepel*, and *Hyeomu* or *Lo'lego and Kerernit* fish weirs), were constructed annually by the Yurok on the Klamath River. (Kroeber and Barrett 1960:10)

The *Kepel* (Cappell) fish weir was built annually just above the mouth of Cappell Creek, three or four miles down river from Kanick Rapids (*Kenek*). This fish weir was constructed as part of an elaborate Yurok ceremony, and marked the start of a Deerskin Ceremony and Jump Ceremony. The weir was built in later summer, between August and September. (Kroeber and Barrett 1960:11).

Yurok tradition tells of the first fish weir being built at *Turip*, about 20 miles downriver from *Kepel*. The story says that the people from *Kepel* came and took the fish weir and the ceremony from *Turip*. *Turip* people traveled up to *Kepel* with the intent of reclaiming both, but after witnessing the *Kepel* ceremony decided instead to transform into redwoods and watch over the ceremony and the fish weir. This story is incorporated into the *Kepel* Fish Weir ceremony and the Guardian Trees remain important cultural and ceremonial figures in Yurok tradition. (Kroeber and Barrett 1960:11)

The cultural significance of the *Kepel* Fish Weir demonstrates several key features of Yurok culture and Yurok identity in relationship to the Klamath River. The construction of the *Kepel* Fish Weir integrated traditional ecological knowledge, spiritual belief, and social organization into a single, elaborate world-renewal ceremony (Kroeber and Barrett 1960:12). The weir was an elaborate structure built by ten men over ten days under the direction of a spiritual leader, or formulist. Yurok people from numerous villages came to participate in the Kepel Fish Weir including: *Tekta, Woxkero, Kootep, Pekwon, Yoxter, Sregon, Meta, Nohtskum, Murekw and Kepel*. Curtis (1924:40) noted that the villagers from *Was'ai* to *Wohtek* participated in building the weir, but people living above it were allowed to come and harvest all the salmon they wanted while the fish weir was in operation. (Kroeber and Barrett 1960:12-13).

The fish weir, once finished, was operated for ten days during which large quantities of salmon were harvested. After ten days, the fish weir was dismantled, allowing the remaining salmon to continue their migration upriver. The *Kepel* Fish Weir illustrates the Yurok integration of ceremonial and practical aspects of the harvesting of river resources (Kroeber and Barrett 1960:12).

The fish weir at *Heyomu* or *Lo'lego* was last constructed and used in 1868, but was discontinued due to the damage done to the area by hydraulic gold mining methods (Kroeber and Barrett 1960:17).

In both the *Kepel* and *Lo'lego* fish weirs, river morphology was important. A wide, shallow portion of the river, and a gravel bottom that allowed for the setting of stakes for construction were considered to be the primary features of river morphology needed to create a fish weir. Fish weirs were designed and constructed to block fish passage up river and instead route fish into holding pens where they could be easily harvested by using nets or spears (Kroeber and Barrett 1960:17)

Kroeber (1978)
In the story of The *Lo'olego* Ceremony, a young man from *Lo'olego* wanted to build a fish dam, but when asked, the *Weitspus* people would not help. They thought he wanted to make a ceremony although he didn't have the regalia to make one. There was a rock with hole in it located on the River. The young man went into the hole and didn't come out for a year. When the young man returned, the *Weitspus* people came to help him build the fish dam. When the dam was built, the *Weitspus* people went downstream to perform the White Deerskin ceremony. The *Lo'olego* people had their own Deerskin ceremony at *Lo'olego*. This fish weir was known as the *Lo'olego* Fish Dam.

In another story *Kerernit* (Chicken hawk) built his house on top of a large boulder by the river at *Knetkenolo*, which translates as "arrowhead-where fish-weir". He built a fish dam near the boulder and made a water fall so high that the salmon couldn't jump over. There are holes in the rock that held posts for his dam. The rock is still there and the holes are visible. This structure was known as the Chickenhawk Fish Dam.

3.2.3 Gravel/Rock

Gibbs (1853 reprinted 1973)
Early accounts by George Gibbs, recorded in the 1800s describe the lower Klamath River as a steep valley where the forest came down to the river, separated only by wide gravel bars void of trees or grass. The Yurok villages were located on the banks of the river, occupying large terraces of rich fluvial soils.

3.2.3.1 Cooking rocks

(Curtis 1924)
Rocks were heated in fire and used inside baskets to heat and cook food. They were stirred inside the basket with a wooden paddle to prevent the rock from burning through the basket.

Gates (personal communication 2003)
Cooking rocks were used to prepare food in hearths and heat food in cooking baskets. Because they were used in fire, they needed to be free of inclusions or moisture that could cause them to explode when heated. Gravel bars along the river were formed as the annual peak flows receded. People would gather suitable cooking rocks from select gravel bars along the River. Not all gravel bars produced suitable cooking rocks, so specific areas in the floodplain at certain gravel bars were used to gather these types of rocks.

3.2.3.2 Porch rocks

Curtis (1924)
Rocks were used to pave the ground in front of a house. A narrow wall of stone was built on either side of the entrance to a Yurok house.

Kroeber (1976)
Large, flat rocks were used to line the outside of dwellings, residences, ceremonial houses and sweathouses. These rocks were usually of granite and were collected from select areas along the floodplain of the River. The size and distribution of these large rocks was likely a result of high water events that deposited these particular type and shape of stone in the River. Porch rocks were a regular feature in the traditional Yurok home. A functional aspect of this feature is that it would reduce moisture and mud from being brought into the dwelling. They were also used as porches where people would sit and visit outside the home.

3.2.4 Rock Promontories/Rock Canyon walls

3.2.4.1 Death rocks

Kroeber (1978)
The *Woge* made it so when people died they would have to use a prescribed formula. The *Woge* made the death purification ceremony. There are eighteen rocks that the *Woge* spirits live in along the rivers that must be spoken to when transporting a corpse. The stories "Origin of Death" and "Death and Purification" detail the locations of the eighteen rocks along the rivers.

3.2.4.2 Petroglyphs or Pictographs

Gates (personal communication 2003)
There are no petroglyphs or pictograph sites documented in the published literature in Yurok territory. There are however, four known sites on the Klamath River on the Yurok Reservation. In all cases these are elaborate forms of petroglyphs. Each location has numerous pecked designs in the faces of large rock outcroppings on the River. One such location is nearly buried by accumulated debris and sand, with only to upper portion of the outcrop and the glyph visible. The location of these petroglyphs is significant as they are along the River terrace at the confluence with important creeks.

3.2.5 Gathering/Botanical

Curtis (1924)
A wide variety of plants, for food, materials, and medicines were gathered along the riparian zone of the Klamath. Numerous species of berries grew along the banks of the River. Plants and roots used for basketry were collected along the River and along tributaries. Plants used for medicines and ceremonies grew along the riparian zone and were gathered for specific purposes by medicine women and ceremonialists.

3.2.5.1 Willow

(Curtis 1924)
Willow was used for many purposes and was often collected along the river. It's roots and shoots were used for basketry. It's leaves were used as medicine in myth times (Curtis 1924:174).

Kroeber (1976)
Willow was often gathered and used as a basketry material. Roots of willow were split for woofs, and used for fine design work, or as substitutes for spruce root (Kroeber 1976:90).

O'Neale (1995)
Willow was used as a primary basketry material, particularly up river. It can be used interchangeably with hazel for the foundation of the basket. High quality willow shoots were generated every year within the floodplain of the river due to the fact that peak flows would remove the previous year's growth and stimulate new shoots in the spring, which are the most desirable for basketry (O'Neale 1995:16)

3.2.5.2 Spruce roots

Merriam (1967)
The primary body material for a basket is spruce root (*Picea sitchensis*). This was gathered by digging out the root and cutting it in lengths of two to three feet. They are then split, while still soft, into broad, flat bands, and then split again to the desired size. These are woven over a frame of hazel (*Corylus*) sticks to form the basket (Merriam 1967:170). Spruce roots are often gathered on exposed riverbanks.

O'Neale (1995)
Spruce roots were primarily gathered near the mouth of the River and along the coast. They were traded upriver for basketry material for bear grass, black fern, and hazel (O'Neale 1995:17)

3.2.5.3 Tobacco

Kroeber (1976)
Tobacco of the same variety as found in the wild was cultivated by Yurok in high elevation sites for smoking and trade. Logs were burned on a hillside to produce a suitable soil and seeds were cultivated in these locations. Tobacco growing outside the cultivation sites was not harvested or used by Yurok for fear that it had grown in association with a cemetery or burials. Wild tobacco, *Nicotianas*, occurs naturally on sandy bars adjacent to the river but was not utilized by Yurok for smoking for fear that it had grown in association with burials (Kroeber 1976:88).

3.2.6 Habitation

3.2.6.1 Village sites

Waterman (1920)
Waterman recorded 31 Yurok villages or settlements located near or within the 100 year floodplain of the Klamath River. A few permanent villages occupy ancient river terraces more than one hundred feet above the river, Prior to the dams, in a high water event the River level could rise up to seventy feet (Waterman 1920:204).

Curtis (1924)
The Yurok ancestral villages extended from Bluff Creek, a few miles above the confluence with the Trinity River along the Klamath River to the Pacific Ocean, then south along the coast to Little River and north along the coast approximately six miles. While their villages tend to be concentrated on the river terraces and on coastal beaches, the Yurok claimed the entire Klamath watershed on both sides as ancestral lands and resource areas (Curtis 1924:37)

Yurok traditional lifestyles persisted in part due to the rugged terrain, the remote nature of the villages, and the lack of impact by non-Indians on the up river areas of Yurok territory. In the early 1900s the River was still the primary means of transportation and exchange between the up river villages and those down river and along the coast. At the time of Curtis' study with the Yurok, he reported nearly 700 living in villages on the River. The largest villages at that time were *Weitspus* (Weitchpec), *Pekwan*, *Wakhtek*, and *Rekwoi* (Requa). Many Yurok lived on allotments along the River, within these villages (Curtis 1924:38).

Thirty-four permanent Yurok villages on the Klamath River and the coast were recorded by Curtis. Of these 34, a total of 27 were on the banks of the Klamath River extending from Bluff Creek to the mouth. These villages were named (upriver to downriver) as follows: *Atsepar, Loolego, Weitspus, Pekwuteu, Ertlerger, Wakhshek, Kenek, Merip, Wa'sai, Kepel, Murek, Nakhtskum, Meta, Shregegon, Yohkter, Pekwan, Kootep, Wakhtek, Tekta, Serper, Erner, Turip, Sa'aihl, Hapau, Wahkel, Rekwoi,* and *Weltko* (Curtis 1924:221).

Merriam (1967)
Merriam recorded a total of 35 Yurok villages on the Klamath River from Weitchpec to the mouth. Twenty-two were located on the north side of the River and 13 on the south side (Merriam 1967:171). Most of the Yurok villages on the Klamath River are within the floodplain, just above the high water mark for the river (Merriam 1967:174).

Bearss (1969)
According to Bearss, there were 55 villages in Yurok ancestral lands. Most of these villages occupied ancient river terraces, increasing in elevation as they moved up river; *Wahkel* at 20 feet above mean sea level (amsl), *Turip* at 25 feet amsl, *Ko'otep* at 35 feet amsl, *Kepel* at 75 feet amsl, *Kenek* at 100 feet amsl, and Wahsekw at 200 feet amsl (Bearss 1969:1). Important villages were clustered together and were also the sites of ceremonial activities. Such villages were *Weitspus, Kepel, Sa'a, Pekwan, Rekwoi, Wetlkwau, Orckw*, and *Opyuweg*. Each of these villages had a sweat house (Bearss 1969:1).

In 1852, a trader recorded 17 Yurok villages between *Kepel* and the mouth of the River. A survey in 1895 recorded the same villages but with a declining population from over 1,000 residents in 1852 to less than 400 in 1895.

Traditional Yurok houses were constructed from large puncheon boards of split redwood planks. House pits were excavated to a depth of three to four feet below the ground surface and the remaining structure was constructed with the redwood planks. The roof was designed to allow for smoke to escape from the fire pit located in the center of the dwelling. The door was usually set to the upriver side, and was a small round or oval entryway. Yurok houses were built in alignment with the River (Bearss 1969:7).

Sweathouses were smaller in size and excavated deeper than a residential house. The walls were lined with redwood planks, but did not extend above the ground. The roof was constructed with redwood planks and the door facing the ocean or the River (Bearss 1969:7)

Pilling (1978)
There were seventy-three Yurok villages in Yurok ancestral territory, 50 villages or settlements were located along the Klamath River. Fifteen of those villages have been identified as having been occupied by Yurok people from before 1850 to present day. Those 15 villages are: *Rekwoi* (Requa), *Tmri, Welkew, Wo'kel* (Waukel), *Turip, Wohtek* (Wautec), *Pekwon* (Pekwan), *Sreyon*

(Sregon), *Metah, Murek, Kepel, Kenek, Wahsek, Weitspuc* (Weitchpec), and *Pek'tul* (Pilling 1979:139).

3.2.6.2 Fish camps

Bearss (1969)
Yurok fish camps on the Klamath continue to be both a social and economic enterprise. Fish camps are temporary camps that are used annually for the purpose of commercial and subsistence fishing on the river. They are strong indicators of a river-based economy. During the salmon runs on the river, these places are utilized by individuals and families. Yurok fish camps are primarily located near the most productive fishing locations, such as Dad's Fish Camp on the south bank, near the mouth of the River (Bearss 1969:14).

Perry (1988)
Fish camps on the Klamath River are necessary in order for Indian fishers to take advantage of their fishing rights at the mouth of the River during the commercial fishing season. Many Yurok travel from upriver villages to participate in the annual commercial fishing season. Fish camps are temporary campsites where families stay during this time. Fish camps are places for people to gather, socialize, share stories, and prepare for the next day's catch (Perry 1988:14).

When Indian commercial fishing resumed on the Klamath in 1987, Indian fishing could only occur between 7:00 pm to 7:00 am. This meant nets had to be checked, and fishers had to stay up all night in order to pull in nets and clean and prepare their catch. Once7:00 am came around, Indian fishers had to remove their nets to allow for recreational fishing. When the night's work was complete, Indian fishers would sleep during the day and then prepare for the next night's work (Perry 1988:14-15).

3.2.6.3 Cemeteries

Curtis (1924)
The dead were buried in cemeteries and were placed in the ground in relation to the river, with the head of the deceased always pointed up stream. In times of famine, if a person died of starvation, their body was put in the river, instead of the ground (Curtis 1924:42)

3.3 Other Features

3.3.1 Up-slope

3.3.1.1 View shed/coverage

Gates (personal communication 2003)
Viewshed and the aesthetics of the viewshed in Yurok lands is an important aspect of Yurok spiritual life. Many ceremonies and spiritual activities incorporate the landscape and viewshed into the prayers and meditations associated with these activities. In this way, the appearance and condition of the landscape and river are important and integral aspects of ceremonial life.

In addition, there is an economic and social value in maintaining an aesthetic viewshed within the river corridor. Yurok economic development plans include the creation of an eco-tourism lodge and the development of a guided tourism program to promote the Klamath River and its ecological value for recreational visitors. This program is being developed in conjunction with the

River's national designation as a Scenic and Recreational river. In this plan the condition, the aesthetic quality and the viewshed within the river corridor is an integral component of the plan. Yurok people wish to share the experience of this riverscape with visitors so that they too will learn to appreciate the natural beauty and importance of the River.

3.2.3.2 Botanical gathering, subsistence medicinal

Mead (1971)
The Lower Klamath River, and most of Yurok ancestral territory occupies a discrete botanical niche, commonly referred to as the Oregon Biotic Province. In addition to containing unique species which do not occur anywhere else in North America (for example, California coastal redwoods), the groups that occupy this unique botanical niche share a common culture, and traditional subsistence pattern that is not shared with their neighbors who reside outside of this biotic region. Culturally significant plants for foods, medicines and arts are shared by the distinct Indian tribes that occupy this region and are part of the common culture that is defined by the Klamath River (Mead 1971:48-49). Yurok share a common forest type with their Karuk and Hupa neighbors, primarily mixed evergreen forest and coniferous forest even if the range and percentage of this type varies between groups (Mead 1971:97).

According to Mead, Yurok used over 13 species of plants in basketry, both in the construction and design of a basket. Four plants were used as dyes for basket materials (Mead 1971:64). Mead further identifies six different stems, and kinds of roots, and one type of leaf used in Yurok basketry (Mead 1971:66). Many of these roots and stems were gathered within the floodplain of the River, along the shore or from the exposed banks. Based upon the common use of plants for medicines, food and materials, Mead concluded that the common culture areas for the region included a grouping of Yurok, Hupa and Karuk even though each group represented a different language family (Mead 1971:71).

Pilling (1978)
Resource areas used for gathering plants for food and materials were often owned by families or individuals. Driftwood along the river, root-gathering areas, seed gathering areas, tobacco plots were resources that were owned by families and individuals (Pilling 1978:147).

3.3.2 Transportation

3.3.2.1 River- boat

Gibbs (1853 reprinted 1973)
Yurok dugout canoes were traded up and down the coast as far as Cape Mendocino and Port Orford. They were built thick and heavy and designed to withstand the rocky waters of the Klamath River. The stern had a raised step carved into it, which enabled the steersman to stand and remain stable in the boat. The paddle was designed for two purposes, upriver and downriver travel, which could be used alternately as a paddle or a pole to steer the boat. Yurok canoes were uniquely suited for traveling lightly on rapidly moving water (Gibbs 1973:9).

Waterman (1920)
Traveling by canoe on the River was the preferred mode of travel for Yurok. The River was the primary source for travel, communication, trade and commerce. The Yurok were more familiar with their upriver neighbors than they were with their coastal neighbors, such as the Tolowa. Canoe travel onto the open ocean was not common, instead they traveled close to shore to gather

shellfish and coastal resources (Waterman 1920:184). The River was the primary travel corridor and also the source of most food.

Boats were highly regarded in spiritual terms and many taboos were associated with boat etiquette. For instance, if a person was careless in landing his boat, or allowed it to bump into rocks, it was believed he would not live long. Canoes were asked for help in dangerous waters and encouraged to make a safe trip. Songs and formulas were known for keeping a canoe out of danger, especially on the ocean (Waterman 1920:186).

Curtis (1924)
Canoes were made exclusively of redwood logs. Gunwales were undercut on the inside, giving the effect of a rail, and the stern seat was shaped by carving out the log. The traditional Yurok canoe is known as a single ender, or blunt end canoe. It is carved this way because it is more stable on the River, and less likely to tip over. (Curtis 1924:39).

Bearss (1969)
Yurok canoes were designed for the River rather than ocean travel. Yurok would paddle canoes out to sea, but tended to stay close to the coastline and only to travel between coastal villages (Bearss 1969:1) Yurok canoes were dugout canoes made exclusively of redwood. Yurok canoes were symmetrical and carefully finished to enable safe passage on the River and out onto the ocean. Two types of paddles were used to steer a canoe on the River. One was a long pole to be used while standing, and the other was a true canoe paddle, used by the seated helmsman. Yurok canoes varied in length, but the standard length was 18-20 feet. A canoe of any greater length was not considered to be safe or controllable on the River (Bearss 1969:7-8).

Kroeber (1976)
Yurok boats were canoes carved exclusively from redwood. The traditional canoe was carved out of half of a redwood log and was designed specifically for use on the River, being sturdy and stable, with a square prow and wide bottom that allowed for quick pivoting in rapid river currents. Paddles and poles were used to steer and navigate on the River. Canoes were used almost exclusively on the River and rarely taken out on the open ocean. The average length of a Yurok canoe was about 18 feet, and varied considerably in width and thickness (Kroeber 1976:83)

Heffner (1986)
The harvesting of redwood logs for the purposes of making a canoe was highly ceremonial. Great care was taken in selecting a tree for a canoe or for planks to be used to build a ceremonial sweathouse or dance house. The procurement of redwood for ceremonial purposes required specific formulas. Selected redwood logs were then transported down river to be used to build a ceremonial structure at a specific location (Heffner 1986:25-26)

Cunningham (1989)
Yurok canoes were made from fallen redwood and were products of fire technology (Cunningham 1989:49). Fire was used to cut the log to its desired length, and to hollow out the center. The style of dugout canoe made by Yurok is called a "*yutch*". This type of canoe has several features that make it suitable to use on a rapidly moving river. These features include a round belly, rocker bottom, spoon-ended riverine hull without keel, cutwater or sharp ends. This is the most complex dugout canoe found in California. Early accounts of Yurok canoe making documented that such a canoe could be made in several days using iron tools, but prior to European trade tools, it took several months to burn, chisel and carve with stone adzes (Cunningham 1989:58-59).

Ortiz (1991)
Traditional Yurok redwood dugout canoes were made on the Lower Klamath, in the redwood forests and then traded or sold upriver (Ortiz 1991:13)

Yurok dugout canoes were designed for use on the River. They were designed to catch rough water in riffles and rise above it without tipping, staying on top of the water, designed to navigate the Klamath River specifically (Ortiz 1991:13).

All Yurok dugout canoes are considered to have a living spirit. They are carved to reflect the human body, and have eyes, a nose, lings, a heart, a belly, and kidneys. A traditional Yurok canoe has these physical elements in it, reflecting the belief that it is a living being (Ortiz 1991:15).

Beasely and Mount (n.d.)
The traditional Yurok dugout canoe was used to harvest coastal shellfish, salmon, lingcod, seals, sea lions, and sea otter. It was used on the coast, and on the Klamath, Little River, and Redwood Creek estuaries. The Yurok canoe was unique in that it could be used on the ocean as well as on the rapids of the Klamath River.

3.3.2.2 Riverside trails

Waterman (1920)
Trails were extensive throughout Yurok territory often connecting coastal villages and river villages with gathering areas away from the river. Some trails followed the river and provided an alternate route between river villages.

Davis (1963)
Indian trails in Yurok ancestral territory followed the river, and extended uphill to connect with prairies, coastal villages, and ceremonial areas. It appears that many Indian trails are now roads through these same areas first developed as military roads, then postal routes, and later improved roads for wagons, and automobile traffic (Davis 1963:8). Yurok trails were considered to be special places and were often marked with piles of twigs, rocks or arrows at junctions and "resting places (Davis 1963:11). Trails were often routes of exchange as well as ways to visit other villages, particularly if the river was too dangerous for travel (Davis 1963:14).

Beals and Hester (1974)
"Yurok country was intersected by numerous trails, many of them very ancient; but those trails were not nearly as important in commerce and social intercourse as the river" (Beals and Hester 1974:48)

Heffner (1986)
Traditional Yurok trails represent heavily utilized trade routes that enable trade, exchange and visiting between Yurok coastal villages and those along the Klamath River. These trade networks included the exchange of salmon, lamprey and sturgeon caught in the river for shellfish, seaweed, and surf fish caught along the coast. Trails followed the course of the river, from upstream to downstream villages, as well as connecting these villages with upland ceremonial and gathering sites and coastal villages within Yurok lands (Heffner 1986:18-19)

Gates (1995)
Trails served many purposes in Yurok life. They were used to travel and visit between villages along the river and the coast, connecting people with the greater world beyond their village or home. Trails were used for communication, to send messages via messengers, or *wego*, who

could travel the trails quickly. Trails connected villages with gathering areas, such as acorn grounds which were visited and used by people from different villages who would travel to the same gathering sites annually via the trail system. Hunters would talk on the trails to help them succeed in their hunt, and would offer thanks to a trail when the hunt was successful. Trails were natural routes for trade and exchange within Yurok territory and beyond it. Trails had many social and ceremonial aspects for Yurok life. Trails provided an alternate route to travel up and down river when river travel was not possible due to lack of a boat, or flooding (Gates 393-418).

3.3.3 Communication

Gates (personal communication 2003)
Verbal communication between villages and tribes up and down the River were a traditional form of exchanging information, such as during the First Fish Ceremony. Specific locations along the river corridor provided the right acoustics for sending a verbal message, by shouting, to the next message station either up or down the river. This form of communication, "the Indian telephone" relied upon the acoustics of the natural river corridor, with only specific locations capable of projecting the message to the next station.

3.3.4 River morphology

USFW (1999)
Many Yurok stories about the River and the land correlate to geological phenomena that occur in the Lower Klamath. Landslides, earthquakes and other tectonic activities have indeed formed the river as it is today. This natural morphology has been changed by human activity in historic times. Mining and logging activities dramatically impacted the water quality and the watershed in past decades. Likewise, the construction and operation of hydroelectric dams have significantly altered and disrupted the natural flow and physical aspects of the River. Geomorphic studies suggest that the impact of the dams is significant and has radically changed the natural flows within the River. These in turn have impacted fish habitat, and surrounding vegetation and resources, all vital to Yurok culture.

Buckley (2002)
The Klamath River has a history of regular and periodic flood events, some catastrophic. The dynamic processes of the River, floods, slides, and even the occasional earthquake or tsunami have altered the shape and landscape of the River over time (Buckley 2002:213)

3.3.5 Oral History

3.3.5.1 How the River (or associated features) came to be

Curtis (1924)
Yurok believe in the existence of spirit beings, or *wo'ge*, who occupied the earth and prepared it for the Yurok people. These *wo'ge* provided not only the world the Yurok lived in, but also the rules and ceremonies to keep it in order. Three primary characters are identified in Yurok stories, the transformer, who improved the natural features of the land and River, a hero who destroyed, drove out or made harmless the monsters that formerly inhabited the earth, and Coyote, the trickster (Curtis 1924:221).

Gunther (1928)
Yurok tradition tells of the origin of salmon in the story of how they are brought to the people. In this story, the main character is Coyote, who tricks the woman who owns the salmon and liberates

them for the people by breaking the fish dam. This story is relevant to the activities associated with the construction of the annual fish dam at *Kepel* (Gunther 1928:162).

Merriam (1967)
There is a story that tells of the arrival of the *Po-lik'-lah* on the Klamath River at a time when the river was occupied by *wo'ge*. The main village of the *wo'ge* was near *Wokero*. The *wo'ge* were kind to the new people from the north and left the country, promising to return someday (Merriam 1967:171).

Kroeber (1976)
Yurok stories include tales about how the world became to be as it is. One such character in these stories is *Wohpekumeu*, "widower across the ocean" who is said to have been the one to make things as they are. He was born at *Kenek*, where he lived until he left to join the other *wo'ge* who departed from this world. At *Amaikiara*, in Karuk territory, he tricked the woman who kept all the fish and liberated them for the future use of mankind. From the sky, he stole acorns for the people to eat. He pursued women everywhere, and as a result of his activities either created or ruined good fishing places. He also recovered the dentalia, or shell money, horded by his son and released it back to the world (Kroeber 1967:73).

"The world is believed to float on water. At the head of the river in the sky, where the Deerskin Dance (Ceremony) is danced nightly, are a gigantic white coyote and his yellow mate, the parents of all coyotes on earth" (Kroeber 1976:74)

Kroeber (1978)
When the creator, *Wohpekumeu*, first came to the Klamath and Trinity Rivers, he saw that there was no food for the people. There were only two women who had salmon. *Wohpekumeu* took the salmon from the women and let them go into the River. *Wohpekumeu* said the people would never catch the Great Salmon. When the Great Salmon comes up, he will swim in the middle of the river so he isn't caught with the nets. The Immortals (*Woge*) only wanted salmon to go up on one side of the river to make sure they knew where they could get salmon. But they never caught anything so they made it so the salmon would come up both sides. A man from the village of *Welkwau* wanted to learn how to fish at the mouth of the River so he went to *Kowetsek* (the home of the salmon) and asked the headman to show him how to harpoon fish. The headman agreed to show the man from *Welkwau*. When *'Nepwo'* (the Great Fish) came through the mouth of the river, the headman acted as if he was going to spear it. He would make thrusting motions with his spear but not actually spearing it, at the same time, he was praying for more salmon to come up the river. More salmon came up the river. The headman speared some salmon and the man from *Welkwau* saw that he handled the fish in a particular way. The headman explained that if salmon was caught at the mouth, a man was not to use a wooden club to kill it; he was to use a stone to hit it in the head. But upstream from the mouth everyone else would use wooden clubs. If a salmon is caught at the mouth it must be buried with only its tail sticking out. People who use a spear to catch fish at the mouth must practice certain medicine before catching salmon. The lamprey eel was also made at *Kowetsek* and there are certain rules one must follow when catching them at the Mouth. This story tells of how the reverence for fish and creator provided the Yurok not only with abundance of salmon, a place for salmon and people to inhabit (the River), that explains the proper etiquette and moral responsibilities of salmon and people.

Perry (1988)
How Fish Came to be in the River (as told by Florence Shaughnessy, Yurok)

> In the beginning, there was an Indian goddess. They sent her with the first Indians to be settled here. They told her to stock the world with whatever she thought our people were going to need. So they got all kinds of animals- deer, elk, bear, and all the others. Then she took her people down to the beach, and she talked to the god there.
>
> "I have brought the children here because that is going to be their home. This is where they shall live."
>
> "Now" she said, " I will need help, because along the shore here there is food."
>
> And he said, "Yes, there is food, but there shall be proper help at the proper time. The food that is in the ocean is so delicate that it cannot be exposed for hours like the food that goes on land. They are different. You shall have a helper."
>
> And she said, "Who will my helper be?"
>
> "The moon, The moon shall control the tides."
>
> And so it was settled who should control the tides. They put the fish down at the mouth, the sturgeon and every known fish.
>
> And she said, "The sturgeon shall go far, far up the River until he is trapped, but he shall be a strong swimmer. And the salmon, there shall be four kinds of salmon coming in over the year. There shall be different species that survive the winter rains. And steelhead. And there shall be smaller fish that are seasonal, like the candlefish and surfish. And the lamprey eels, they are for variety of the diet."
>
> Then the sea foods were promised. So we got seaweed, seaboots, crabs, mussels, China slippers, clams of all sizes and others.
>
> And so it was that all the fish were named and sent as far as they could go up the river to feel the people all along the way. And the people were to follow and have their own fishing rocks. They were to look for a place with and eddy and claim that rock. Then they would build homes nearby because their food rock would be there, and then they can take care of their families. (Perry 1988:15)

3.3.5.2 Traditional etiquette/river (or associated features) management

(Yurok Culture Committee)
"The Creator placed Yurok people and fish together for reasons of balance and longevity. The Yurok have a responsibility for assuring the fish get up the River. These reasons are codified as Indian Law, first instructions from the Creator to the Yurok People. When the Law is not followed, the balance is not maintained and the fish do not return, the River dries up and the Yurok people dwindle away."

"Traditional Yurok Fishing Law is as follows:

1. Know your family relations. Know where you are related along the river. Know the River and its locations, particularly the village name that your family is from.

2. Not every Yurok family had/has a fishing place right.

3. Every Yurok has a fishing place right through permission.

4. Permission is gained by asking and being granted the right, with terms and conditions.

5. Permission given once is not permission given forever.

6. One standard condition is to offer some fish caught at the place where permission was granted.

7. Some fishing places are "open" and anyone can fish there. They are open on a first-come, first-serve basis. If someone is fishing in an open place then the latercomer informs the first party that they want to fish, and then they politely wait a day unless they have already caught enough fish, then they should make ready to leave. It is polite for the first party to provide some fish to those waiting.

8. No fighting on the River, particularly no fighting over fishing places. The River is a place to show respect.

9. Do not waste fish; do not take more than what is needed. It is not what the River will do for you, it is what you will do for the River.

10. Drift netting can occur anywhere as long as it doesn't disturb anyone else's fishing place or net set."

3.3.6 Relations with up or down river neighbors

Curtis (1924)
The name "Yurok" was derived from the name given them by their upriver neighbors, the Karok. To the Karok, they were known as "*Yuruq-arar*" which means, "down stream people" (Curtis 1924:38)

Relations between the Yurok and their neighbors, the Hupa on the Trinity River were known to be friendly. Many aspects of culture, ornamentation, subsistence, and apparel were nearly identical to those of the Hupa (Curtis 1924:39).

The Yurok name for their upriver neighbors, the Koruk was "*Petsikla*", meaning "up river people". The Yurok name for the Shasta who lived further upriver beyond the Karuk, was "*Siyaau*" (Curtis 1924:222).

Davis (1963)
One of the primary indicators of trade and exchange both on the River, and up the coast, was the importance of shell money, or dentalia in Yurok society. Yurok men would often have a special tattoo on their forearm for the sole purpose of measuring lengths of dentalium. These shells are

indicative of wide trade and exchange because they originated offshore of Vancouver Island. The use of dentalia as currency on the Klamath River beyond Yurok territory indicates the trade networks along the river were quite extensive (Davis 1963:7).

Other common trade goods exchanged between Yurok and their upriver neighbors, the Karuk and the Shasta included obsidian, coastal shells such as Olivella, clam, mussel and abalone, tobacco seeds, juniper beads, white deerskins, woodpecker scalps, sugar pin nuts, elk antler, baskets, redwood canoes, acorns, salt, and seaweed (Davis 1963:49-50).

Merriam (1967)
The Yurok were self-identified as two groups, the *Ner-er-ner*, or coastal Yurok and the *Po-lik'-lah* or River Yurok (Merriam 196: 167-169).

Perry (1988)
Trade between upriver and downriver Yurok and between River Yurok and Coastal Yurok was a common practice that enabled the exchange of desired food items between localities. Shellfish, seaweed and surf fish from the coast were traded for salmon, sturgeon, and lamprey from the river. Salmon caught and dried near the mouth of the River were sought by upriver Yurok because of the better flavor provided by the extra fat, which the fish lose as they migrate upstream. These patterns of trade and exchange existed prior to European contact, and persist in present day Yurok society (Perry 1988:13).

Buckley (2002)
The name "Yurok" is a recent name derived from the word "down river" by the "up rivers", or the Karuk. The word "*puliklah*" means down river and is a word that is used to identify the Yurok living on the Klamath.

Yurok oral history identifies a time before the world is as it is. In this time, the *wo'gey* lived in Yurok lands. There was a constant struggle to keep the world balanced upon the water. "Knowing that this would be so, before they left the *wo'gey* instructed certain people in what to do to put the world back in balance when the weight of human violations grew too great for it" (Buckley 2002:214).

These instructions are the world renewal ceremonies that are held between villages on ceremonial grounds of Yurok, Karuk and Hupa alike. It is a common culture and a common ceremonial cycle that connect the people along the River in the past, present and future.

3.3.7 River language

Gibbs (1853 reprinted 1973)
The Yurok used no specific name for themselves, but rather identified themselves and each other by the name of their village, which would also distinguish them as "above" or "below". The Klamath River had no special name, but was referred to as "the water" or the "big water" (Gibbs 1973:7).

Curtis (1924)
The name "Yurok" was derived from the name given them by their upriver neighbors, the Karok. To the Karok, they were known as "*Yuruq-arar*" which means, "down stream people" (Curtis 1924:38)

The Yurok name for their upriver neighbors, the Karuk was "*Petsikla*", meaning upstream (Curtis 1924:222)

Kroeber (1976)
Yurok directionality was related to the River as indicated by the use of Yurok terminology. "*Pul*" means downstream; "*pets*" means upstream; "*hiko*" means across the stream; "*won*" means up hill or away from the stream; "*wohpe*" means across the ocean. In terms of English, east means upriver. Features in villages and Yurok houses are described in relationship to the River, for instance, a house would not have its door on the western corner, but rather the downriver corner. Right and left are directions that are designated by their person's relation to the River, either upstream or downstream. At the confluence with the Trinity River, the Trinity is considered to by up a side stream, while the Klamath continues upstream (Kroeber 1976:15).

4. Contemporary Yurok Views of the River

4.0 Interviews with six Yurok elders.

4.1 Desmond "Merkie" Oliver

Merkie Oliver was born in the Yurok village of *Rekwoi* (Requa) in 1929. He was raised in Yurok Indian culture "dancing and fishing". Culture is his whole life. He got through by fishing and trading. He has fished for many different types of fish in the River: salmon, steelhead, perch, bull head, suckers, and candlefish. Merkie was always around the River. His father and uncles all guided tours. Merkie also spent a good part of his life guiding tours for recreational fishers, hook and line fishers. River resources were never wasted; everything they caught was brought home and used. During the depression, and the World Wars, and during the relocation era, subsistence fishing on the River maintained the Yurok way of life and provided food for Yurok people.

Salmon run in the spring and fall. Steelhead runs in the summer and winter. Sturgeon run once a year. Merkie attributes some of the decline in fish populations to over fishing in the open ocean. Trolling boats are allowed to catch as many fish as they can take without a limit. The decision to ban the 40 miles trolling nets has had a beneficial impact on the salmon, resulting in larger runs and bigger fish in the River.

Candlefish (eulachon) used to be a major fish species in the River. There used to be millions that come up the River. Merkie recounts that the last good run of candlefish happened in 1986. Since then a few trickle through between December and February. He is not sure what has caused the decline in the Candlefish population. They used to catch them in dip nets and they would haul in a full catch. In 1996, he reported seeing only two candlefish.

Eel populations appear to be declining. The conditions at the mouth of the River are part of the problem. The River flow is not what it used to be and as a result, the current is not good enough. Perhaps the eels now migrate by traveling up the center of the River channel. Eel hooks were the traditional means for catching eels in the River. Each eel hook has a name, and they are decorated with special designs. Merkie started eeling when he was 6 or 7 years old. At that time the mouth of the River was very narrow. Merkie commented that eels would migrate up river and often got up inside the turbines of the dams. He stated that eels were poisoned in the reservoirs to keep them out of the turbines. Eel hooks are specialized equipment for a special use, catching eels, he commented that they are not the same as a gaff or snag hook. Eel hooks are used for one purpose

and need to be appreciated as such. Eels were not caught in the summertime because they were wormy. "When you see the *Perna-keesh* coming down the River, don't eat eels".

The BIA attempted to regulate eeling on the River and start up commercial eeling. Merkie said that selling eels is okay, the Yurok have always traded and bartered. But commercial eeling is not the same; many Yurok do not want it. Once eeling is commercial, rules and regulations follow. The cultural rights of Yurok to harvest resources needs to be protected to allow for traditional fishing and eeling on the River. The BIA has previously closed theRriver for months, and banned the use of eel hooks and even dip nets. Merkie defied this ban and went to the River and caught 4 fish with an eel hook. The BIA came and cited him for it. At the same time tourists were allowed to keep fishing. Merkie stated that all of his life, he is a fisherman. "Fishing is a god-given right". Yurok subsistence fishing is a way of life, a god-given right, and should not have imposed rules and regulations for using an eel hook or a gill net. Fishing is a means of Yurok survival before government commodities and social security. "Who has the right?" "Whose reservation is it?"

4.2 Walt McCovey, Jr.

Walt was born at Haa-wok on the Klamath River in July 1931. He lived on the River most of his life. His father was a commercial fisherman. Commercial fishing on the river was banned when he was about 2 or 3, but his family kept on fishing. "Fishing is a tribal resource. If we don't utilize the resource someone else will". In the 1970s Walt became involved in the Indian fishing rights issue. He wanted to fish to make a living and to exercise his rights as a Yurok Indian. Commercial fishing was a way of life for the old people. Indians continued to fish, even after it was banned, often coming up river to do it.

Fish runs on theRiver included winter steelhead, springer, summer and winter salmon. Many of the salmon spawned in the creeks feeding into the Klamath. He remembers the creeks had a lot of fish in them. He recalled fishing in the creeks when he was around 6-7 years old. Now the creeks are silted in, full of gravel piling up at the mouths, just like cement. Winter salmon used to run in November, December, and January. These runs have disappeared.

The River used to have high winter flows. People would move around in the winter. The River would rise 40-50 feet every year in peak flows. Walt recalls high water and flood events in 1955, 1964, and 1974. High water events removed silt and sediments and large woody debris from the river. Now the flows are not high enough to float out the big logs over the riffles or clear out the gravel and sediments that pile up at the mouths of the creeks. The construction of dams on the Klamath and the Trinity Rivers had a big impact on the River and its annual flow. Walt stated that a significant decline in fish population was evident after the construction of the dams.

The traditional fishing season ran from summer to fall. Fish were harvested and prepared for storage to be used in the winter months. Salmon ran in the spring, but it was dangerous to fish for them because of the high water. When commercial fisheries and canneries were opened near the mouth of the river, many Yurok worked as fishermen and in the canneries. People working in the commercial fisheries and canneries made good money, but it was cut off in the 1930s. Then fishing was banned on the River until the 1970s. Old people told Walt during that time that Indians were supposed to have net and commercial fishing rights. Indian people continued to fish on the River, even though it was illegal.

When the mulberry bush blooms, there is supposed to be sturgeon in the River. When the dogwood blooms there is spring salmon in the River and it is the end of eel season.

The primary species caught in the River were eels, suckers, catfish, bullheads, and candlefish in addition to steelhead and salmon.

Candlefish (eulachon). There used to be a lot of candlefish in the River. They were caught in dip nets. In the late 1970s surrounding forests were heavily sprayed and Walt attributes the decline in the candlefish population to this activity.

Sturgeon. Two types of sturgeon were caught in the Klamath River, Green sturgeon and White sturgeon. The White has gray colored skin and a pointed snout. The Green sturgeon has green skin and is better for eating. Sturgeon run in mid-December, but not in the summer. Sturgeon would break a trigger net because they were so strong. Walt guessed they must have used older style nets for catching sturgeon.

Eels. Catching eels required intense concentration on the water. "If you're not thinking eel, you won't get one". Eels were caught with an eel hook, made of madrone or oak, with a hook and notch on the end. Dip nets were also used for catching eels, but would easily escape from the net.

The mouth of the River changes because it is supposed to be a lady. She takes a position for a while, and when she gets tired, she changes position and moves her legs. The two rocks at the mouth are sentinels. The one on the upper side (north) is *Or egos* (Tucker Rock). It looks like a woman carrying a burden basket.

"Tribes fight for fishing rights to make a living. One time people fished for subsistence. Not all people are fishing people. I was always a fisherman. Once you have your rights, you don't have to beg to have a fishing season each year".

"The River is the lifeline of the Indian people. We depend on the fish, depend on eels, sturgeon. In his lifetime, as an Indian person, going to school, come out to our freedom. River is medicine to him. He can feel lousy as hell and go out on the River and come back feeling good. Gives strength, knowing this is mine; this is where I live, where I'm born. This is where my roots are."

4.3 Glenn Moore, Sr.

Glenn is from the Yurok village of Sregon on the Klamath River. Glenn fished at Moore's Rock on the River ever since he can remember. When the River was high, they fished off a small rock near where they lived. His parents fished in other spots along the River, but he always fished at the same spot. Glenn recalls that the basic foods for Yurok were salmon and acorns. As long as the River provided a good run of salmon, there was enough food for the people.

"Most Indian people had fishing spots. They have a right to fish, sometimes it's handed down through relations. You can give a fishing place to someone else". Agreements for fishing places were not made in writing, but were all verbal. The person giving would let it be known that the person could fish there. The owner of a fishing place could grant permission to others, families and others, to fish there. People were allowed to use the fishing hole of someone else as long as they offered it to you."

Traditional Yurok fishing is the best way to manage fishing on the River. "Tradition gives people the right to do things. They can say this is what we've done for years and years. Tracing back generations and generations, this is what makes us strong culturally. Hold onto the old ways. Stick with family fishing holes".

Glenn recalled camping near the mouth in 1932-33 on a family fishing trip at Safford Island. The camped on the Island between August and September. Some people fished all night and then took their fish to the cannery. When the commercial fishing season was over, they would pack up and move back up river where they would fish for themselves. They would catch enough fish to last until the next season. Fish were smoked like jerky. So were eels. They were stored near the stove to keep them dry through the winter months. Glenn remembers their smokehouse was always full.

4.4 Billy Wilson

Billy was born at Martin's Ferry along the Klamath River. He remembers fishing every summer on the River at his grandfather's fishing place. His grandfather was Ben Billy. That is their fishing hole. They would catch sturgeon, salmon, ells, and steelhead. They would build a scaffold and set trigger nets to fish. When the gill net came along, this made fishing easier. He recalls the nets were made by hand. Old timers sat and rolled Iris fibers on their legs to make the cords used to make a net.

"The River is part of life. No river, no life. God put it there for us, the people, to use. If people don't use it right, it's gone. It was a place for everyone. The River is there to supply food to the people who need it. We wouldn't be here without the River. I don't know how they figure the are going to get the water back [in the river system]. Who has the water? It is natural to have high water in the winter. I can't see anything bad about it. It is an act of nature".

"Fish came to visit you. If you don't treat them right, they won't come visit you anymore. If you catch them at the wrong time. If the sturgeon goes up and you miss it, when it comes back down, if you catch it, you let it go".

Fishing is part of Yurok culture. Indian people used fish for food and for trade or sale. When they needed money, they could sell their fish. Indian people have always had the right to fish.

Eels. Billy never noticed if there were two annual runs of eels. He recalled eels came up river once a year. Old Indians would eat eels until after the first of the year. Eels were caught in nets during the same time as the spring salmon run. Eels, sturgeon and salmon all began their annual runs after the first of the year. Eels declined after they started poisoning the eels in the dams because they got inside the turbines. Dead eels would float down the River because they had been poisoned. Billy said there are not many eels that come up the River anymore.

Salmon. Spring salmon are the best tasting fish. The have better flavor. High water did not make the salmon more difficult to catch up river. The low water is keeping the fish out of the creeks now. The fish can't get into the creeks anymore. They want to get in there. Billy believes that the declining salmon population is due to the hatcheries. Too many fish in the estuary are stripping the habitat so that the native salmon cannot survive. Dams on the River also hurt the fish. If there is not enough water in the River, the fish will die.

Candlefish: Billy does not recall catching candlefish up River. He remembers going to the mouth to dip net for them. They did not go fishing for candlefish very often, but when they did would bring a lot back.

4.5 Aileen Figueroa

Aileen was born in 1912 in Klamath. She remembers gathering along the River for huckleberry, sallal berry, and willow. Willow was used to make eeling baskets. She also recalled her

grandfather raising Indian tobacco down on the river bar. Mint tea used to be gathered on the river bar, but it does not grow there anymore.

4.6 Fawn Morris

Fawn was born on the south side of the River, near the mouth at *TsekweL* and grew up on the beach and on the River. She traveled with her brothers and learned to fish, trap, duck hunt, and even eel. She also commercial fished when they reopened the cannery at Requa. She remembers always fishing at night. She remembers catching eels, salmon, candlefish, and sturgeon.

Eels. Eels were caught in the winter months and at nighttime. She does not remember eeling during the day. They would take gas lanterns over the water so they could see the eels reflecting in the water. Winter eels were the best. They would be split, flattened, and then smoked or baked in an oven.

Sturgeon. Fawn recalls catching sturgeon at the mouth of the River. She remembers when they were endangered and they were not allowed to catch them.

Candlefish. Fawn recalls that these fish ran in the summertime. They used dip nets and would catch a lot in a short time. The candlefish died out in the 1970s.

Salmon. Spring salmon run in May and June. The run does not last long and they are hard to catch at the mouth. She remembers using the gill net to catch salmon and seeing her parents use dip nets to catch them. Spring salmon are best because they are better tasting.

The River. The River at the mouth is always changing. There are two sisters who guard the mouth of the River. When one gets tired, one can stretch her legs. That is why the mouth of the River moves from side to side over time. The mouth of the River has closed in over time. When they put riprap in on the north bank, it filled in even more. Water flows in the River are no longer natural and it contributes to the problem.

Dams. The dams have changed the River. The River has cut a deeper bed and is no longer a natural channel. The natural flow of the River has been stopped by the dams. Not enough water flows through anymore, and the water has no strength. It is shallow.

"The River is our life. Our life revolved around the River. For our own subsistence, our own person, later for business, kept our families for year round. We depended on the River for survival. Without the River, you don't have the fish. The River needs to be taken care of".

5. Conclusion

For the Tribes of the Klamath River Basin it is difficult to discuss the traditional and contemporary culture in two distinct life ways. Instead Tribal presence throughout the Klamath River Basin is a continuum running from time immemorial into the future generations yet to come. While this continuum can be marked by periods of change (creator, *woge*, culture heroes, oral tradition of prehistory, oral tradition of proto history, oral and written 20th century history, and 21st century contemporary occurrences.) the basic relationship remains the same: Tribes of the Klamath River Basin rely on the fishery, and tribes and anadromous fish rely on a healthy riverine ecosystem that includes as a necessary requirement adequate flows of high quality water.

The relationship between indigenous people, fish, and rivers with water is fundamentally a cultural relationship. The cultural relationship encompasses all other ways of defining the relationship and thus includes relationships of economics, politics, ecology and environment, and religion. In addition archeological or historical perspective for understanding cultures, while yielding important information, are limited in scope by the requirements of objectivity, evidence and a chronological ordering that may be radically different than that of the cultures to be understood. The River is of such great importance that there is no particular unique word that names the river. Instead, the River is named as 'river'. Yurok words for 'river' are *'la yoh'*, *'ra yoy'*, and are translated 'to run' or to 'run past' in reference to a liquid. An additional word for river *'?ume?wo'* associated the River with the fish dams that were placed across them. A common euphemism exists among the Yurok people that speaks to human manipulation of water flows. When a particular rock lying at the bottom of water is revealed because of decreased water flows, this revealing signifies the end of the Yurok World.

Yurok interaction and emulation of the environment is a spiritual - ceremonial activity. More than environmental management, for Yurok interaction and emulation are a religious right. This is important for linking Native American environmental practices to additional laws, regulations, policy orders, and policy that acknowledge Native American religious rights (American Indian Religious Freedom Act 1978, Executive Order 13007).

Oral traditions, the spoken word that links people, cultural practices and place are critical to understanding the environment from the perspective of the Yurok and other Klamath River Tribes. The Klamath River as a cultural environment important to indigenous people is more than a collection of individual historic properties or sites. Instead it is the whole of the River considered as a single entity that best frames the meanings and relationships between Indigenous people, fish and water. It is clear from Yurok oral history that the River is such an integral part of the Yurok way of life that without it the traditions of the Yurok people would be perceived in a radically different perspective. Practically every function of the Yurok way of life is associated to the River: The origination of fish, proper methods for taking fish, how the River is to flow, death passage ceremonies, locations for fish dams and ceremonies all reflect the bond between the River and the Yurok people. It is essential that the River be maintained at a level that provides relevance to the young Yurok mind that hears these stories.

The condition of the Klamath River, it's health and quality, is of grave concern to Yurok people. Healthy habitat, adequate and high quality water flows, sustainable and abundant fish populations are of critical importance to Yurok culture. This concern is due to dependence on the River for all aspects of Yurok life, the directives handed to the People by the Creator as Indian Law, and a responsibility for good stewardship of the River and the resources it provides. The role and significance of the River in Yurok life and ceremony, from birth to death, cannot be overstated. The River is the bond that unifies Yurok culture. It is also the bond that unites Yurok with their upriver neighbors in a common life way that has persisted through time.

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DIVISION OF FISH AND GAME OF CALIFORNIA

FISH BULLETIN No. 34

Salmon of the Klamath River California

I. The Salmon and the Fishery of Klamath River
II. A Report on the 1930 Catch of King Salmon in Klamath River

By
JOHN O. SNYDER
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I

THE SALMON AND THE FISHERY OF KLAMATH RIVER

THE SALMON AND THE FISHERY OF KLAMATH RIVER

INTRODUCTION

The present paper is a digest of the work accomplished in a salmon investigation* conducted under the authority of the Bureau of Commercial Fisheries of the California Division of Fish and Game. Active work was begun in 1919, and is still in progress. At the outset the investigation was so planned as to contribute as directly as possible to the solution of certain questions relating to the 'conservation of the fishery. The work has progressed in a fairly satisfactory way in some directions as will appear, while in others the results are not so good. The information now most needed relates to the seaward migration of young salmon, and to the relative contribution of natural and artificial propagation to the population of the river.

It may seem that the matter of depletion is overstressed in this report, since its progress has been evident for years. A condition of increasing depletion was not sufficiently evident on the Klamath however, to be convincing to those most interested. In fact, opinions to the contrary were commonly held, some asserting that the "run" was not only maintaining itself but that it was gradually building up. There is very little exact information concerning fishing operations on Klamath River previous to 1912, and no really dependable statistics are available relating to the catch before that time. During the period of placer mining on the river, large numbers of salmon were speared or otherwise captured on or near their spawning beds, and if credence is given to the reports of old miners, there then appeared the first and perhaps major cause of early depletion. In 1912 three plants operated on or near the estuary and the river was heavily fished, no limit being placed on the activities of anyone. A resume of commercial fishing near the mouth or the river appears on page 88.

In the collection of statistical data relating to the ocean catch of salmon, the state authorities have not been able to separate the different species. Four occur in the state, but only two species are of commercial importance-the king salmon, or chinook, and the silver salmon or coho; hence all statistics relating to ocean fishing include both of these fishes in unknown proportions, the king salmon certainly predominating in a large measure.

Commercial fishing is now confined to the lower part of the estuary of Klamath River, partly as a matter of convenience and partly because of legal restrictions. Formerly nets were used at certain places as far up stream as Blue Creek, and occasionally beyond. Advantage was taken of slack water below the swift riffles, and much work was done at Ferry Drift and at Hollow Tree Drift. (Fig 6.) An official tide limit, above which fishing was illegal, was first fixed at the mouth of McGarvey Creek. Later it was moved down stream at the point where the highway bridge stands. Salmon are caught by means of drifting gill nets, which are laid out across the river mostly between the lowermost island

* Salmon considered in this report are of the genus ***Oncorhynchus,*** but principally ***tschawytscha*** and ***kisutch.***

and a safe distance from the jaws. It is the habit of the fishermen to start the layout at a signal from the cannery whistle, usually about eight o'clock in the evening. The nets are laid from the decked stern of a large rowboat, one man at the oars and another at the net. Occasionally a skilful man manages both boat and net. Layouts are accomplished simultaneously from both sides of the river, the nets thus interdigitating across the stream. After the layout the nets drift with the current until recovered. The fisherman passes slowly from end to end of his net removing the entangled fish, evidence of which is apparent from the movements of the corks. Often the fishing is over in a short time, and in rare cases the fish become entangled so rapidly that no time is lost in bringing in both net and fish. Too often however, drift after drift is made with poor success.

Occasionally a large sturgeon runs afoul of the nets, harbor seals have been caught, while small sharks, skates, and almost any fish of small size may become entangled. The capture of some steelheads can not be avoided.

The number of fishermen varies somewhat from year to year, and also during the season, more boats operating after the migration is well on, some fishermen being perfectly willing to allow others to do the prospecting and preliminary exploring when fish may be scarce, and hidden snags not definitely located. Fishing is not usually accompanied with success when there is a bright moon overhead.

The actual fishing and the work in the cannery is to a considerable extent in the hands of Indians who are the descendants of members of the small aboriginal tribes which inhabited the region. Salmon have always furnished a great part of their food, and they have come to depend pretty largely upon the money earned during the fishing season for the few necessities of a simple life. They are skilled in the production of artistic baskets, and formerly, dugout canoes of large size and fine proportions were made by them. Some of these were beautifully carved. The lore of these people is replete with legends relating to the things about them. They were greatly restricted in their geographic outlook, but they seem to have been closely acquainted with every detail of their own land, They were essentially nature worshipers, and the fishes, reptiles, birds and mammals were adopted into intimate spiritual companionship.

The estuary of the river contributes in no small degree to the scenic beauty of the immediate region, and although it is not pertinent here, one finds it difficult to refrain from launching into an attempted description of the beauty of the entire river basin. From mouth to source the course of the stream offers a panorama of unending grandeur, and an incomparable assemblage of mountains and forests and great open spaces.

In connection with this work, invaluable aid was rendered at times by temporary assistants in the laboratory and field. Among these the following deserve particular mention : Messrs. W. L. Scofield, E. C. McGregor, C. D. Duncan, Paul Bonnot, E. C. Scofield, G. H. Clark, and R. P. Hayes. The study would have been impossible without the friendly cooperation of dealers and fishermen, and of officials of the Bureau of Fish Culture and the Bureau of Patrol. Mr. E. V. Cassell, Superintendent of the Fall Creek Hatchery aided in the marking experi-

ments. At the mouth of the Klamath, the writer and his assistants were granted every possible courtesy by Mr. George R. Field who was in charge of the plant of the Klamath Packers Association, and later by Mrs. Field. Finally, the writer wishes to express his obligations to Mr. Norman B. Scofield, Chief of the Bureau of Commercial Fisheries of the California Division of Fish and Game, and a pioneer in salmon investigation, for constant and valuable aid in the work.

GENERAL CHARACTERISTICS OF KLAMATH RIVER SALMON

The salmon of Klamath River, which at present is of chief commercial importance is the king salmon, *Oncorhychus tschawytscha* (Walbaum). It is a species of wide distribution, extending from the region of Monterey Bay northward to Alaska, and across to the Asiatic coast and Japan. Occasional wanderers are taken along the cost of the southern part of California.

In this State it enters the larger streams to spawn, the Sacramento, Eel, Klamath and Smith rivers having migrations of commercial importance. Individuals sometimes enter the smaller streams, and experiments in artificial propagation have demonstrated the possibility of at least temporarily establishing the species in a small creek where the water is cool and the mouth open to the sea.

It is well known that all the species of salmon are anadromous. They enter the coastal streams to spawn, migrate even to the small tributaries, lay their eggs in the gravel and then die, none returning to the sea from whence they came. The young which appear shortly afterward, remain for a time in the stream and then pass out into the ocean where they rapidly grow, and eventually approach maturity.

The actual contribution of the river to the entire salmon catch of the State is not known, nor can it be known, for the reason that the Klamath salmon migrate southward to Monterey Bay and enter the ocean catch from there, as well as from other fishing points to the northward.

A graph, figure 1, representing the entire yearly catch of the State, together with that of Klamath and Sacramento rivers, is presented. From this it will be seen that in the years immediately before and following 1918, the Sacramento contributed largely, and the Klamath rather meagerly, while lately the Klamath compares more favorably through shrinkage of the Sacramento. The fishery of the Klamath is particularly important, however, because of the possibility of maintaining it, while that of the Sacramento probably is doomed to even greater depletion than now appears, on account of commercialization of the river, the damming of its tributaries, irrigation of its valley, pollution, and the introduction of competitive species.

There are current among fishermen and dealers, statements relating to differences which may be seen between king salmon of the Klamath and Sacramento rivers. Most of the alleged differences disappear upon close comparison of examples from the two streams, There are, however, important anatomical differences as was discovered by N. B. Scofield while making a study of salmon in 1900. A detailed examination of these differences was made by E. A. McGregor at a later date.

The Klamath fish have been described by some observers as smaller, more rounded and somewhat heavier in proportion to the length, while

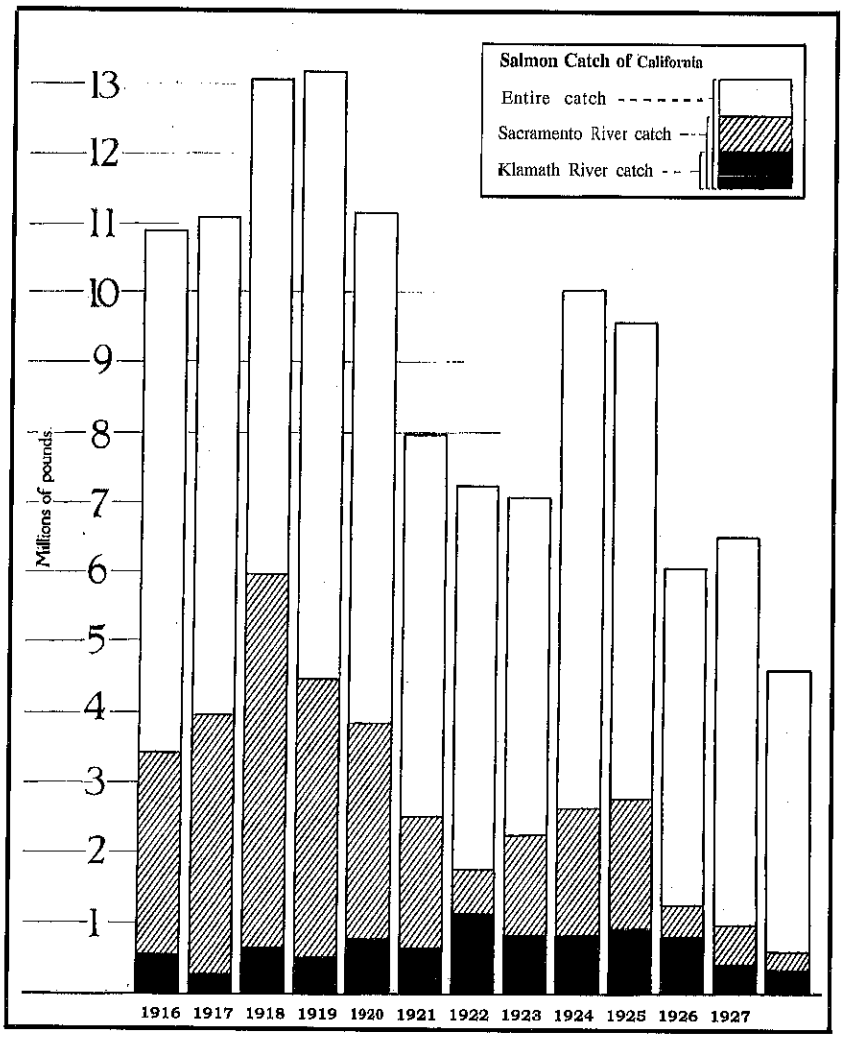

FIG. 1.

the same characteristics, except length, have been ascribed by other persons to Sacramento fish. All agree that Sacramento fish are larger, and this is well illustrated when series of fishes of the same age class are compared. For example, four-year Klamath fish are much smaller than four-year Sacramento River fish as demonstrated in table 1. (Fig. 22.)

In the matter of weight in relation to length, there appears to be very little or no difference. Tables, which after a fashion express the relations between length and weight are presented. In the preparation of these an average weight was computed for twenty examples of a given length and sex class, when as many as that number were available.

As previously stated, N. B. Scofield found that Klamath salmon differ from Sacramento River salmon in having more gill rakers on the

TABLE 1

Illustrating the Relative Lengths of Four-Year-Old Salmon from the Klamath and Sacramento Rivers, and from Monterey Bay

Length in cm.	Number of individuals in each length group		
	Monterey Bay	Sacramento River	Klamath River
58	2		
59	2		
60	1		
61	3		1
62	5		2
63	6		3
64	7		3
65	11		4
66	14		13
67	21	1	13
68	18		24
69	23	1	33
70	34		45
71	55	6	74
72	63	3	80
73	66	5	97
74	69	3	137
75	73	4	161
76	80	7	196
77	81	1	235
78	101	10	291
79	92	10	300
80	106	10	287
81	103	14	300
82	130	18	236
83	110	23	262
84	106	15	202
85	94	20	146
86	112	26	155
87	100	19	114
88	106	28	112
89	93	28	86
90	72	20	64
91	68	35	50
92	68	45	44
93	84	33	30
94	77	41	29
95	57	39	22
96	74	45	15
97	62	32	13
98	60	36	12
99	54	40	12
100	40	33	5
101	32	16	1
102	30	19	1
103	15	20	1
104	15	20	2
105	16	14	
106	6	14	
107	3	6	
108	3	8	
109	3	7	
110	3	6	
111		7	
112	1	5	
113		1	
114		1	
115		1	
116		1	
117		1	
118			
119			
120		1	
Totals	2,730	798	3,913

TABLE 2

Length-Weight Relation-Klamath River Fish

Length of fish in cm.	Average weight 20 males recorded in pounds and tenths	Average weight 20 females recorded in pounds and tenths	Extreme weights males recorded in pounds and ounces	Extreme weights females recorded in pounds and ounces
40	2.0		2-00 to 2-00	
42	2.3		2- 0to 2- 8	
44	2.5		2- 2 to 2-14	
46	2.7		2- 6to 3-00	
48	3.3		3- 0to 3-12	
50	3.7		3- 4to 4-10	
52	3.9		3- 1 to 4- 4	
54	4.4		4 -2 to 5- 0	
56	4.9		4- 0to 8- 4	
58	5.8	6.0	5-4to 6-14	
60	6.5	6.4	5-10 to 8-12	
62	7.0	6.8	6-10 to 10- 4	6- 1 to 7- 2
64	8.0	7.8	7- 8 to 9- 4	7- 4 to 8- 8
66	8.4	8.6	7-12 to 9- 4	8 -0 to 10- 8
68	9.4	9.0	8- 4 to 10- 2	8- 0to 10- 0
70	10.6	10.0	10- 0to 12- 8	9- 0 to 10-12
72	11.0	10.7	10- 0 to 12- 4	9-10 to 12- 0
74	11.6	11.4	10- 4 to 13-12	10- 0to 12- 6
76	12.6	12.5	12- 0 to 14- 2	10-14 to 13-12
78	13.6	13.8	12- 8 to 15- 0	12- 0 to 15- 0
80	14 2	14 7	14- 0to 16- 2	13- 0to 17- 8
82	16.1	15 4	15 0 to 18-10	13- 8 to 16-12
84	16.6	16.8	15 6 to 17-14	15-12to 18- 6
86	18 0	18 0	17- 0 to 19-14	17- 0to 21- 8
88	18 9	19 0	17- 0 to 21- 4	16- 0to 21- 8
90	20 8	19 7	18- 2to 22- 4	18-12 to 23- 0
92	22 5	22 4	20- 2to 26 -8	19-10 to 24- 4
94	24 1	23 3	22- 4to 28- 4	20- 0 to 29- 0
96	24 9	24 2	16-14 to 28- 8	18- 0 to 27-10
98	26 8	26 9	21-14 to 30- 4	24-12 to 32- 0
100	28 8	28 5	23- 8 to 36- 0	28- 0 to 32- 0
102	29 9	31 0	27- 4 to 34-10	26-12 to 34- 0
104	31 6	31 4	27- 4to 35- 2	26- 6 to 36-12
106	33 8	34.8	28- 8 to 37-10	34- 4 to 36- 0
108	34 9		32- 8 to 38- 6	
110	38.9		34- 8 to 43- 8	

first arch, and fewer pyloric caeca. It was later learned that a considerable difference exists in the number of eggs produced by the individual, the Klamath salmon having smaller ovaries.

At the writer's suggestion, the data obtained by field observers of the Fish and Game Commission were reported on by E. A. McGregor in California Fish and Game (Vol. 9, No. 4, pp. 134-150, 1923). McGregor not only confirmed the previously made observations of Scofield, but he also found that Sacramento River fish have fewer vertebrae. The following table 4, taken from McGregor's paper, summarizes these differences.

The distinctive characters here found would be regarded by systemists as subspecific, and they are just such differences as characterize geographic races.

No data are at hand to enable one to make a comparison between these forms and the king salmon of the rivers to the northward, nor can any statement be made at this time regarding characteristics which king salmon from Eel and Mad rivers may possess.

While it is possible to distinguish between king salmon from the Sacramento and Klamath rivers, any attempt at the present time to determine the relative number of either in an ocean catch must be regarded as premature at least, for the very simple reasons that we have

TABLE 3

Length-Weight Relation Sacramento River Fish 1919

Length of fish in cm.	Average weight 20 males recorded in pounds and tenths	average weight 20 females recorded in pounds and tenths	Extreme weights males recorded in pounds and ounces	Extreme weights females recorded in pounds and ounces
68	9.4		8-12 to 9-14	
70	10.0		9- 4 to 10-12	
72	10.8		9-10 to 11- 6	
74	11.0	12.0	10- 2 to 12-12	11- 2 to 13- 0
76	12.0	13.0	11- 8 to 13- 2	10-12 to 14- 2
78	13 2	14.1	11-14 to 15- 0	12-10 to 16- 4
80	14.0	15.1	12- 6 to 15- 6	13-12 to 16-10
82	15.2	16.8	14-10 to 17- 6	15- 8 to 17- 2
84	16.8	17.0	15- 2 to 18-12	15-10 to 18- 8
86	18.6	18.0	16-10 to 20- 2	16- 8 to 20- 8
88	19.7	19.6	16-14 to 27-14	17-12 to 22- 8
90	20.2	20.2	18- 0 to 21- 6	15-10 to 29-10
92	21.9	21.3	20- 6 to 23-10	20- 4 to 23- 6
94	23.0	23.3	22- 6 to 26-14	21-10 to 25-12
96	24 6	24.7	22- 4 to 26-14	21- 8 to 27- 0
98	26.5	26.5	23- 0 to 28-14	23-14 to 31- 8
100	28.2	28.0	25-10 to 31- 6	24- 8 to 33- 4
102	30.1	30.0	28- 8 to 31- 8	22- 2 to 32-14
104	32.0	31.1	27- 8 to 35- 0	23-14 to 35-12
106	34.2	32.1	30- 0 to 38- 2	23- 8 to 35-10
108	36.6	34.0	31- 6 to 41- 2	25- 2 to 41- 4
110	38.3	37.0	33-12 to 44- 4	30- 6 to 44- 4
112	40.1	41.0	34-14 to 45- 0	35-14 to 48-14
114	42.6		37- 8 to 48-12	
116	44.8		40- 4 to 49- 8	
118	46.0		40- 4 to 53- 6	
120	49.a		46- 4 to 50-10	

TABLE 4

	Klamath River		Sacramento River	
	Range	Mean	Range	Mean
Number of Eggs	1,718 to 4,977	3760.0	4,795 to 11,012	7453.0
Number of caeca	93 to 193	132.2	134 to 214	176.4
Number of gill rakers	24 to 30	24.7	21 to 35	23.5
Number of vertebrae	66 to 68	67.0	62 to 65	63.8

little knowledge of the migration of salmon at sea, and we know almost nothing of any racial traits which may characterize salmon from the rivers entering the ocean to the northward of the Klamath. As information relating to the movements of salmon at sea slowly accumulates it becomes increasingly evident that their migrations are often very extensive, and hence the marine catch in any locality may contain fish which are natives of far distant streams. The notion, once common, that salmon do not in their ocean life move far from the stream in which they were hatched has been abandoned in so far as concerns California fish at least.

As occasion offered, certain anatomical characters of Klamath River salmon useful in the discrimination of species were examined. The results are here presented in tabular form.

TABLE 5

Scales

Scakes ub katerakserues	130	131	132	133	134	135	136	137	138	139
Number of speciments	4	6	9	14	9	11	13	8	10	10

Scales

Scales in lateral series	140	141	142	143	144	145	146	147	148
Number of speciments	12	6	7	5	3	4	1	2	1

Scales

Scaks Numberofspe&nens ---] before dorsal 5:	55	56	57	58	59	60	61	62	63	64	65	66	67
	4	6	6	12	17	14	21	12	13	8	5	5	2

Scales

Scales above lateral line	25	26	27	28	29	30	31	32
Number of specimens	2	7	10	15	38	32	25	6

Fin Rays

Dorsal rays	10	11	12	13	Anal rays	13	14	15	16
Number of specimens	4	82	46	3	Number of specimens	2	35	81	17

Gill Rakers

Number of gill rakers	9–15	10–13	10–15	10–16	10–17	11–14	11–15	11–16	11–17	12–12
Number of specimens	2	1	5	1	2	13	14	12	1	1

Gill Rakers

Number of gill rakers	12–13	12–14	12–15	12–16	12–17	13–14	13–15	13–16	14–15
Number of specimens	1	31	21	11	5	3	6	4	1

Gill Rakers

Number of gill rakers on both sides of arch	23	24	25	26	27	28	29
Number of specimens	1	2	15	43	33	17	9

Branchiostegals

Number of branchiostegals	13	14	15	16	17	18
Number of specimens	3	11	31	55	17	3

TABLE 5-Continued

Individual Characters of 30 Klamath River Salmon

Scales before dorsal	Scales in lateral series	cales above lateral line	Number dorsal rays	Number anal rays	Number branchiostegals	Number of gill rakers
62	136	28	11	14	18	11-15
59	134	29	11	14	16	12-14
55	131	30	12	15	17	11-16
55	137	29	11	14	15	11-15
57	136	29	11	15	16	12-15
58	136	31	11	16	14	11-14
59	132	29	11	14	15	10-13
61	133	28	12	15	14	13-15
56	135	31	11	15	17	13-14
60	144	30	12	15	15	13-16
59	135	29	11	15	15	12-16
66	142	29	12	15	14	12-14
59	136	26	11	14	16	11-14
54	132	26	11	15	17	12-14
65	140	29	11	14	16	12-14
60	135	29	12	15	15	12-15
60	133	31	11	14	16	13-15
61	135	29	12	15	17	12-14
60	139	29	12	15	16	12-16
61	145	29	12	16	16	12-16
61	139	30	11	16	15	12-15
64	142	29	12	15	15	13-16
61	134	29	11	14	16	12-15
60	147	28	12	15	16	12-14
62	139	29	11	15	16	12-14
60	136	29	11	15	15	13-13
61	137	29	11	15	16	12-14
58	139	29	10	15	16	12-14
55	133	29	11	14	16	12-15
66	145	28	11	13	16	12-14

TABLE 6

Silver Salmon in the Klamath River Catch

Date	Number	Weight
September 20, 1919	1,000	6,950
September 22, 1919	618	4,326
September 23, 1919	660	4,620
September 24, 1919	1,059	7,413
September 25, 1919	783	5,481
September 26, 1919	250	1,584
September 27, 1919	287	2,103
September 29, 1919	559	4,063
September 30, 1919	163	1,248
	5,379	37,788
October 1, 1919	47	376
October 2, 1919	151	1,253
October 3, 1919	111	852
October 4, 1919	82	685
October 6, 1919	679	5,100
October 7, 1919	567	4,371
October 8, 1919	800	6,138
October 9, 1919	743	5,795
October 10, 1919	183	1,430
October 13, 1919	328	2,500
October 14, 1919	239	2,031
October 15, 1919	514	4,145
October 16, 1919	361	3,067
October 17, 1919	193	1,649
October 18, 1919	197	1,662
October 20, 1919	290	2,428
October 21, 1919	148	1,237
October 22, 1919	150	1,329
	5,783	46,048
Totals	11,162	83,836

SPECIES OTHER THAN KING SALMON

Besides the king salmon, three other species enter Klamath River to spawn, namely, the silver salmon *(Oncorhynchus kisutch),* the humpback (0. *gorbuscha)* and the dog salmon (0. keta). The humpback and dog salmon are seldom seen and the fishermen are not familiar with them. The silver salmon occur in large numbers, the migration being later than that of the king salmon.

An occasional silver salmon is caught in the nets prior to September 6. The migration starts after that date and it is usually in full progress by the 20th of the month. No statistics of the silver salmon catch were kept prior to 1919 and no effort has been made to catch these fish since that time.

During 1919 only a few silver salmon were taken prior to the closed season which extended from September 6 to 20. On and after that date they appeared in the catch as shown in table 6.

Silver salmon are said to migrate to the headwaters of the Klamath to spawn. Nothing definite was learned about them from inquiry because most people are unable to distinguish them. In 1925, 295 silver salmon appeared at the Klamathon racks, of which 269 were males and 26 were females.

The blue-back salmon or redfish (0. *nerka)* is recorded by Jordan and Evermann (Fishes of North and Middle America, pt. 1, p. *482,* 1896) as occurring in Klamath River. Nothing to substantiate the statement can be found. A fish identified by some fishermen at Requa, July 15, 1919, as a blue-back, proved to be a steelhead (Salmo *irideus),* somewhat more elongate in form than usual, very silvery on the sides and greenish blue above. The flesh was deep red. Scale counts and other characters were as follows. Scales before dorsal, 54; in lateral series, 128 ; above lateral line, 25 ; dorsal rays, 9 ; anal, 12 ; branchiostegals, 13 ; gill rakers, 22. Another proved to be a cutthroat steelhead (S. clarkii), the fine scales attracting attention. It was caught near The Jaws, July 14, 1920. It measured about 16½ inches and was silvery on the sides and pale olive on the upper part of the body. The spots were scarcely distinguishable. There was a trace of red beneath the mandible. There were 196 scales in the lateral series, 46 above the lateral line, and 86 before the dorsal.

Humpback and dog salmon are not common enough anywhere in the State to be of commercial importance; in fact, they are so rarely seen as to be unknown to any but the most observant fisherman. Both species occur as far south as Salinas River. On the other hand silver salmon are fairly common, and because of their habit of entering small streams to spawn, they are much more generally distributed than the king salmon. As king salmon become increasingly difficult to obtain within the State, more attention will be given to the protection and propagation of the silver salmon. Silver salmon seem never to have been so abundant as king salmon, but even now it is not possible to say to what extent they enter into the catch of the State.

Close attention was paid to boatloads of salmon as they appeared at the houses on Noyo Estuary near Fort Bragg, with the following results :

TABLE 7

Date	Number King Salmon	Number Silver Salmon
July 14, 1919	32	72
July 16, 1919	4	49
July 17, 1919	48	2
July 18, 1919	23	17
July 19, 1919	49	23
July 23, 1919	177	25
July 25, 1919	26	25
July 27, 1919	17	23
July 28, 1919	32	11
July 29, 1919	29	10
July 30, 1919	3	1
July 31, 1919	2	1
August 2, 1919	8	1
August 4, 1919	10	2
August 5, 1919	32	13
August 11, 1919	30	13
Totals, 1919	521	288
June 21, 1920	109	43
June 22, 1920	5	1
June 23, 1920	3	5
June 24, 1920	73	11
June 25, 1920	50	4
June 28, 1920	172	19
June 29, 1920	179	24
June 30, 1920	30	12
July 1, 1920	71	116
July 2, 1920	75	60
July 3, 1920	104	62
July 5, 1920	61	31
July 6, 1920	150	67
July 7, 1920	135	62
July 8, 1920	163	98
July 13, 1920	78	12
July 14, 1920	102	28
July 15, 1920	62	25
July 16, 1920	117	22
July 17, 1920	57	56
July 19, 1920	60	28
July 20, 1920	27	17
July 21, 1920	37	17
July 22, 1920	50	27
July 23, 1920	45	10
July 24, 1920	56	15
July 26, 1920	8	10
July 27, 1920	23	39
July 30, 1920	7	6
August 3, 1920	27	9
August 5, 1920	22	35
August 6, 1920	94	128
August 7, 1920	11	17
August 9, 1920	9	5
Totals, 1920	2,272	1,121
June 17, 1922	75	46
June 25, 1922	20	95
July 6, 1922	20	45
July 8, 1922	61	35
August 6, 1922	64	15
August 9, 1922	68	5
August 10, 1922	81	13
August 22, 1922	84	10
Totals, 1922	473	264

Reference has been made to the difficulty which one encounters in trying to assemble exact information relating to either the distribution, abundance, or extent of spawning grounds of any species of salmon, observers in general having difficulty in distinguishing species. Old male king salmon are often referred to as dog salmon, king salmon fresh

from the sea are sometimes called silver salmon, and not infrequently salmon and steelheads are not distinguished.

The steelhead of the State is a sea-run trout which after living one or more years in the stream, enters the ocean, where it grows rapidly. In time it returns to the stream again, mature and ready to spawn. Steelheads usually accompany a salmon migration for the probable reason that conditions are then favorable for spawning, and not to eat salmon eggs as some assert. After spawning, the steelheads usually recover and again enter the sea, not always dying shortly after maturity as do the salmon. From an examination of 100 steelheads taken in the estuary of Klamath River it appears that these fish often spawn for the first time after having spent one year at sea. They usually enter the ocean at or near the end of the second year. Occasionally, one migrates to the sea at the age of one year, and rarely one may be found that has remained three years in the stream. One example had spawned in the second year. None had spawned before having spent a year in the sea. They usually spawn annually after the first time. The following conditions were noted:

TABLE 8

Stream	Ocean	Spawned	Age	Length
1 year	2 years	0 times	3 years	270 mm.
3 years	3 years	2 times	8 years	645 mm.
1 year	4 years	2 times	5 years	625 mm.
2 years	3 years	2 times	5 years	635 mm.
3 years	4 years	3 times	7 years	640 mm.
2 years	2 years	1 time	4 years	480 mm.
3 years	2 years	1 time	5 years	530 mm.
2 years	3 years	1 time	5 years	635 mm.
2 years	2 years	0 times	4 years	370 mm.
3 years	1 year	0 times	4 years	345 mm.

Commercial fishermen working at night in Klamath River distinguish steelheads when removing fish from the nets, by their deeper caudal peduncles and somewhat narrow tail fins, these characters being apparent to the touch. A diagram, figure 2, exhibits tracings of four species of salmon and a steelhead. The difference referred to is apparent. This together with the shorter anal base and the immaculate lining of the mouth should enable anyone to distinguish a steelhead. The lining of the mouth has much black pigment in the salmon.

THE SPRING MIGRATION—(IMMIGRATION)

Although king salmon in small numbers at least, appear to enter the Klamath at all seasons, there are apparently two more or less definite periods of migration, one occurring in the spring and the other in midsummer and early fall. Some doubt appears as to the distinctness of these migrations, the first possibly being little more than a long continued and varying start of the summer influx. However, G. R. Field and W. H. Baily, and the fishermen as well, speak of two distinct runs. Field wrote: "As the run of winter steelheads ceases, about March 30, spring Salmon begin to come. A few enter the Klamath

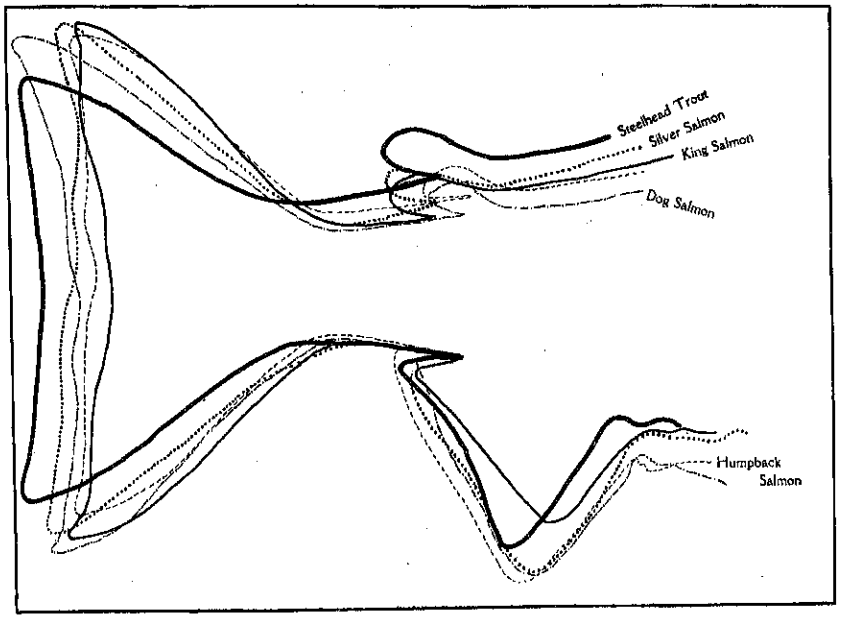

FIG. 2. Tracings of the outlines of the posterior fins and the caudal peduncles of salmon and the steelhead.

in the latter 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 June."

The spring migration,[1] granting that it was once very pronounced, has now come to be limited as to the number of individuals, and is of relatively little economic importance. The fish of this run begin to materially increase in numbers in the latter part of March or early in April and the migration has reached its maximum, and waned before the middle of June. The river at the time of the spring migration is apt to be in a condition of maximum flood[2] as indicated in figure 3,[3] the

[1] R. D. Hume in a paper without date, and presumably published by himself (Stanford University Library ___) says of the Klamath River: "In 1860 in this river during the running season, salmon were so plentiful, according to the reports of the early settlers, that in fording the stream it was with difficulty that they could induce their horses to make the attempt, on account of the river being alive with the finny tribe. At the present time the main run, which were the spring salmon, is practically extinct, not enough being taken to warrant the prosecution of business in any form. The river has remained in a primitive state, with the exception of the influence which mining has had, no salmon of the spring run having been taken except a few by Indians, as a reservation by the government has been maintained, until within a few years, and no fishing has been allowed on the lower river by white men; and yet the spring run has almost disappeared, and the fall run reduced to very small proportions, the pack never exceeding 6000 cases, and in 1892 the river producing only 1047 cases."

[2] The impounding of flood waters above dams may now control in a measure the violence of spring freshets, and the gradual release of this water may contribute somewhat to the minimum flow of summer.

[3] The graph was constructed from data found in Water Supply Papers, 311-313, U. S. Geological Survey.

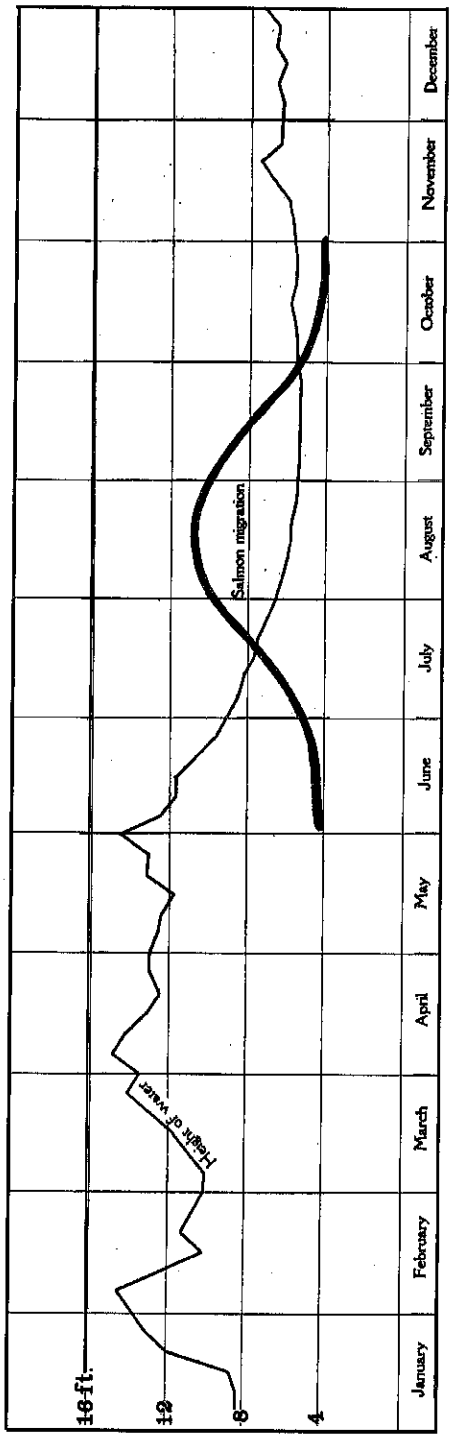

FIG. 3. The relation between height of water and the summer migration of king salmon in the Klamath River.

water bearing quantities of yellow silt and having a very low temperature. A huge yellow fan extends from the mouth outward over the surface of the ocean, occasionally reaching a width of three or more miles. Its shape and extent seemingly influenced by wind and tide, varies from day to day, now shifting far to the north or south and extending a greater or lesser distance out to sea. The line between fresh and salt water is often sharply defined by a narrow band of foam. From some distance to the north and south of the river the shore fauna shows the influence of fresh water.

The number as well as the destination of the fish which enter the river at this time is unknown. It is certain that the number is small

TABLE 9

Spring Run, Klamath River

Date	1918		1919		1920	
	Number fish	Average weight	Number fish	Average weight	Number fish	Average weight
April 16	5	13.0				
April 17	2	11 1				
April 18	6	13 1				
April 19	4	12 8			18	13.1
April 20	2	9.0			5	10.8
April 21					21	12.8
April 22	2	13.0				
April 23	2	10.0			19	13.3
April 24	9	11.2				
April 25	1	19.0				
April 26	4	11.7			23	14.4
April 27					12	16.4
April 28					18	11 2
April 29	6	10.5				
April 30	4	11.7	15	11.0	24	14.0
May 1	7	12 3	23	12.2	9	14 7
May 2	2	19 0				
May 3	2	15.5	4	11 5	6	12.0
May 4					14	13.6
May 5			20	13 3		
May 6	7	11.8				
May 7	7	9.0	54	11.5	2	12.7
May 8	1	8 0	30	12 4		
May 9			31	12 0		
May 10			36	12.1	18	14 7
May 11						
May 12			71	11 7		
May 13			20	12.1		
May 14			24	12.3	6	14.6
May 15	1	10.0	29	11 7		
May 16			57	12.4		
May 17			68	12.8	4	
May 18					16	11 3
May 19			28	13.4	2	11 0
May 20	11	11.4	102	12.8		
May 21	9	10.0	50	14.7		
May 22	1	7.0	21	12.5	9	14.3
May 23	1	13.0	40	13 3		
May 24	13	9 6	46	13 4	15	15 3
May 25						
May 26	2	11 0	8	14 4		
May 27	2	10 0	100	13.6		
May 28	10	9 2	32	12.2		
May 29	8	10 4	94	13.0		
May 30	2	10 4	27	13 0		
May 31	23	9 8				

or insignificant when compared with that of the summer run, yet many fish might easily escape notice in the silt-laden torrent with which the channel is filled. Possibly the migrating fish slowly make their way to the most distant headwaters[4] or they may spread out over a considerable area of the basin and reach maturity at the same time as those of the summer migration.

The fish of the spring run appear to be characterized by the immature condition of the gonads, and by their small stature. The ovaries when examined, April 17-25, 1920, were in all cases very small.

It is reported that spring fish do not exhibit even an approach of breeding colors, nor is the snout ever elongate as is frequently the case among fish of the late summer migration.

There is at hand very little accurate data relating to the fish of this migration. During the years 191.8 to 1920, the Klamath Packers Association operated its plant in the spring, when Field preserved a record of the catch, a summary of which is presented in table 9. Fishing ceased after May in each case, the venture not proving profitable. A comparison of the average weight of these fish with that of others taken in July and August indicates that they are considerably smaller.

TABLE 10

Year	Spring		July		August	
	Numher fish	Average weight	Number fish	Average weight	Number fish	Average weight
1918	1,710	9.9	312	12.4	12,140	11.9
1919	1,030	12.8	1,008	13.5	23,591	13.4
1920	242	9.8	948	14.2	46,851	14.8

From April 19 to 25, 1920, all fish to the number of 35 that were brought to the wharf were examined by the writer. The gonads of these were immature, eggs preserved in formalin measuring 3 to 3.2 mm. in diameter.

Fishermen reported that the catches were made at Hollow Tree and Ferry drifts, some distance above the mouth of the river. These fish appeared more silvery than those of the summer migration and

[4] Williamson River and the entire Klamath Lake basin are now closed to the migration of salmon and steelheads, the dam at Copco having become operative as a barrier October 25, 1917, according to H. A. Frazer of the California Oregon Power company. During the summer of 1918, the writer, acting under the authority of the United States Bureau of Fisheries, interviewed many fishermen and old residents of the Klamath Lake region in an effort to learn something of the migration of salmon. Testimony was conflicting and the lack of ability on the part of those offering information, to distinguish between even trout and salmon was so evident, that no satisfactory opinion could be formed as to whether king salmon ever entered Williamson River and the smaller tributaries of the lake. However this may be, large numbers of salmon annually passed the point where the Copco Dam is now located.

the spots were smaller and more linear. Some scale counts resulted as follows :

TABLE 11

Lateral series	Above lateral line
136	27
140	29
141	29
136	30
147	29
145	30
136	33
133	31
139	27
133	26
139	30
135	29
143	29

Of the 35 spring fish, 29 possessed scales of the ocean nuclear type. There were five male and 21 female four-year-old fish measuring from 70 to 83.5 cm. The stream type of nucleus was represented by only six fish. Two of these were four-year-old females 76 and 80 cm. long, while there were one male and three females from 72.5 to 83 cm. long.

THE SUMMER MIGRATION-(IMMIGRATION)

The summer migration of king salmon in 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 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. 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, as is shown in figure 3, which was constructed from data found in Water Supply Papers, 311 to 313, United States Geological Survey.

The period of migration of the king salmon varies somewhat from year to year, both as to time of starting and duration. In 1919 it was not well begun until late in July, while some years previously, 1913, 1914 and 1915, to be more exact, fish were caught in numbers during the second week in July. (Table 12.) The progress of the migrations of 1914 and 1919 are graphically compared in figure 4.

TABLE 12

Record of the catch of king salmon in the estuary of Klamath River as kept in the office of the Klamath River Packers Association

Number of Fish Taken

Date	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
June 15		25												
June 16		19												
June 17		24												
June 18		20												
June 19		17												
June 20														
June 21			53											
June 22		39	60											
June 23	95	35	1'3											
June 24	64	21	98											
June 25	94	21	58											
June 26	1'1	32	17	11										
June 27	87	8		155	1									
June 28	33		141	53	1									
June 29		89	175	80										
June 30	112	67	116	43										
July 1	94	67	121	27		13								
July 2	74	23	95		1									
July 3	74	26	1	144	4	5								
July 4	47	6		64	2									
July 5	48		243	173	1			4						
July 6		139	108	106										
July 7	95	125	120	364			1	22						
July 8	174	72	185	32		1		1						
July 9	231	133	201		11		3	6						
July '0	207	104	85	275	14	2	2	2						
July 11	177	23		187	8	3	5							
July 12			375	203	6	3		4						
July 13		394	237	60	5	1		8						
July 14	23 1	" 1	363	37			2	4						
July 15	107	83	203			1	36	3						
July 16	268	60	231		6	2	12	2			258			
July 17	435	45	103	743	6	1	21	19			145			
July 18	468	5		139	7	1	1				1	4	5	
July 19	47		776	73	7		4	181			236			7
July 20		290	362	132		5		156	53		100			8
July 2'	269	154	276	469			39	75	121		55		7	19
July '2	207	216	90	81		4	19	246	[illegible]				86	201
July 23	15	452	101		48	1	3	85	101		178		955	186
July 24	33	1,034	10	188	31	37	34	121			83		288	64
July 25	57	70		311			110		224		37		532	
July 26	165		319	291		32	184	178	11		161			112
July 27								164	94		442		1,507	40
July 28	697	2,052	287	341	25	79	223	262	51		56		1,579	37
July 29	822	966	444	178		59	334	227	136	1,514			1,120	86
July 30	7'4	861	1,495		31	39	195	612	70		125	397	114	77
July 31	411	2,502	242	1,333	91	20	441	582		7 1 3	'7,	233	129	26
August 1	560	323		104		46	442		931	513	3	353	1.676	
August 2	253		3.294	593	28	66	420	1.875	1,165	167	1	980		7
August 3		1,383	929	419	96	88		715	1,192	277			1,892	34
August 4				514	152		491	985	663	1,360		2,071	1,959	1,163
August 5	1,730	918	760	560		"25	167	653	1,939	1,248		833	1,158	719
August 6					140	267	51	1,556	951		138	1,024	1,081	355
August 7	1,218	1,326	'76	600	105	123	483	1,357		2,175	481	855	832	717
August 8	382	355		460	89	181	481		2,376	2,373	218	296	100	
August 9	15		1,057	682	68	4121	401	642	1,008	2,662	1,282	188		1,386
August 10		1,043	554	439	151	270		2,033	990	1,645	1,109		972	115
August '1	807	1,151	792	1,213	73		1,602	1,780	2,104	1,483	539	222	288	696
August 12	1,155	2,608	1,942	844		252	439	1,264	170	754		1,1201	1,603	620
August 13	1,886	2,456	494		125	115	807	1,449	1,006		984	2,817	2,774	1,557
August 14	1,504	2,363	2,491	1,560	160	190	170	2,918			9,923	2,638	913	304
August 15	1,460	2,427	1,733	784	39	300	366		[illegible]	482	*	1,158	402	
August 16	460		2,343	2'7	62	218	796	*7,420	[illegible]	[illegible]	2,959	2,269		130
August 17.				268	37	373			2,638	3,703	1,666		2,065	145
August 18	2,454	[illegible]	1,279	441	163		758	*2,000	1,803	1,267	1,513	3,887	2,544	51
August 19	832	6,111	1,503	2,001		808	1,214	*2,007	1,670	1,601		809	4,135	75
August 20	830	1,891	654		189	1,628	549	*2,079	963		1,558	2,539	5,905	92
August 21	540	3,137	1,003	310	80	870	1,611	*2,112	2,640	[illegible]	617	1,899	*1,681	131
August 22	504	4,177		353	125	218	3,587				5,216	2,421	1,401	
August 23	704		8,705	678	67	1,211	611	*1,922	482	2,950	2,287	3,280		463
August 24		2,920	*2,832	1,879	162	487		*1,997	3,290	4,406	1,344		3,724	1,566
August 25.	356	1,069	2,518	1,520	105		1,350	*1,984	1,140	1,548	1,736	3,266	2,078	3,030
August 26.	218	1,034	3,087	991		995	1,875	*1,695	1,232	984		1,115	462	1,564
August 27	180	1,285	4,204		305	398	1,256	*1,280	*678		2,428	404	362	4,306
August 28.	352	997	2,176	1,803	142	714	1,416	*1,572		1,524	1,270	861	1,923	1,681
August 29	220	1,004		764	126	472	1,097		*	1,334	3,243	503	1,266	
August 30. I I	100		7,529	828	309	539	226	*2,614	*	1,382	4,309	642		578
August 31		1,187	1,852	385	181	665		*1,132	1,895	1,750	1,333		1,095	637

TABLE 12-Continued

Record of the Catch of King Salmon in the Estuary of Klamath River as Kept in the Office of the Klamath River Packers Association

Number of Fish Taken

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
September 1	440	418	526	516	182		239	*1,565	905	1,240	*	1,185	1,353	2,037
September 2	177	853	1,797	294		1,072	493		1,108	993	*	2,380	1,410	2,744
September 3	801	509	657		300	423	267	*1,470	481		1,632	1,597	905	566
September 4	411	442	2,550	389	467	767	134	500		3,273	2,645	1,189	398	1,394
September 5	458	553	3,277	1,128	291	386	234		506	1,011	593	657	544	
September 6	192				100	578	238	776	527	1,595	2,944	204		1,146
September 20					722	374	1,402							
September 21					152	238								
September 22					86		330							
September 23						187	378							
September 24					133	49	180							
September 25					79	33	91							
September 26					193	25	66							
September 27					255	31	33							
September 28					464	36								
September 29					166		32							
September 30						133	48							
Totals	28,593	63,706	72,357	30,819	7,213	16,784	29,424	54,126	42,996	61,502	56,999	46,871	54,828	30,772

*A limit was placed on these days.

As might be presumed from what is known of the behavior of other animals, the migration does not consist of a steadily increasing flow with a similar gradual decline, but rather of a continuation of successive waves of varying size which on the whole mount higher and higher until a maximum is reached, and then die away in much the same manner as they came. Some fishermen express the opinion that these waves are caused by the varying conditions of moon and tide, but there seems to be no evidence that large schools are lingering for any great length of time in the sea near by, awaiting proper conditions for entering the river. Fishermen are not able to predict the size of the day's catch with any degree of certainty, nor are they always able to tell whether fish are plentiful in the estuary. The fish often make their presence known by "finning" as the act is called, that is, by cutting the surface with the dorsal fin or a large part of the back, a rather slow and deliberate movement, in strong contrast with the sprightly leap of the steelhead. A large catch may or may not follow a brisk exhibition of finning. It seems that. fish mostly enter the river with the tide, beginning to come in numbers on low water. It is said by some fishermen that they do not come in with the night tides. Anglers appear to meet with more success on an incoming tide, but it is to be noted in this connection that the mouth of the river does not offer a large margin of safety when the tide is passing out, and anglers are not apt to venture there with their boats at that time. Many who have observed the salmon here are positive in their statements that the fish mostly enter the river with the tide, and that migration does not occur in a marked degree with the full moon tides. It is said also that fish enter the river in the daytime and that there is no marked inward movement at night. Direct observation at the mouth of the river is not possible because of the deep, rapid and silty water.

Usually the stomachs of the fish are entirely empty and evidence appears which suggests that the long fast of migration is already under

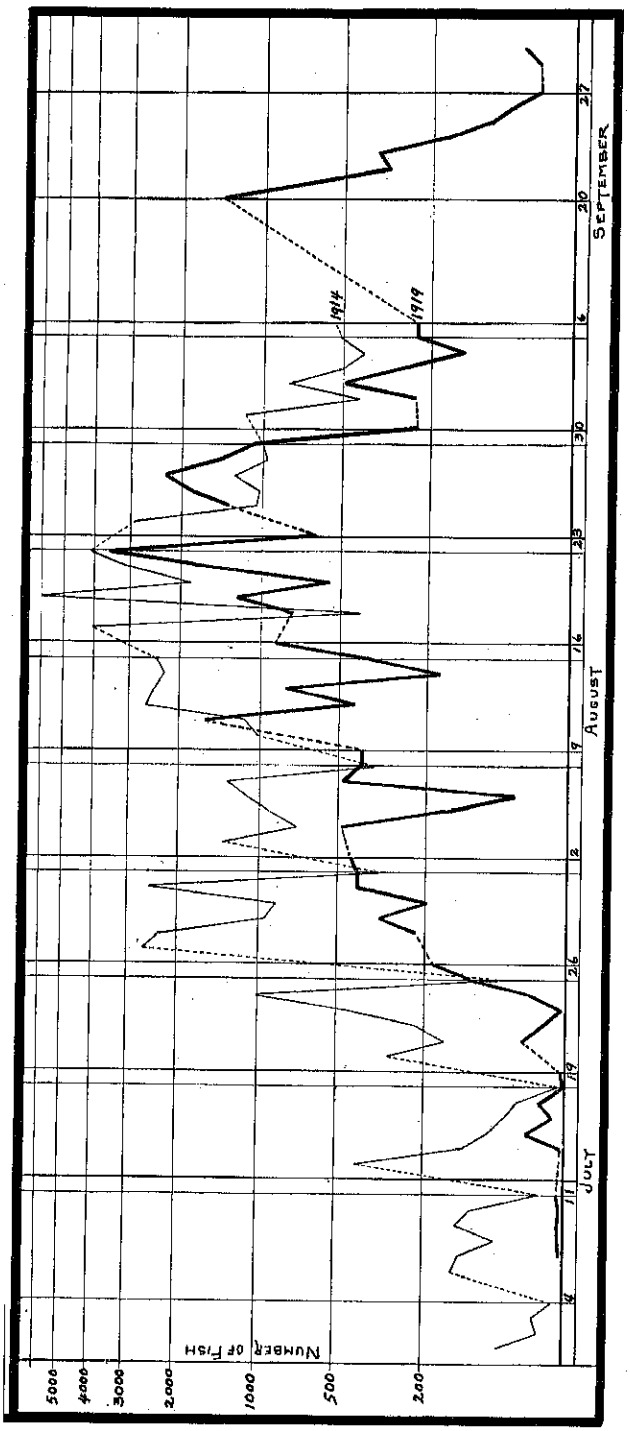

FIG. 4. Illustrating the migrations of 1914 and 1919. The dotted lines represent closed seasons.

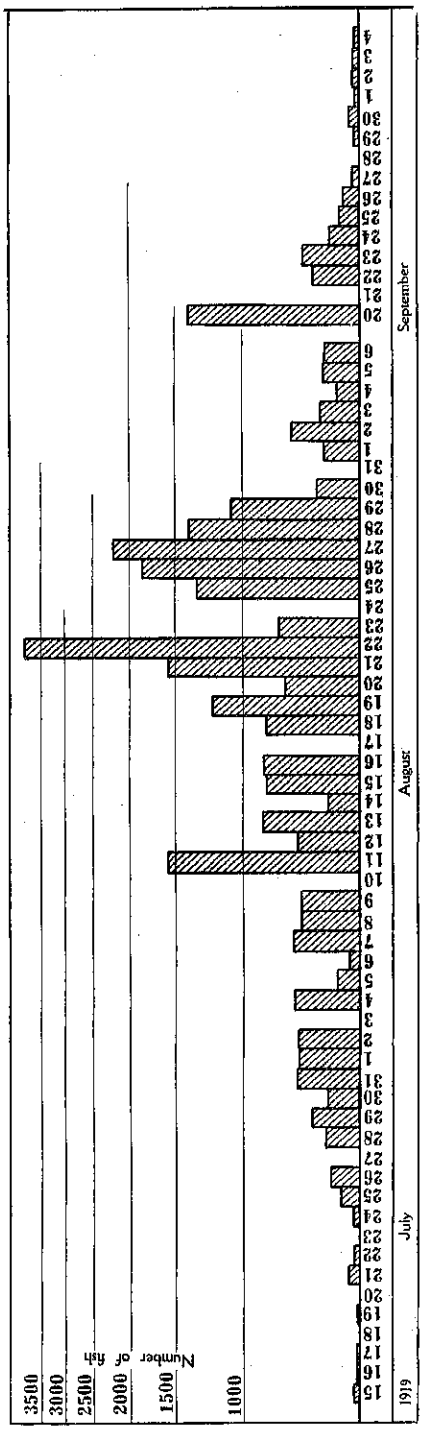

FIG. 5. The migration of 1919 as represented by the daily catch.

way. Occasional individuals have some sea food in the digestive tract and some have been seen with their stomachs full of sardines.

After entering the river, it appears that the fish are accustomed to linger in the estuary for a time at least. This seems to be established by the fact that a closed season whether long or short is generally followed at once by an unusually large catch. This is borne out by an inspection of table 12[5], and also in figure 4, where the dotted lines represent legally closed periods. It will be noted also that when fishing begins late in the season as in 1922 and 1923 the initial catch is large. In many cases two or three successive days of fishing almost clear the river. Exceptions occur, but they are not frequent. From reports it appears that fish sometimes pass quickly up the river after entering the mouth. They also linger at times in the larger pools. Nets are often successful at Ferry Drift or Hollow Tree Drift when very few fish are caught in the estuary. In migration, the fish often rest in the slower parts of the stream which extend between the rapids. They are said to select one side of the river or the other in migration, the choice presumably being made in relation to the current. All this must be taken into account in the consideration of closed periods or restricted areas as aids to conservation.

Sometimes a migratory- wave of unusual size appears, suddenly taking everyone by surprise. In 1920, early in August the fish were coming in numbers and the catch was well sustained during the week ending with the 14th. On the evening of the 15th the layout began at 8.15 at the first sound of the whistle. Almost immediately fish began to strike the nets and the catch progressed so rapidly that the recall was sounded at 8.50. Some of the nets had filled so quickly that several boats were in distress from an overload and other nets had to be hauled without taking time to disengage the fish. 7420 fish were taken into the cannery at this time. From then until the end of the month the catch was limited to the capacity of the plant. At the same time the river was alive with steelheads.

The gonads of the early arrivals are comparatively immature, their size and general appearance not differing from many examples caught at sea, this condition changing with the progress of the season, some of the last fish to come being almost mature. Eggs of fish taken early in the season often measure no more than 3 mm. in diameter, while later, some measuring 7 or even slightly more may be seen. A ripe egg measures about 9 mm.

The late arrivals have in most cases acquired the external marks of mature fish, notably the highly colored skin, deeply embedded and eroded scales, the hooked jaw and enlarged teeth. The appearance of larger and older fish also characterizes the wane of the migration.

Upon entering the stream early in the season the fish are almost uniformly olive greenish above, the color somewhat lighter or darker in different individuals, and bright silver on the sides, the sheen disappearing on the lower surface. The spots of the body are elongate, in many cases almost reduced to zigzag lines each covering 4 or 5 scales and extending obliquely with the rows of scales.

[5] In these tables the catch of the previous evening is recorded as of the following day. For example, the catch of August 14th was begun August 13th at 8.15 p.m. and continued at intervals during the night of that date and the early morning of the 14th.

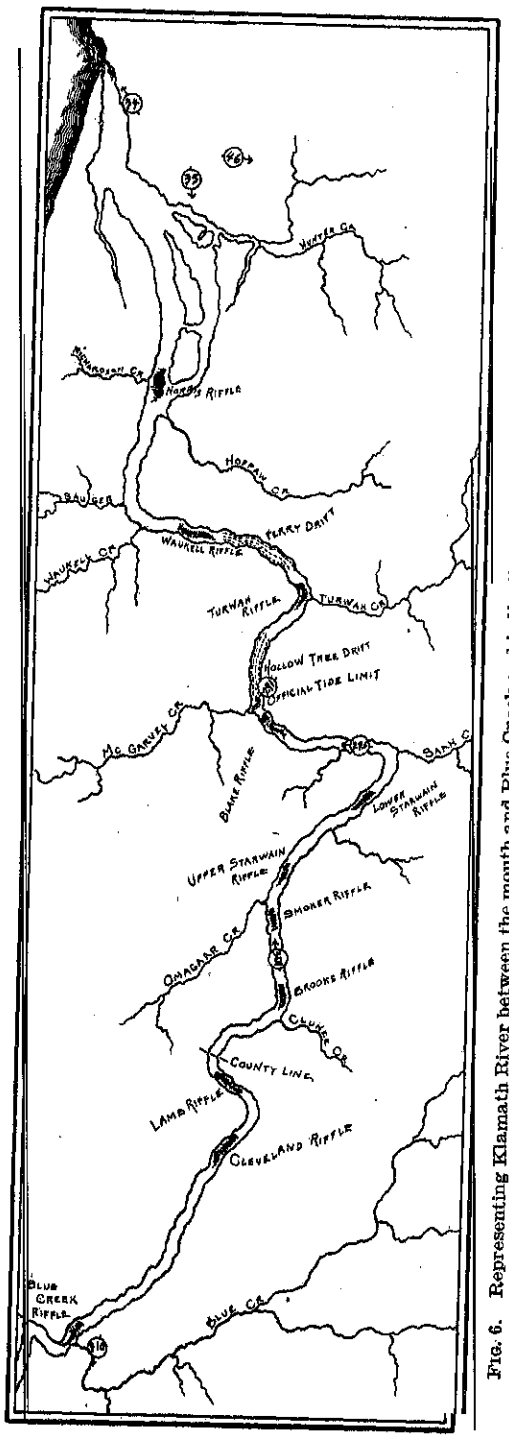

FIG. 6. Representing Klamath River between the mouth and Blue Creek and indicating the location of rapids (riffles) and fishing grounds.

The dorsal fin is profusely spotted. The caudal fin may be completely spotted or immaculate. In a series of specimens exhibiting variously spotted fins the immaculate condition is approached by a disappearance of spots first from the middle of the fin, then downward toward the lower lobe, remaining to the last on the lower edge, then dorsally toward and finally including the upper rays of the upper lobe. The spots of the caudal are round or slightly ovate, usually more elongate near or on the upper and lower edges.

Inside the mouth the tissue is blue black on the lower jaw near the teeth, on the tongue and backward along the gill arches, along inside of upper jaw, on edge of valve and on two elongate areas bordering palatine teeth. This character serves to easily distinguish between salmon and steelheads, the latter having the inside of the mouth white.

About the middle of August fishes begin to appear with traces of the nuptial colors. Some have the back and sides suffused with a brilliant bronze which is often strongly tinted with pink. Others are dark or even blackish and along with the color comes an elongation of the snout and a thickening of the skin. As the season progresses individuals with colors more nearly approaching those of the spawning period appear from time to time, while very late in the season an occasional male is seen the color of which is almost in full bloom.

When about ripe the males become very dark olive or almost black, the silver having entirely disappeared, even the ventral surface being dark, the throat and chin black. The region of the branchiostegals, the jaws and snout and the lower sides of the paired fins are black. Above and behind the anal fin the body is cherry red. Axil and covered areas anterior to branchiostegals and beneath jaws, dead white.

As the bright color stage advances the red progresses anteriorly until the whole head and body are suffused with it. The advanced color phases are not entirely coordinate with maturity, a brilliantly colored example sometimes not being so nearly ripe as one which is much less ornate.

Far up stream even late in the season individuals are occasionally seen with something of the silvery color of the sea. These are identified by the casual observer as silver salmon while the darker colored examples are spoken of as hook-bills.

No observer has had an opportunity to trace a migration up the river, and at present there is nothing to offer in this connection except what may be culled from interviews with residents or anglers and other fishermen along the stream. Information secured in this way is difficult to evaluate because of confusion resulting from an inability to distinguish species or to discriminate between members of the same species. When the observer is called upon to regard males and females, some with their silvery sheen fresh from the sea, and others dark and highly colored as they approach maturity, not to mention old males with hooked jaws, and the steelheads and silver salmon, the difficulty becomes acute. Out of a mass of reports and descriptions it appears safe to accept in the main the following extract.

In the past there were two fairly distinct runs of king salmon, noted even to the headwaters of the river and its larger tributaries. First came the spring or summer salmon, which were later followed by

the fall or snow salmon. The migration of spring salmon has everywhere been diminishing until of late years it has practically disappeared. It is reported that the spring salmon lingered near the spawning beds both in the main river and its tributaries where they at last matured, ripened and spawned with the fishes of a later run. The spring salmon, also known as "silvers" because of their bright color, were said to arrive in the region of Happy Camp in May or June, and in Shasta River in June and early July. These fish are described as being silvery in color, the scales plainly seen on the surface, and the jaws without hook or fighting teeth. These are never seen spawning. The inference is plain that before spawning they assume the characters common to spawning fish, and this at about the time that fish of the summer run appear on the spawning beds. There is said to have been no spring run into Scott River.

The fall or snow salmon sometimes called "hookbills," appeared later in the season arriving near Happy Camp late in August or early in September and continuing to come, entering such streams as Clear, Elk, Indian, China and Grider creeks where they spawned from November on, some even as late as January. Fish of this run enter Scott River and Beaver Creek at about the same time. They formerly came to Shasta River in great numbers, an old resident referring to it as the best spawning tributary of Klamath River. The demands of irrigation have changed all that and now the Shasta is said by many to contribute relatively little to the population of the main river.

The racks at Klamathon, near Hornbrook are usually in place by the latter part of July in anticipation of the early arrivals of the summer migration and they sometimes remain until late in November, most of the fish having then been entrapped. Artificial spawning begins at the racks a little after the middle of October and continues into November. Fish of the summer run, and especially after their entry into the tributaries, which may in some cases be delayed until the rains of early autumn, are often dark in color, some having a conspicuous area of cherry red on the sides. Their skin is then thick and leathery, the scales small (eroded or absorbed) and deeply embedded, and the jaws of the males greatly extended, hooked and armed with large teeth. In a word they are mature, and ready to spawn. The designation "hookbills" or "dogs" as applied to these is easily understood. In spite of the emaciated condition of some of these and their poorly flavored flesh, they were formerly sought with hook and spear and many were destroyed just before the eggs were laid.

The time of arrival of salmon in the tributaries appears to differ markedly, at least in certain cases, and their degree of maturity varies also. For example, during the week beginning October 16, 1927, relatively small numbers of the fish held between the Klamathon racks were ripe. In Shasta River large numbers were actively spawning, while many spent and a few dead fish were seen. At the same time only a few fish were in Scott River, the migration having scarcely begun there. Spawning had not yet started. The volume of Scott River at the time was equal to or greater than that of the Shasta.

During the summer migration the salmon enter the river from a constantly lower temperature to a varying higher one. No careful observations on temperature and its possible relation to migration in

Klamath River has been made, but a cursory examination of conditions prevailing there leads one to suspect that an investigator with temperature control as a thesis will find ample food for thought. In passing up the stream, salmon enter tributaries which are either warmer or colder than the main channel as the case may be. Diurnal variation is great both in the main river and its tributaries. One may at times find a difference of two degrees between the water flowing along the north and south banks where the river is not more than 250 feet across, and where there are neither springs nor tributaries to affect it.

A tributary may at one time of day be colder than the river while at another time it may be warmer. Some tributaries into which salmon migrate have a flow so weak when compared with the main stream that their temperature influence may be detected only a short distance either laterally or below their mouths.

Some scattered observations on temperature may be of interest.

During the summer of 1926, from August 10 to September 15 the ocean temperature near the mouth of the river was 55° Fahrenheit, according to G. H. Clark, assistant to the Bureau of Commercial Fisheries. He reported river temperatures at the same time as follows:

TABLE 13

Date	Time	Depth of water	Bottom temperature (degrees, Fahrenheit)	Top temperature (degrees, Fahrenheit)
August 1, 1926	10.00 a.m.	8′ 6″	71.5	72.0
August 3, 1926	10.30 a.m.	8′ 8″	71.0	72.0
August 4, 1926	10.30 a.m.	9′ 6″	71.0	71.0
August 5, 1926	10.00 a.m.	8′ 2″	70.0	70.5
August 6, 1926	10.00 a.m.	8′ 6″	70.0	70.5
August 11, 1926	10.00 a.m.	8′ 1″	70.0	70:o
August 12, 1926	9.30 a.m.	2′ 8″	68.0	68.0
August 13, 1926	10.00 a.m.	1′ 6″	69.0	70.0
August 16, 1926	8.30 a.m.	3′ 6″	68.0	69.0
August 18, 1926	8.30 a.m.	4′ 0″	68.0	69.0
August 19, 1926	8.30 a.m.	4′ 6″	67.0	69.0
August 21, 1926	8.30 a.m.	4′ 0″	68.0	69.0
August 23, 1926	10.30 a.m.	5′ 2″	61 0	71.0
August 25, 1926	2.30 p.m.	7′ 3″	60.0	65.0
August 30, 1926	10.00 a.m.	5′ 0″	68.0	68.0
September 1, 1926	11.00 a.m.	5′ 0″	68.0	69.0
September 4, 1926	10.00 a.m.	5′ 10″	64.0	67.0
September 7, 1926	9.00 a.m.	5′ 2″	65.0	66.0
September 14, 1926	10.30 a.m.	5′ 0″	67 0	67.0
	10.30 p.m.	5′ 0″	66.0	66.0

At the egg taking station near Hornbrook the water temperatures during the month of July of the same year varied from 60° to 76° Fahrenheit, the daily variation being from 4° to 10°. During August it was just a little lower. In September it fell, going down to 40° at one time. In October and November it was still lower. The following summary may be of interest.

Average temperatures for ten-day periods taken twice each day at 8 a.m. and 5 p.m.:

TABLE 14

Date	Degrees, Fahrenheit (a.m.)	Degrees, Fahrenheit (p.m.)
July 1 to 10	68.1	76.0
July 11 to 20	67.2	72.6
July 21 to 30	61.9	70.7
August 1 to 10	60.0	70.4
August 11 to 20	60.0	68.6
August 21 to 30	60.2	66.6
September 1 to 10	58.6	66.2
September 11 to 20	55.0	62.6
September 21 to 30	49.6	60.0
October 1 to 10	50.6	59.2
October 11 to 20	51.4	56.9
October 21 to 30	47.6	56.8
November 1 to 10	46.6	53.7

From time to time one hears the declaration that the migration is growing later each year. This often accompanies a plea for a late extension of the legal open season. The same report also comes from Eel and Smith rivers. This belief expressed by many fishermen and other observers, is in the writer's opinion a misinterpretation of a phenomenon of depletion. Instead of the curve of migration progressively moving toward the end of the calendar year, the early part of it is being rapidly cut off. The spring run has practically disappeared and the early part of the summer migration has been greatly diminished, while increased effort has sustained the size of the catch which is now largely obtained from what was once the central region of the curve. The partial disappearance of the early fish together with the increased effort necessary to maintain the catch have contributed toward a manifestation of depletion which has been wrongly interpreted as a change in the habits of a species.

The cause of the disappearance or depletion of the early spring migration is another matter and it is doubtful if an entirely satisfactory explanation may now be offered. It is attributed by some to the closure of the river at Copco, this belief resting upon the supposition that the fish of the early part of the migration were bound for Williamson River and the upper Klamath. But depletion of the early run was well under way, if not about complete long before the erection of the dam. Mining operations, overfishing both in the river and at sea, irrigation, and other causes have been suggested.

SEX REPRESENTATION IN THE MIGRATION

During the migration of 1919 the sex of 3136 individuals was recorded. In each case the sex was determined by dissection. Of these, 1461 were found to be males, while 1675 were females. This enumeration takes almost no account of the three-year males, the so-called chubbs or grilse, which, because of their small size, easily escape the nets in numbers and when caught are not usually brought

TABLE 15

Sex Representation in the Annual Catch, Klamath River

Date	1919		1920				1921				1922				1923			
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
July 10					1	1												
July 11	2	3													3	2		
July 12					2	2												
July 13					3	5									2	9		
July 14	1	4			1	2									3	21	8	32
July 15	6	31			1	2												
July 16					1	1									11	44		
July 17	4	16			3	12	12	25							17	58		
July 18															11	74		
July 19	2	1	15	55	22	47									19	56		
July 20					20	40			24	29					11	49		
July 21	5	31			10	20			47	47					5	44	74	325
July 22	2	16			40	59			18	58								
July 23		2			20	65			32	63	121	229			9	56		
July 24	5	13			25	50	137	281							21	59		
July 25	34	70							47	53					7	22		
July 26	24	26	70	158	23	46			4	4					12	53		
July 27					30	43			43	49					12	68		
July 28	16	24			34	70			20	30					8	2	69	260
July 29	71	78			35	60			40	60			23	57				
July 30	46	39			53	101			34	53	188	231			14	61		
July 31	36	44			47	107	222	427					12	53	4	13		
August 1	29	34							54	56			16	34		3	18	77
August 2	35	24	233	243	81	122			41	68			8	20				
August 3					45	74			50	50			4	36				
August 4	34	30			42	107			55	116			13	62				
August 5	14	11			72	67			49	80			13	71	89	289		
August 6	31	14			66	114			38	62	287	432						
August 7	22	48			60	127	366	611					82	186	20	60		
August 8	37	53							43	66			65	154	9	46		
August 9	1	4	139	160	44	61			39	65			202	428	22	63		
August 10					89	151			36	69			79	212	13	11		
August 11	58	67			97	186			36	64			15	35	10	40	74	286
August 12	34	40			67	119			40	60			17	33	460	1,048		
August 13	20	35			51	139	348	660	44	66	238	380			9	66		
August 14	11	4											20	44	23	77		
August 15	15	20			69	111			33	87			14	43	22	65		
August 16	14	20	152	186	86	133			35	66			15	40	17	53		
August 17					61	134			40	58			100	207	24	56	96	317
August 18	29	30			78	117			34	11			14	46				

August 19	19	36			87	118			43	55			10	50	173	430						
August 20	33	32			130	125	511	758	39	56	224	392					26	50				
August 21	30	43											73	226			13	27				
August 22	41	65							32	73			61	164			23	62				
August 23	38	36	190	242	85	129			22	28			19	30			20	65				
August 24					73	132			79	106			92	177			31	44				
August 25	34	70			87	113			60	44			111	168			16	34	179	282		
August 26	29	46			89	121			53	47			14	25	370	790						
August 27					103	108			49	57	295	355					11	64				
August 28					61	89	498	692					23	61			21	54				
August 29	33	27											48	102			26	49				
August 30	21	18	111	161	60	90							56	134			27	54				
August 31					68	82			49	64			189	281			24	62	109	283		
September 1	39	30			71	79			57	53			185	341								
September 2	51	36							42	57			22	53	523	972						
September 3	32	27			50	95			49	51							24	51				
September 4	66	58			31	49			51	49			24	51			26	53				
September 5	27	25							44	66	292	340	96	179			28	47				
September 6	33	21	248	197	56	84	336	479					101	174	221	484	24	36	102	187		
September 20	70	58																				
September 21																						
September 22	33	21																				
September 23	5																					
September 24	12	17																				
September 25	11	9																				
September 26	14	16																				
September 27	11	13	156	134																		
September 28																						
September 29	5																					
September 30	2	3																				
October 1	4	3																				
October 2	5	5																				
October 3	15	9																				
October 4	3	2	34	22																		
October 5																						
October 6	4	7																				
October 7	18	20																				
October 8	4	17																				
October 9	6	9																				
October 10	13	16																				
October 11	11	5	56	74																		
October 12																						
October 13																						
October 14	21	12																				
October 15	6	11																				
October 16	13	10																				
October 17	5	6																				
October 18	6	4	51	43																		
Totals			1,461	1,675							1,645	2,359			1,836	3,033			678	2,049		

into the cannery. Early in the season there was a relatively large proportion of females in the catch, but as the season advanced the males became more numerous. This is illustrated in table 15 where for comparison the sex enumeration for later years is also recorded. Reduced to percentages, the relative number of females appearing during successive periods of the migration is as follows :

TABLE 16

Percentage of Females in the Catch During Successive Periods of the Summer Migration

	1919	1920	1921	1922	1923
To July 19	70.5	67 5			76 4
July 20 to 26	69.3	67 2	65 4		79.0
July 27 to August 2	51.0	65 7	55 1	76 2	81.0
August 3 to 9	53.6	61 8	60 0	69 4	79.4
August 10 to 16	55.0	65 4	61 4	68 1	76 9
August 17 to 23	56.0	59 7	63 6	68 0	68.6
August 24 to 30	57 9	58 5	54 6	65 0	72.2
September 1 to 6	44 3	58 5	53 8	64 6	64 7
September 20 to 27	46 2				
September 28 to October 4	39 3				
October 5 to 11	56 9				
Total number observed	3,136	6,442	3,975	2,134	2,724

In the case of sex representation the desirability of considering numerically large samples has not escaped attention, and an illustration of what a sample of small size might present may not be out of place here. One day, August 25, 1922, to be more particular, 100 fish picked up without conscious selection resulted in finding 37 males and 63 females. Other hundreds were then examined in small pods just as they came to hand with the following results:

TABLE 17

Males	Females	Males	Females	Males	Females	Males	Females
	17	11	14		13	9	16
8	17	13	12	12	20	9	16
8	17	10		1	13		15
15	10	10	16	36	10	108	17
39%	61%	44%	56%	44%	56%	36%	64%

It appears that we have no means of knowing the relative number of either sex in an entire migration, principally because the small males are allowed to pass the nets in large numbers, and further, there is no opportunity to observe the latter part of the migration when males are apparently more numerous. The results of some observations on Trinity River" in Hoopa Valley, extending over a short period from September 18 to 26, are suggestive. During this time 340 king salmon were caught under such circumstances as would warrant presumption that a fair sample of the migration at this time was secured, Of these, 260 were males which measured less than 64 centimeters in length, all of a size most likely to escape the nets at the mouth of the river. Of

[6] Snyder, J. O. Indian methods of fishing on Trinity River and some notes on the king salmon of that stream. California Fish and Game, vol. 10, no. 4, pp. 163-172, 1924.

TABLE 18

Average Weight of King Salmon in Klamath River as Shown by the Daily Catch for 1917-1925

Date	1917	1918	1919	1920	1921	1922	1923	1924	1925
July 17	14.9		12.4	13.6			14.4		
July 18	16.8		14.0				14.1		
July 19			12.2	14.9			15.6		
July 20	18.8			15.0	13.8		15.6		
July 21			14.1	14.7	14.0		14.3		15.7
July 22	18.2		13.6	14.7	15.0				15.0
July 23	15.1		15.7	14.6	14.1		15.0		16.6
July 24	16.1		13.1	14.7			15.5		16.5
July 25	16.0		13.2		14.5		13.6		16.0
July 26	14.8		14.7	14.1	12.2		14.3		
July 27	15.3			14.5	14.4		15.0		16.6
July 28			13.3	14.6	13.8		14.2		16.3
July 29	14.9		13.2	14.1	14.5	15.6			15.8
July 30	14.8		13.8	14.7	13.2	15.0	14.9	14.6	16.3
July 31		12.7	13.8	14.3			14.3	14.0	15.3
August 1	15.0	12.9	13.4		13.3	14.9	14.6	13.8	15.6
August 2	14.9	12.3	12.6	14.0	12.6	15.0	10.0	14.6	
August 3	15.1			14.4	12.8	15.1			15.6
August 4		11.9	13.3	14.4	12.5	14.9		13.6	15.1
August 5	14.6	12.5	12.2	13.0	13.1	14.8		13.4	14.8
August 6	14.4	12.3	12.9	14.3	12.2		14.4	13.9	15.3
August 7	15.0	12.2	12.8	14.0		15.0	14.2	13.8	16.0
August 8	13.3	12.4	12.8		14.1	15.1	14.0	12.8	16.1
August 9	14.9	13.3	12.7	14.0	12.7	14.9	14.9	13.4	
August 10	14.5			14.5	12.6	14.3	14.6		15.1
August 11		13.1	12.7	13.9	13.1	14.9	14.5	14.7	16.0
August 12	14.9	12.6	13.0	14.4	13.3	14.6		13.7	15.6
August 13	14.1	12.4	12.5	13.7	13.8		14.2	14.0	15.4
August 14	15.3	12.0	13.0	14.4		15.1	15.0	14.3	14.5
August 15	14.4	12.3	12.5		15.5	14.0		14.2	14.6
August 16	14.9	11.9	13.2	14.4	14.3	14.1	14.1	13.1	15.1
August 17	15.9				13.3	14.8	14.2		
August 18		12.0	12.6	14.4	13.4	14.6	14.9	14.5	16.0
August 19	15.3	12.2	12.6	14.9	13.5	13.2		15.1	15.7
August 20	15.1	11.8	13.0	15.3	12.8		13.9	15.1	15.4
August 21	14.8	12.0	13.5	15.8		13.6	13.6	14.6	16.6
August 22	15.0	12.1	13.8		13.9	13.8	14.1	14.3	15.8
August 23	13.1	11.1	14.1	14.9	15.3	14.6	14.3	16.0	
August 24	14.2			14.8	14.3	14.8	13.9		16.6
August 25		11.3	13.6	15.1	17.4	15.1	13.3	16.0	15.4
August 26	15.1	11.7	13.2	15.5	14.7	15.9		16.0	15.0
August 27	14.1	11.4	13.6	15.2	15.4		13.6	14.4	15.0
August 28	13.9	11.2	14.2	15.1		14.3	13.8	15.5	15.5
August 29	16.5	11.3	14.0			13.5	13.9	14.4	15.8
August 30	15.2	11.3	14.1	16.6		14.0	14.1	13.8	
August 31	15.0			15.4	15.1		14.7		16.4
September 1		11.6	14.0	16.9	14.6	14.3		14.9	16.6
September 2	16.2	11.2	14.2		15.2	14.6		16.5	16.2
September 3	16.5	12.1	15.1	14.9	16.3	15.3	14.0	16.3	16.4
September 4	18.3	12.7	15.3	14.9		15.7	15.0	17.1	16.4
September 5	17.6	12.5	16.9		16.2	15.7	15.4	18.9	15.5
September 6	21.1	17.3	14.8	16.7	15.9	16.4	15.4	16.6	
September 20	18.0	17.9	22.8						
September 21	20.6		23.3						
September 22		19.1	22.7						
September 23	20.6	20.6	22.9						
September 24	18.3	23.5	21.8						
September 25	14.1	19.1	24.3						
September 26	18.1	21.3	22.9						
September 27	18.5	24.0							
September 28	21.1		21.7						
September 29		23.1	21.0						
September 30		23.9	24.0						
October 1		22.3	17.3						
October 2		25.1	19.0						
October 3		25.1	21.2						
October 4		24.5							
October 5			21.8						
October 6		27.0	18.6						
October 7			23.2						
October 8		24.6	26.6						
October 9		23.4	23.5						
October 10			27.0						
October 11		23.0							
October 12			25.6						
October 13			22.9						
October 14									
October 15			23.2						
October 16		24.3							
October 17			25.2						
October 18		24.2							
October 19									

TABLE 19

The Increase in the Average Length of Fish as the Klamath River Season Progresses

Date	Number males	Number females	Average length males	Average length females
July 11	2	3	72 8	76.3
July 14	1	4	60 5	77.0
July 15	6	31	75 3	77.1
July 17	3	16	69 8	76.1
July 19	2	1	76 0	72.0
July 21	5	31	68 5	77.5
July 22	2	16	80 5	77.6
July 24	5	13	80 7	78.1
July 25	34	70	75 8	76.5
July 26	24	26	80 4	78.1
July 28	16	24	78 9	77.0
July 29	71	78	77 8	77.4
July 30	42	39	76 8	77.3
July 31	36	44	79 6	76.7
August 1	20	34	79 2	77.0
August 2	35	24	77 7	73.6
August 4	34	30	85 0	77.2
August 5	14	11	79 5	71.8
August 6	31	14	73 5	75.9
August 7	22	48	78 4	78.2
August 8	87	53	76 6	76.4
August 11	58	67	79 8	78.1
August 12	34	40	77 5	75.4
August 13	20	36	77 0	77.7
August 14	11	4	82 9	77.6
August 15	15	20	80 4	77.4
August 16	14	20	75 0	78.3
August 18	27	30	78 0	76.4
August 19	19	36	72 5	75.4
August 20	33	33	81 9	77.3
August 21	30	43	77 3	78.3
August 22	41	66	81 9	79.2
August 23	33	36	80 7	78.9
August 25	46	67	82 1	78.3
August 26	27	46	84 4	78.6
August 29	33	27	80 5	80.2
August 30	19	17	76 9	76.8
September 1	34	30	87 9	83.2
September 2	41	38	84 8	80.5
September 3	32	27	85 2	80.1
September 4	66	57	84 7	80.2
September 5	27	25	85 4	82.9
September 6	33	21	85 3	82.4
September 20	56	57	88 4	89.1
September 22	23	21	89 6	87.0
September 24	12	17	94 5	94.1
September 25	11	9	86 2	89.4
September 26	14	16	85 0	87.4
September 27	9	13	85 9	87.5
September 29	5	0	92 7	0.0
September	2	3	80 5	96.5
October 1	4	3	85 4	89.5
October 2	5	5	93.2	90.6
October 3	15	9	78 8	89.1
October 4	3	2	107 5	94.7
October 6	4	7	90 6	92.7
October 7	18	20	90 2	90.8
October 8	4	17	99 4	91.1
October 9	6	9	95 26	90.5
October 10	13	16	94 2	93.3
October 11	11	5	92 6	97.1
October 14	21	12	96 8	93.0
October 15	6	11	92 8	92.5
October 16	13	10	92 4	98.3
October 17	5	6	92 0	96.1
October 18	6	4	95 6	94.3

the remaining fish there were 47 males and 33 females, just about the proportion of each sex that one would expect to find in the catch near the mouth of Klamath River at the same time. It seems quite likely that the presence of so many small fish here is due largely to the straining process going on in the commercial fishery. It may be noted in

passing that 206 of these small fish were in the second year of growth, examples of which are difficult to find at the mouth of the river.

The racks near Hornbrook are so constructed as to prevent the passage of all salmon. A census of salmon entrapped there since 1925 is presented on page 91. Where the record is complete it will be seen that males are far in excess of females. But of these males the larger number are grilse, the small two and three-year old fish which escape the nets and do not appear in the catch at the mouth of the river. If the grilse are disregarded it will be found that the females exceed in number the males of their own size.

FISH INCREASE IN AVERAGE WEIGHT AND SIZE AS THE SEASON ADVANCES

A considerable increase in the average weight of the fish is observed as the season progresses. The increase is not always gradual from day to day, not even from week to week, but when the fish taken early or late in the season are compared, the latter are always found to average much the larger. This is well illustrated in the catch of 1919 as reported by Field (table 18) as also in the catches of the two previous years. When the fishing season is short as in 1922 for example, the difference is not so marked, while in 1923 and 1925 it scarcely appears. The whole picture might differ somewhat if a record of the small three-year fish, the so-called grilse or chubbs, which escape the nets in numbers, should enter into its composition. Not only do the fish apparently increase in weight, but there is a corresponding gain in their average length as is demonstrated in table 19, which exhibits the average measurements of a number of examples of both sexes as observed from day to day. An inspection of the data here presented should not lead to the inference that the increase in average size is due entirely to seasonal growth, for such is not the case.

An occular inspection of the catch as it lies from day to day, Spread out on the floor of the receiving house, leads one to note the appearance of unusually large fish in increasing numbers as the season progresses. Most of the fish taken early in the season measure less than 90 cm. in length, an example of much larger size being noted as unusual, while late in the season such large fishes are relatively common. The recorded measurements of 3200 fish observed during the season of 1919 are tabulated as follows:

TABLE 20

Date	Number examples	Per cent measuring less than 90 cm.	Per cent measuring 90 cm. or more
July 14-20, 1919	75	98.6	1.4
July 21-27, 1919	208	92.3	7.7
July 28-August 3, 1919	483	91.3	8.7
August 4-10, 1919	302	92.7	7.3
August 11-17, 1919	315	94.3	5.7
August 18-24, 1919	432	90.3	9.7
August 25-31, 1919	355	88.6	11 4
September 1-6, 1919	433	78.9	21 1
September 20-28, 1919	284	51.8	48 2
September 29-October 5, 1919	56	48.2	51 8
October 6-12, 1919	133	37.6	62 4
October 13-19, 1919	83	27.7	73 3

Here as frequently occurs elsewhere, the statistics of the catch fail in a measure to present a true picture of the migration. Fishermen, aware of the fact that unusually large fish appear late in the season, lay their plans accordingly and occasionally provide themselves with nets of very large mesh. The practice does not appear to have been general in the past, and is not now resorted to because of the shortened legal fishing season. A number were in use in the fall of 1919 but there was no means of determining just what effect they may have had on the average size of the fish caught. That the use of a net of large mesh may produce results different from that of a net of small mesh may be demonstrated. For example, on September 21, 1916, Stansbury and Fisher, with a net of 6-3/4 in mesh caught 78 fish weighing 1180 pounds, while at the same time and place, Robinson and Madsen, with a net of 8-3/4 inch mesh took 54 salmon weighing 1070 pounds. The fish of the small meshed net averaged 15.13 pounds; those of the large meshed net 19.81 pounds.

The presence of large fish is by some attributed to artificial propagation, the direct result of the introduction of Sacramento salmon. If true, their appearance would date from the introduction of these fish, and hatchery experts who have had to do with propagation on the Klamath maintain that this is the case. This supposition is not sustained, however, by the reports of old residents at the mouth of the river, including Indian fishermen whose memory reaches a long way back of artificial propagation in the state. According to them these very large fish have always appeared in the fall just as they do now. Moreover they all agree in reporting that these fish mostly enter the lower tributaries to spawn. Many are said to go into Blue Creek, and for this reason the very large fish are locally referred to as "blue-creekers." These "blue-creekers" resemble the fish of Smith River in size, as well as in color, character of snout and other peculiarities associated with maturity. The Smith River fish like the "blue-creekers" enter the river late in the season, are relatively mature, and have but a short distance to migrate to their spawning beds.

Bailey on April 17, 1920, told the writer that these large fish, the so-called blue-creekers, had always been a feature of the latter part of the migration.

A more detailed account of the progressive entry of large fish into the migration is given in table 21, where for a short period of time the percentage of fish which constitute a given length class is recorded. For example, it will be seen from a glance at the table that during the period from July 21 to 31, of the 509 fish measured, only 0.78 per cent, were 90 cm. long, while from September 20 to October 18, of 569 fish, 2.99 per cent were 90 cm. long. From data contained in this table, figure 7 was constructed. This presents the percentage of individuals of any length from 55 to 110 cm. which are found in representative samples of the catch during certain periods of the season. Here a late invasion of large fish is distinctly evident. This invasion would not seem so abrupt if data covering the time from September 6 to 20 were available. An inspection of fish caught, on hooks during this closed season indicated that the large fish gradually became more numerous.

TABLE 21

The Percentage of Klamath River Fish which Constitutes a Given Length Class for a Certain Period of Time

Length in cm.	July 21-31	Aug. 1-14	Aug. 15-16	Aug. 25–Sept. 6	Sept. 7-19 (closed season)	Sept. 20–Oct. 18
	1	2	3	4	5	6
40						
41		.42				
42	.19	.56				.17
43		.14	.19			.34
44		.14		.24		
45		.84		.39		
46		.42		.24		
47		.42		.39		.17
48	.19	.84	.19			.17
49		.14	.19	.84		.17
50		.42	.39	.39		
51	.25	.56	.39	.53		
52			.19	.24		
53	.19	.14		.96		
54	.19	.28		.39		.34
55	.19	.28	.60			.52
56	.58	.14		.24		.71
57	.25	.14	.39	.24		.52
58	.25	.14	.19	.53		.87
59	.19			.39		.71
60	.19	.28	.39	.39		.71
61	.98	.56	.19	.24		.71
62	.58	.28	.60	.12		.34
63	.19	.84	.79	.24		.34
64	.98	1.13	.60			.34
65	1.32	1.55	.79	.66		.87
66	1.57	2.39	1.02	.53		.52
67	2.36	2.93	2.79	1.08		.17
68	2.36	2.64	3.00	1.45		.34
69	3.73	4.23	4.19	1.20		.52
70	3.30	3.63	3.79	2.53		.17
71	4.32	2.93	4.19	1.46		
72	3.73	3.10	4.40	2.29		.52
73	4.52	2.93	4.19	2.89		.17
74	2.74	3.80	4.19	2.53		.17
75	4.91	3.63	3.40	2.53		.17
76	5.50	4.23	4.00	2.88		1.50
77	5.50	4.93	4.59	3.36		.34
78	5.30	5.64	4.59	3.61		.86
79	5.60	4.93	4.79	4.46		1.40
80	5.69	4.93	4.59	5.66		1.40
81	3.54	3.80	4.59	5.55		1.40
82	3.30	2.52	3.60	5.91		2.61
83	3.73	3.10	4.40	5.18		1.98
84	4.13	2.23	3.19	4.82		2.99
85	2.36	2.64	2.79	3.12		2.99
86	2.36	2.64	1.04	2.89		3.32
87	.19	1.53	2.79	3.49		4.00
88	1.37	2.64	2.40	2.88		4.00
89	1.76	1.97	2.00	3.10		4.38
90	.78	1.55	3.00	2.25		2.99
91	1.37	1.55	2.19	1.93		3.13
92	1.96	1.13	.19	1.08		4.92
93	.58	.84	.39	1.08		2.99
94	1.37	.76	.90	1.08		3.50
95	.78	.14	1.02	.96		4.00
96	.19	.56	.19	1.56		3.13
97	.19	.14	.60	1.81		3.13
98	.25	.42	.39	1.08		4.38
99	.25	.28		.39		3.85
100	.25	.42	.39	.53		2.61
101			.19	.24		2.61
102		.28		.66		1.58
103	.19	.28		.24		2.81
104	.19	.14		.39		1.93
105	.19	.28		.12		1.58
106			.19	.24		1.50
107				.12		1.58
108		.14		.12		.52
109				.24		.71
110				.12		1.40
111						.17
112				.12		.34
113						.71
114						.17
115						.17
116				.12		
Number of specimens examined	509	709	507	829		569

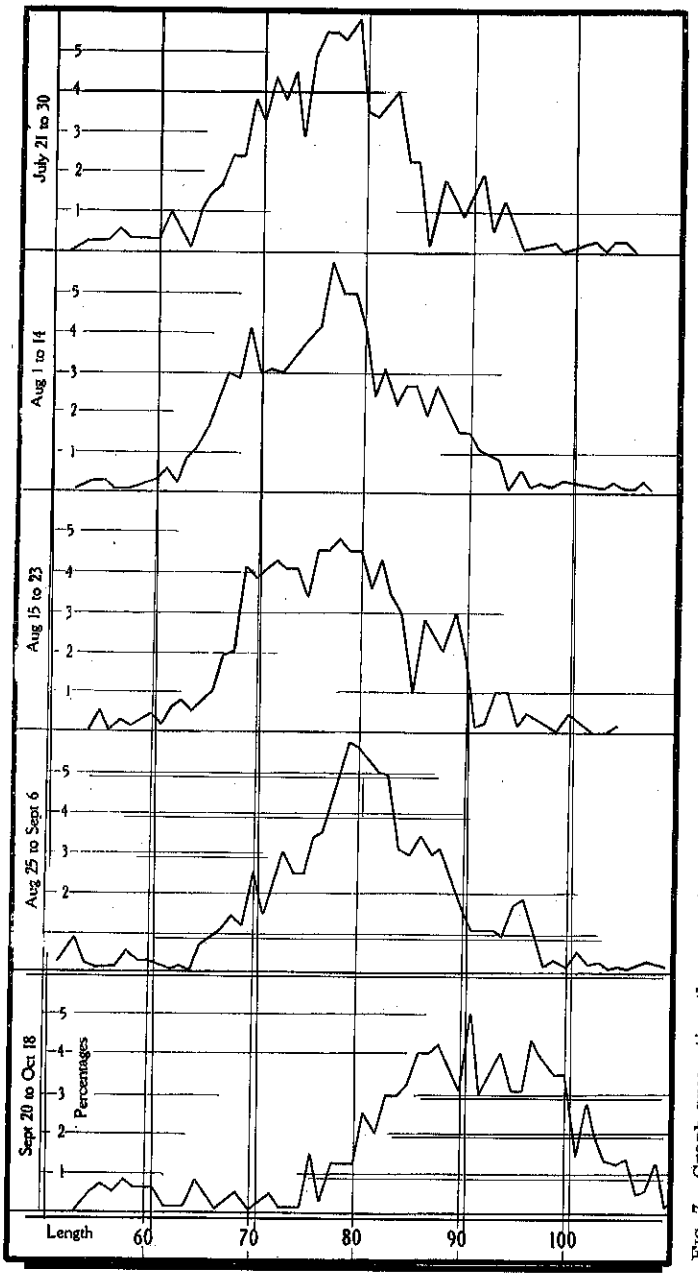

FIG. 7. Graph presenting the percentages of fishes of lengths from 55 to 100 cm., which are found in representative samples of the catch during given periods of the season.

ANGLING FOR SALMON

When the river water becomes sufficiently clear, numerous king salmon are caught by anglers in the lower part of the estuary by means of trolling or casting with a naked spinner. At times, when the river or tidal current is sufficiently strong, it is only necessary to anchor the boat and await a strike.

When hooked with light tackle in the river, the salmon is not given to leaps like the more sprightly steelhead. H'owever, his rushes are strong and often persistent and continued. Occasionally he prefers to fight it out by sulking on the bottom, but soon a new impulse sets him going again, and he is off to resume the struggle. Trolling with heavy line and sinker has been almost entirely superseded by the use of light rods. Casting long distance with a free reel is also a favorite method.

At the height of the season there is scarcely room for the several hundred sportsmen in the restricted estuary. Small canneries have recently sprung up, and now the successful sportsman may have his fish preserved in the usual way, the can even bearing a colored label with his name.

As the fish do not eat after entering the river, the majority of them having initiated their long fast while still at sea, it is commonly supposed by fishermen that the glittering spinner arouses the fighting instinct of the salmon. However this may be, the catch of the angler's hook is much like that of the fisherman's net as regard sex representation and size of the fish. E. A. McGregor paid some attention to this during the season of 1921 and the sum total of his observations may be well represented by the following summary (table 22) of the catch of two days.

TABLE 22

Date	Troll catch				Net catch			
	Number males	Average length males	Number females	Average length females	Number males	Average length males	Number females	Average length females
August 4	20	79.0	49	79.8	34	76.1	70	76.7
August 5	11	78.7	18	76.8	49	78.5	80	77.1

Some king salmon grilse, large and small silver salmon of both sexes, and occasionally a steelhead are caught in the same way. Salmon are occasionally caught with spinners at any place along the river, but they appear to be most easily taken below an obstruction such as an irrigation dam. A resumption of placer mining on the river and resultant silt may at any time put a stop to angling for salmon or steelhead as well.

Reports are current that salmon occasionally bite baited hooks, and one such instance at least, is well authenticated. D. H. Fry, Jr., and R. S. Croker observant anglers, reported to the writer that on September 23, 1927, in a large pool in Salmon River, about 200 yards above the junction of that stream with the Klamath, a salmon was

caught with steelhead roe as bait. The baited hook, intended for a steelhead, was lying on the bottom, when a strike came, which was duly followed by the landing of a small king salmon. The fish weighed 21/2 pounds, and it was a mature male. The stomach was so shrunken as to be entirely functionless.

THE SEAWARD MIGRATION (EMIGRATION)

No one has as yet traced a seaward migration (emigration) of young salmon in Klamath River. One may assume that the habits of the young are similar to those of the same species in other streams as described by Rutter, N. B. Scofield, Gilbert, Chamberlain, Rich and Holmes.

An examination of scales taken from adult fish at the mouth of the river leads to the inference that young fish enter the sea at various stages of growth, from a time shortly after free swimming has been attained to a year or a little more. There appear among these scales several kinds which include not only those bearing what have been termed the stream and ocean type of nuclei, (Figs. 20 and 21) but many others of a composite form, the latter from fish which appear to have prolonged their passage down stream and lingered for a time in the estuary. [7]

Late in the summer and in the early fall, king salmon of the year may be found near the mouth of the river. They are sometimes caught with hook and line and carried away as trout. They are six or seven inches long or even larger. In color they are light yellowish green on the upper surface and silvery on the sides. Faintly traced parr marks are to be seen on the smaller ones, these always standing out in bold relief in preserved specimens. In pursuing these little salmon with net and rod, it became evident that their distribution in the estuary was general. They seemed, however, to prefer the fresh current, although they were sometimes taken in brackish water, Schools of them moved back and forth, before or following the tides. In seining, they were sometimes caught alone, but most often they were associated with such fish as adult salmon, steelheads, flatfish, suckers, sticklebacks, bullheads (Cottus asper), smelt, and others. Both sexes were represented, and an occasional mature male was observed. One is at a loss to account for the presence of a precocious male among down-stream migrants, unless the condition of precocity is soon to disappear in these individuals.

Examples caught early in the season (August 5) are considerably smaller than those taken later (September 15), although an infiltration of small fish seems to be constantly progressing during this time.

A photomicrograph of a scale of one of these estuary salmon, measuring 184 millimeters, is presented as figure 8. Here a well-defined

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7 Rich Willis H. Early history and seaward migration of chinook salmon in the Columbia and Sacramento rivers. U. S. Bureau of Fisheries, Bull., vol. 37 (Doc. 887), p. 70, 1920.

Rich Willis H and Holmes Harlan B Experiments in marking young chinook salmon on the Columbia River, 1916 to 1927. U. S. Bureau of Fisheries, Bull., vol. 44 (Doc. 1047), p. 259, 1929.

Snyder, J. O. The return of marked king salmon grilse. California Fish and Game, vol. 8, no. 2, pp. 102-107, 1922.

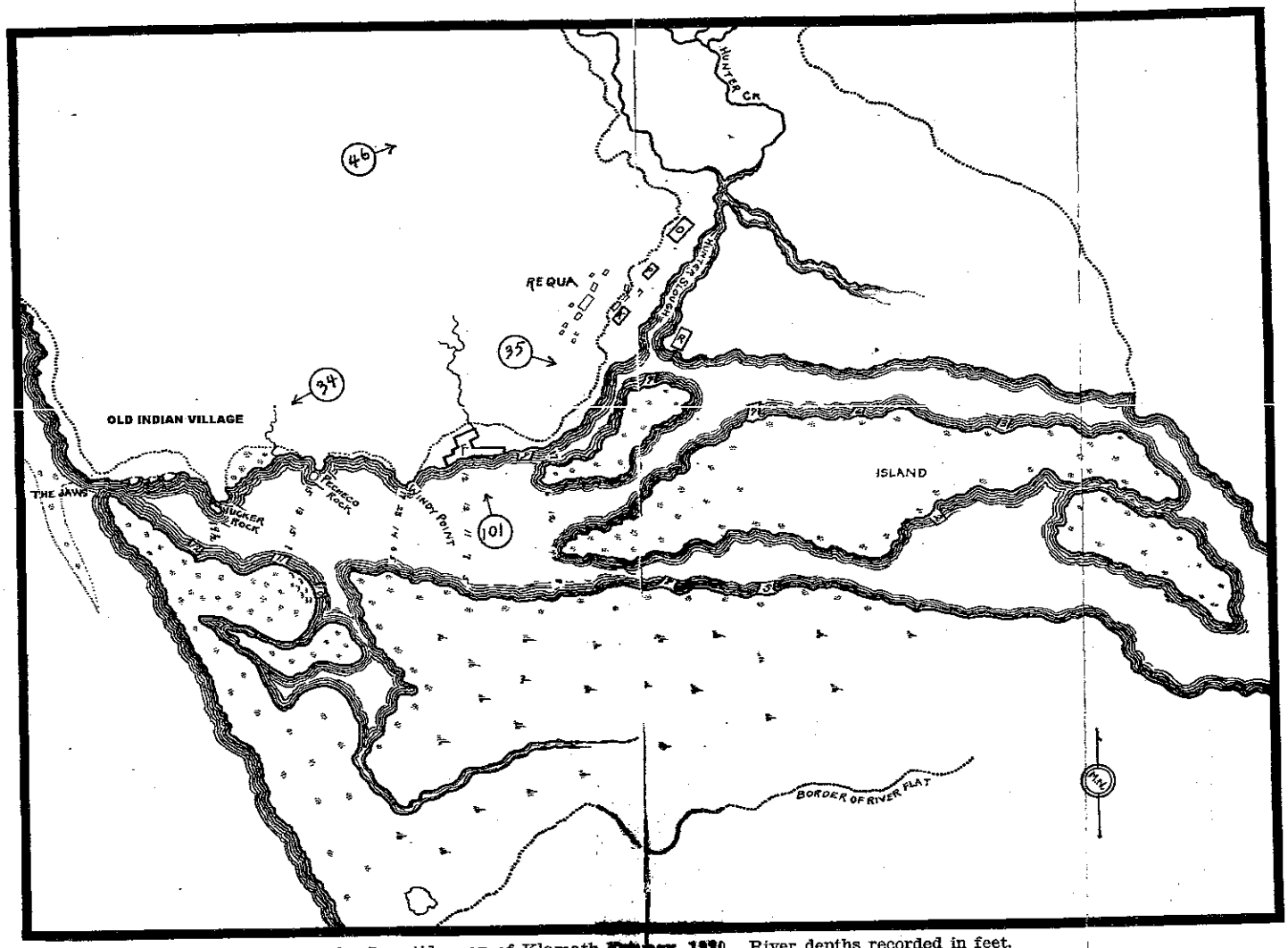

FIG. 9. Low-tide map of Klamath Estuary, 1930. River depths recorded in feet.
F. Plant of Klamath River Packers Association.
D. Del Norte Salmon Canning Company. 1912–1913.
K. Klamath River Canning Company. 1911–1913.
P. W. G. Press. (Never operated.)
R. Requa Cooperative Packing Company. 1917–1918.

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central nuclear region of more or less crowded circuli is to be distinguished from a broad outer area of widely spaced ones. The structure of this scale is typical of every one of the larger estuary fish, the size of the nuclear area remaining fairly constant, while the area lying without or bordering the nuclear part varies in width about as the fish vary in size. There is no evidence that these fish have come in from the sea. On the contrary, it is certain that they are down-stream migrants, lately arrived in the estuary where abundant food has contributed to very rapid growth. It is inferred that the nuclear area of closely apposed circuli represents the growth before reaching the estuary. This inference is supported by observations as follows:

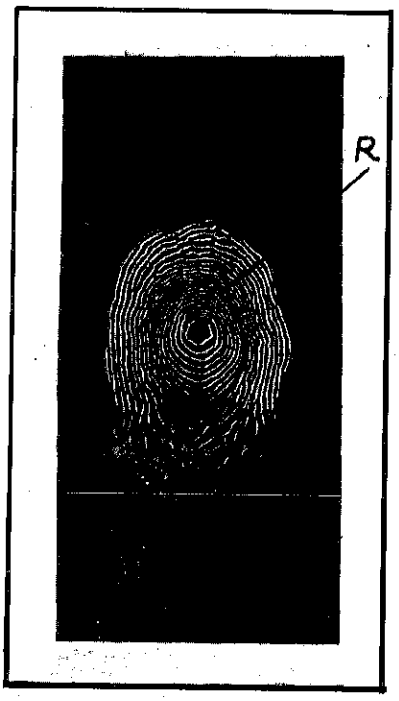

FIG. 8. Photomicrograph of a scale of a small estuary salmon, 184 mm. long.

Early in August, the 6th to be more explicit, many small fish, measuring from 80 to 118 mm., were collected from the estuary. They were then generally distributed, but they could be more easily caught on the bars of the islands and near the mouth of Hunter Creek. Scales from the smallest of these fish are represented by figure 14. It will be observed that this exactly represents a stage comparable with that of R in figure 8. The largest of the fish caught at this time had scales bearing two or three broad rings outside of, or beyond the region represented by the edge of this scale. These rings corresponded exactly with those of figure 8, which are outside of the point *R*. On later dates selections of fish were made, the scales of which bore every intermediate condition of growth between the extremes illustrated by the two figures. The smaller fish were darker in color than the larger, more silvery ones.

Small salmon were collected from points up stream, well above the estuary, and in all cases they bore scales like those represented by figure 14. The fishes themselves were exactly like the smallest ones found in the estuary. No fish like the larger estuary fish was seen there.

In the fall of 1920, September 18 to 26, while observations were being made on a weir which the Indians had placed in Trinity River in Hoopa Valley, young salmon measuring 56 to 75 mm. were secured. Again, on September 27, 1924, they were collected in large numbers. At this time the river was somewhat swollen and roily because of recent rains. Seining was done at two points, at the mouth of Beaver Creek, and about three miles farther up stream near the junction of the main river and the Tishtangatang. The abundance of small salmon was indicated by the presence of some four hundred in a single seine haul.

FIG. 10. Line fishing, Klamath Estuary near the Jaws; view from point 34, figure 9.

FIG. 11. Valley of Hunter Creek from point 46, figure 9.

FIG. 12. View up Klamath River from point 35, figure 9.

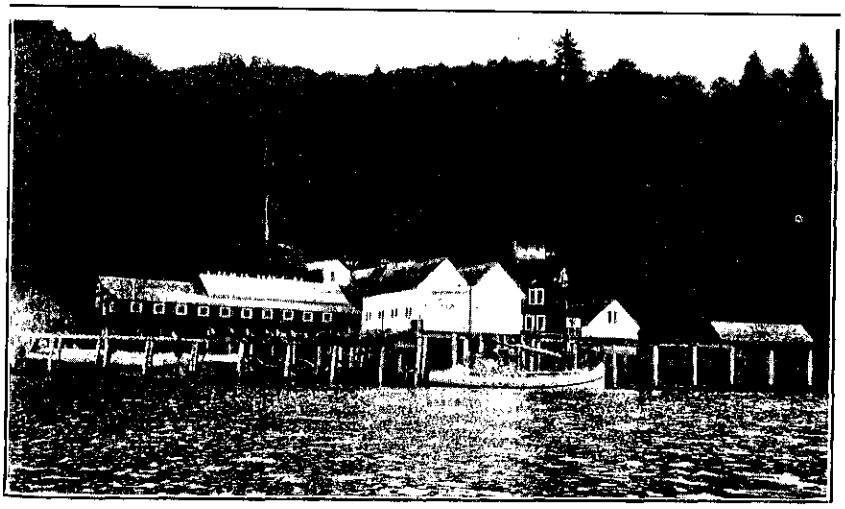

FIG. 13. Plant of the Klamath Packers Association from point 101, figure 9.

As they were plentiful at both places one might safely assume that at least the intervening three miles of river were similarly populated. It was thought that these fish were migrating down stream. They were small in size, measuring 74 to 106 mm. The scales of these were similar to that of figure 14, and the fish looked exactly like those caught in the river above the estuary and like the smallest found in the estuary.

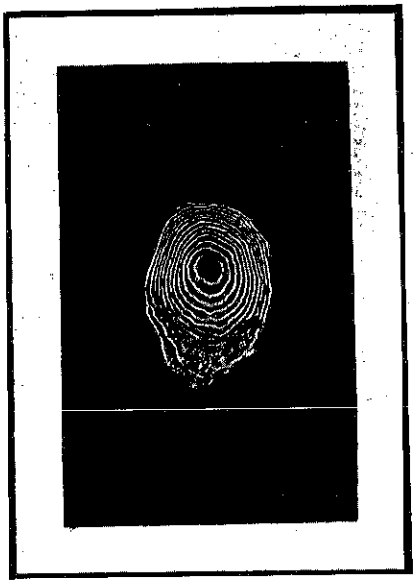

FIG. 14. Photomicrograph of a scale of a small salmon taken in the Klamath Estuary.

Similar salmon from the Sacramento basin, collected from overflow pools near Collinsville, June 22, 1922, had scales exactly like the smaller Klamath specimens, and the fish were like those of the Klamath in size and general appearance.

A pronounced check in growth may be seen at the point R in figure 8. The check is indicated by closely apposed, narrow circuli. Such a check is not present in many examples, the transition from stream to estuary growth being generally abrupt. Such a check has not been seen in any small specimens from either the Trinity or from the Klamath above the estuary.

All this would seem to indicate without doubt that the peculiar structure of scales, such as illustrated in figure 8, may be interpreted as representing an inner nucleus of up-stream growth, and an outer area of varying width of estuary growth. The belief that this type of structure results from environmental conditions as here observed is strengthened by the fact that the scales of fishes of the same species and of the same size as the largest estuary fish, but reared in ponds at Mt. Shasta, bore scales of homogeneous structure throughout.

It would appear from what has been discovered at and near the mouth of the river that a pronounced emigration of young salmon occurs in the late summer and early fall. The extent of this migration is not known and no more information relating to the movements of young salmon in the river is at hand.

A thorough knowledge of the migratory movements of young salmon is essential to any meritorious plan of conservation, and with this in mind observations are now being carried on in the Klamath and one of its tributaries, Shasta River.

When the scales of mature fish are carefully scrutinized, many are found which present exact duplication of the growth record of the large estuary fish. An example of such is illustrated in figure 15, a scale from a fish measuring 50 cm. and caught in the estuary September 1. Here, R represents the stream nucleus and from R to E is thought

to be estuary growth. If the present interpretation of growth as represented by this scale is correct, the individual from which it was taken, hatched from an egg deposited in the fall or early winter, passed down stream in time to arrive in the estuary in the following summer, remained in the estuary until growth represented by ***R-E*** was complete, perhaps late fall, and then migrated to the sea. A check in, growth, probably the first winter check, is plainly indicated at ***E***. From ***E*** to the margin of the scale is no doubt ocean growth. The fish was a mature male in its second year.

A scale from a three-year fish is represented in figure 16. This is from a male, measuring 69 cm. caught in the estuary August 11. Its age is believed to be about three years, and it is very probable that the growth from ***R*** to 1 was made in the estuary.

Among the returned adults in Klamath River are large numbers which bear scales of this type. Intergradations between this record of first year growth and the ocean type, i.e., a very large nucleus of homogeneous structure and even growth, are so complete as to make the two indistinguishable in many cases. The writer is at present unable to state in what proportion either type is represented in the catch, and hence both are termed ocean nuclei and the fishes bearing such scales are separated from those bearing the strictly stream type of nucleus, and which are believed to have remained in the stream somewhat longer than a year.

FIG. 15. Photomicrograph of a scale from a male salmon, 50. cm. long, taken in the Klamath River Estuary, September 1, 1919.

With the tabulated data relating to both ocean and river catches there is a separate enumeration of those fish which have had a protracted life in the stream, extended presumably over a year or somewhat more, and which is indicated in the scales by the presence of the so called stream nucleus. The writer finds nothing of economic importance in this concerning California king salmon. The number of fish which hear scales with stream nuclei which appear in the ocean catch or in the stream immigration is not, in so far as we know, an index to the relative number of young fish which enter the sea either as late or early migrants. Nor has it any known bearing on the question as to whether fry should be released early or late from a hatchery. It appears to be a feature which is entirely beyond artificial control, and in some cases

it is perhaps a matter of chance, as when a tributary becomes closed early in the season by a bar across its mouth, thus entrapping the young fish and delaying emigration.

On several occasions it has been reported that large numbers of young salmon are left to perish in pools of the lower courses of small tributaries as the water dries up. Upon investigation these have proved to be silver salmon. One case may serve to illustrate. On July 8, 1919, the lower course of Turwah Creek was examined. Many isolated pools containing silver salmon were found. Something over 2500 vigorous young fish were rescued from a single pool roughly measuring 10 by 25 feet, and from 3 to 18 inches deep. Seining in the stream above these pools did not reveal any examples of king salmon.

FIG. 16. Photomicrograph of a scale of a male king salmon, 69 cm. in third year, caught in Klamath Estuary, August 11.

OBSTRUCTIONS IN THE RIVER

Klamath River and its principal tributaries are fairly free from obstructions below the large dam at Cnpco. Projects have appeared in the recent past which if carried through would have blocked the stream to most of its migrating fish. Others will come in the future, and eventually the anadromous fish may disappear from the river.

Klamath River presents an almost continuous series Of potential power sites from its source to its mouth. The development of any one of these involves the erection of a high dam which under our present limited knowledge of the habits of salmon and steelhead trout, will constitute an absolute barrier to the upward passage of the migrating adults, or the downward migration of the young. Certain articles have lately appeared in current periodicals which allege that experimental work has conclusively shown that the obstacles presented by high dams to the migration of fish may be easily overcome. These statements are misleading. No method has as yet been devised which will safely provide for the downward migrants, and the only

proposed scheme for overcoming the barrier to up stream migration of adults, which seems at all feasible, is the use of a hoist. The hoist would lift the fish from a channel or fishway at the bottom of the dam. John N. Cobb, who has experimented with the proposed hoist concludes as follows: " If the fish can be induced to enter such a fishway, they may be lifted to almost any desired height. In the majority of cases this method can be employed in getting fish over high dams, provided an experienced biologist, who is familiar with the habits of the fish sought to be lifted is called in before the work on the dam is started. This is absolutely essential as certain precautions must be taken with the bed of the river, etc., before and during the construction period, in order to persuade the fish to foregather in front of the entrance to the fishway or fish hoist. " The writer of the present paper sincerely hopes, however, that the experienced biologist, the dam and the fish may be assembled on some other stream in an effort to persuade the fish to foregather, for if the dam is built and the fish refuse to be persuaded, the jig is up.

In the Klamath River a condition prevails that must be constantly kept in mind in any discussion of the relation of dams and fish, namely, that the principal migrations occur during low water (Fig. 3), and when the water is in greatest demand by the power plant. At this time it will be very difficult to maintain an overflow sufficient for large fishways.

As obstructions appear in a river it becomes increasingly difficult to deal with them, and it seems that no general law or rule will apply to all. If possible, they should be dealt with individually, for each presents a set of problems of its own. A single illustration may serve to explain. On Shasta River is a power plant the chief auxiliary of which is a dam built across the river, at a point about seven miles above its junction with the Klamath. During the migration and spawning period of 1926 the dam was supplied with a functioning fishway and all the requirements of the law were apparently complied with. None the less the presence of the dam was responsible for the daily destruction of large numbers of salmon.

At the time, the dam was about 290 feet long and 7 or 8 feet high. At the left side of the river was a race some 15 or 20 feet wide, which extended 1800 feet or so to the power house. (See figs. 17, 18, and 19.) Its source was protected by a revolving screen. A fishway was placed against the right bank of the river in line with the main channel just as it should be, and an ample flow of water was passing, as was easily demonstrated by tests, fish swimming easily and rapidly up the fishway when given an opportunity. For a long distance below the dam the channel had a deeply scored bed of solid rock with numerous minor channels. One of these channels led from the fishway, while the others came from leaks in the dam and the sides of the race. Fish, in passing up stream, frequently chose the wrong way and instead of reaching the fishway were led aside to struggle up the false channels and at length throw themselves out of the shallow water alongside the race, or batter their heads against the dam. On September 20, 79 large fish, either dead or in impossible situations were seen. A few days later conditions were no better. The remedy in this particular case was both obvious and simple.

Here, also, the law relating to the spearing of fish below a dam was inoperative, for a fish 800 feet below the obstruction was just as much exposed as one 150 feet or less from it.

The Indians sometimes construct a weir on Trinity River[8] where numbers of fish are caught. The weir will not long withstand the high water following the early fall rains, and it appears that the obstruction is rendered inefficient before the migration is well on.

Klamath River has a relatively limited amount of irrigable land in its basin and consequently the problems attending a conflict between agriculture and the conservation of fisheries may not attract attention there for some time.

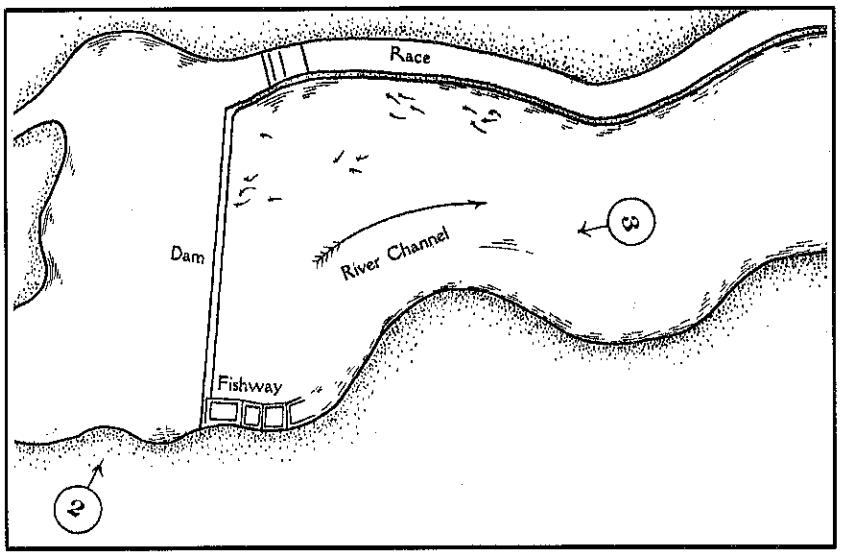

FIG. 17. Map showing dam and the affected part of Shasta River.

THE AGE AT MATURITY OF KLAMATH KING SALMON

An age determination of king salmon has been accomplished here, largely through a microscopic examination of the scales, a method long employed by investigators, and first successfully applied to the various species of Pacific salmon by Dr. Charles H. Gilbert. It is perhaps unnecessary to remark that the method appears to be reliable. In the case of Klamath River fish it has been verified by numerous comparisons with marked individuals of which the age and something of the life history were known. The relations of some details of scale structure to growth are not understood, but these need not enter into the present discussion.

Photomicrographs of two fairly typical scales are here so presented as to illustrate the manner in which the age and one or more details of the life history of the individual fish are portrayed by particulars of structure. (Figs. 20 and 21.) What are commonly known as seasonal

[8]Snyder, 1924, op. cit.

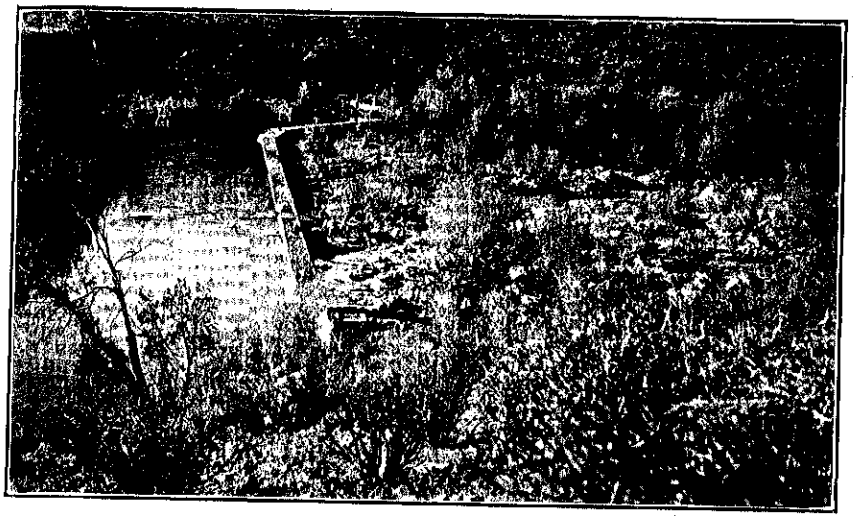

FIG. 18. Shasta River dam with fishway in the foreground and rocky streambed below. View taken from point 2 on map, figure 17.

FIG. 19. Rocky streambed with its numerous false leads fatal to migrating salmon. View from point 3 on the map, figure 17.

checks or annuli, changes in the rate of growth, are depicted at *A* and *D*. That portion of the scale included between *D* and *E* represents the growth of the third year, *i.e.*, from some time in the winter to July 28 in the case of figure 20, and August 27 of figure 21. From *A* to *D* represents the growth of the second year, while from the center of each scale to *A* is a record of the first year. Although somewhat out of place here it may be well to proceed further with an interpretation of the two figures. A marked difference appears in the areas of the two scales from the centers to *A*. One of these (fig. 20) is believed to represent ocean growth while the other (fig. 21) pictures stream growth. From ample observation it appears certain that the fish which bore the former scale entered the sea soon after being able to swim freely, while the one which possessed the latter (fig. 21), to be more particular, remained in the stream for a long time, perhaps a year or so. The parts lying within *A* in both figures, are usually termed nuclear areas, while of the two, the smaller one, representing stream growth, is generally spoken of as a "stream nucleus," and the larger as an "ocean nucleus."

FIG. 20. Photomicrograph of a scale with the ocean type of nucleus.

Klamath River king salmon are found to mature at ages ranging from less than one year to that of six. No seven-year example has been seen. Those which mature before the age of approximately one year are of the male sex only and are usually spoken of as "precocious males." They are numerous at times among fish which are held in hatchery ponds, and they are sometimes found in the rivers, particularly in the estuaries, there mingling with otherwise normal young fish. They appear to mature at about the same time as older individuals, and as a test of the possibility of functioning in the process of spawning, C. V. Cassell, foreman in charge of the Fall Creek Hatchery, was requested to fertilize some eggs with the milt of precocious males. This he did, and the eggs developed in a perfectly normal way. One year later 3000 of the resulting fish were marked by removing the posterior half of the dorsal and the entire left ventral. These were liberated in Klamath River in 1923. Four of them were later recaptured; one in Klamath estuary and one at the Klamathon racks in 1925; one off the coast of Eureka and one at the racks in 1926. All were normal fish. There is some reason to believe that precocious yearlings, together with second-year males, and even the small three-year males, when associating with larger salmon on the spawning beds, may be mistaken for egg-eating trout.

In so far as we know, the two- and three-year males are of no commercial importance in the river catch. There is no way of determining their relative number. If taken at sea, there is no trustworthy method of always separating them from males which might mature at a greater age. In the river estuary they are not entrapped in numbers by the large meshed nets. In the upper courses of the river, as at the

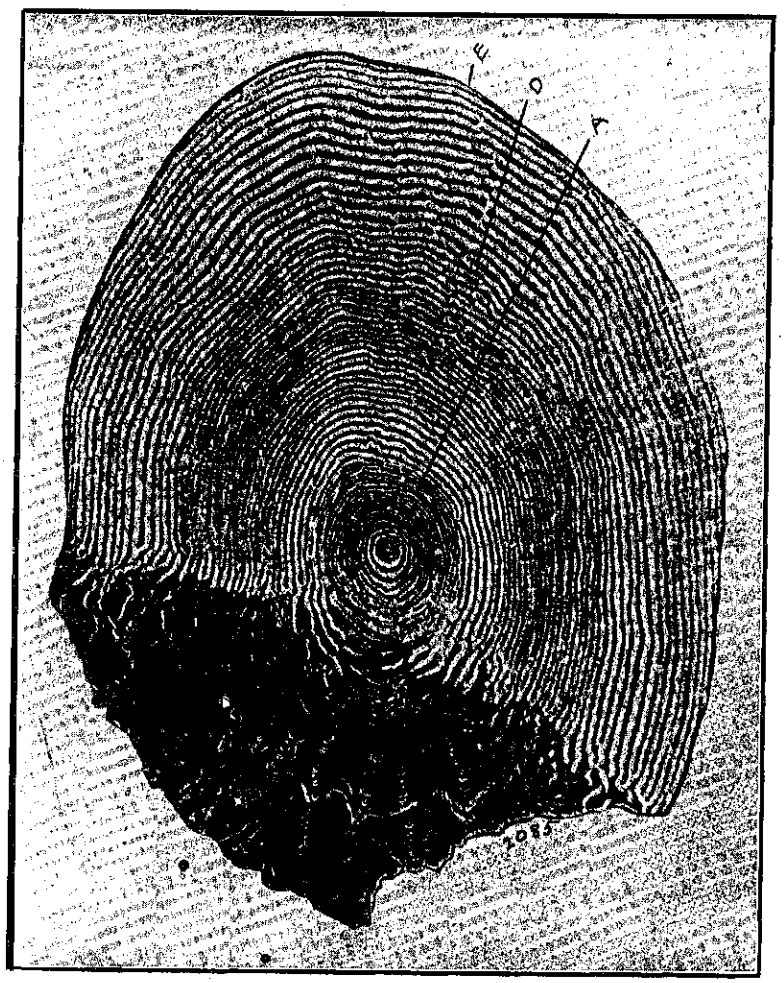

FIG. 21. Photomicrograph of a scale with the stream type of nucleus.

racks, one observes the large number which has escaped the straining process of the estuary fishery. It seems quite probable that these small fish are now reaching the spawning beds in ill-proportioned numbers, and if their propensity to mature at an early age is hereditary and transmissible in a marked degree, their involuntary selection and preservation may be a menace to the fishery of the future. However, so long as the role of precocious yearlings, and of the two- and three-year

males remains unknown speculation regarding them is of little more than passing interest.

Three-year mature males appear to outnumber by far those of two years, but no reliable method of determining anything like an exact proportion of the two classes was found.

Examples of mature fish of the age of two years are not easily obtainable in the Klamath. Those which we have were nearly all caught by means of a small seine. Of 314 specimens from the estuary of the Klamath and from Trinity River, the smallest is 35 cm. in length and the largest 58. The Trinity River individuals average somewhat smaller than the others. Measurements of the series are presented in the following table :

TABLE 23

Length Measurements of Two-year Fish

Length (cm.)	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Klamath River, 1919									2	3	1	4	7	5	3	6	8	3	7	3	6	1	3	2		1	1
Klamath River, 1920								1	2	3	2	3	3	4	2	4	2	3	1	3	4		2	2		1	
Trinity River, 1920		1			3	2	2	2	17	17	15	21	28	28	23	18	15	7	3	4							
Totals	1			3	3	4	7	22	21	22	32	35	35	31	29	19	17	10	10	3	5	2	2	1			

These are smaller than fish of the same class from the Sacramento, where in a series of 33 examples, the smallest is 48 cm. long, the largest 60, and the mean about 55.

All of the above are males and the scales possess the ocean type of nucleus.

When one has at hand samples of the scales of a fish of known length, it is possible, with some degree of accuracy, to compute the length or stature which the particular fish had attained at a given time in its life. This computation presumes that the growth of the scale progresses at about the same rate as that of the fish. It will be of interest to compare the computed second year stature of fish of the same class, i.e., males which entered the sea at an early age but which matured at three, four or five years, with that of these small, two-year individuals.

TABLE 24

Computed Lengths at Two Years, Klamath River, 1919, Males, with the Ocean Type of Nucleus

Length (cm.)	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Length at 2 years of fish matured at 3				1	2	4	6	4	8	8	11	6	9	6	4	2	2					
Length at 2 years of fish matured at 4	1		2	1		4	6	6	13	9	6	12	10	15	11	6	2	7	3	4	1	1
Length at 2 years of fish matured at 5								2	1	4		2	4	13	4	4	1	7	4		2	
Totals	1		2	2	2	8	12	12	22	21	17	20	23	34	19	12	5	14	7	4	3	1

In connection with the above it is to be noted that the measurements of two-year fish were made from individuals which ceased growth in the summer or early fall, while the computed lengths were statures attained at a later date, perhaps midwinter. This may account for the comparatively smaller stature shown by the grilse. The Trinity River fish were smaller than the Klamath River examples, but the former were all

collected by means of a seine of small mesh. The computed length at two years, of fish which matured at three, compares favorably with two-year grilse from the Klamath catch. That of fish which matured at four years is somewhat greater, while that of five-year fish is considerably greater.

Fish of the third year which appear in the catch are included in three categories. The first is of males which have scales of the stream type. These are relatively small, not much larger in fact than two-year males which possess scales of the ocean type. Of this class, 40 exhibited length measurements of from 54 to 67 cm. These fish enter the catch only by accident as they are ordinarily able to pass through the meshes of the nets. The second category consists of males with scales of the ocean type. These fish have evidently spent more time in the ocean than those of the first class and the consequent advantage is reflected in the growth. They are relatively more numerous than those previously mentioned and they are also much larger, ranging in length from 51 to 81 cm., as determined from an inspection of 417 examples. The third group, consists of females which bear scales of the ocean type. These appear in numbers, a condition in the Klamath which is contrary to the observations of Gilbert[9] and Rich[10] in the Columbia. Females of this class appear also in the Sacramento River where they attain large size. Three-year fish contribute something like 11 to 16 per cent to the commercial catch in the Klamath. The three-year fish appear to increase in numbers until about the middle of August after which they grow relatively less numerous until the end of the season.

TABLE 25

Date	Year class			
	Three	Four	Five	Six
	Per cent	Per cent	Per cent	Per cent
July 11-19, 1919	9.9	86.5	3.6	
July 21-26, 1919	9.3	74.3	16.4	
July 28-August 2, 1919	14.3	62.5	22.2	
August 4-9, 1919	25.8	60.2	14.0	
August 11-16, 1919	24.4	64.4	10.8	0.4
August 18-23, 1919	28.3	64.7	7.0	
August 25-30, 1919	23.7	64.8	11.5	
September 1-5, 1919	10.8	73.0	15.9	0.3
September 20-27, 1919	5.5	42.7	44.6	7.2
September 30-October 4, 1919	12.2	38.7	38.7	10.4
Ortober 6-11, 1919	2.8	41.0	43.5	12.7
October 14-18, 1919	4.8	37.5	51.5	6.2

Casual daily observation of the catch as it lies en masse on the floor of the receiving room, reveals an increase of large fish toward the end of the season. The early catches are characterized by comparative uniformity in the size of the fish which are relatively small, while the later catches are distinguished by the incursion of larger and older fish, as is elsewhere shown in detail.

The bulk of the catch consists of four-year fish. In 1919 when the fishing season extended into the late fall, 63 per cent were of the four-

[9] Gilbert, Charles H. Age at maturity of the Pacific coast salmon of the genus Oncorhynchus. U. S. Bureau of Fisheries, vol. 32 (Doc. 767), P. 14, 1913.
[10] Rich, 1920, op. cit., p. 4.

year class. In 1920 and 1923, both shorter seasons, there were 78 and 60 per cent respectively.

Previous to the middle of September, fish of this age class make up 60 to 80 per cent of the catch, while after that date, five- and six-year examples appear in sufficient numbers to reduce the four-year fish to 35 or 45 per cent of the catch.

Four-year fish measure from 61 to 104 cm. in length, the average being somewhere near 80. Individuals smaller than 65 or larger than 95 cm. are very uncommon. Four-year Klamath fish are smaller than those of the Sacramento as is graphically shown in figure 22. Fish which early migrated to sea are on the whole larger than those which spent a year or so in the stream. The males average somewhat larger than the females.

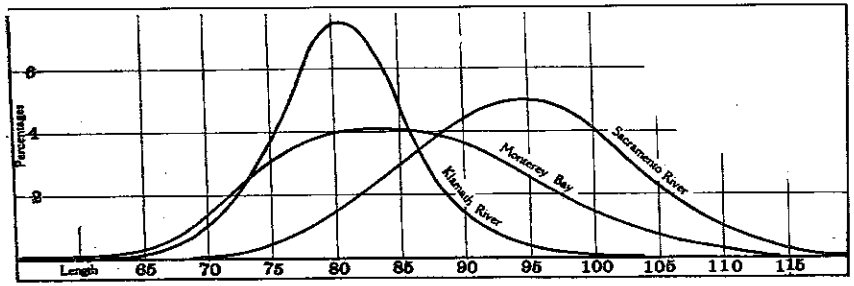

FIG. 22. The number of four-year fish of given lengths in river and ocean catches.

Numerous details relating to the four-year age class are recorded in tables 26, 27, and 28.

TABLE 26

KLAMATH RIVER 1919

Length in centimeters			54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	Total
Three Year Class	Ocean Type	Males	3	3		4	1	3	5	7	8	9	11	10	13	18	18	25	15	12	16	12	8	6	4	2		1		1																																			215
		Females								3		3	2	4	10	8	27	18	11	8	7	9	4	2																																									116
		Total	3	3		4	1	3	5	10	8	12	13	14	23	26	45	43	26	20	23	21	12	8	4	2		1		1																																			331
	Stream Type	Males	4	1	2	3	6	2	3	1				1																																																			23
		Females																																																														
		Total	4	1	2	3	6	2	3	1				1																																																			23
Total 3 year fish			7	4	2	7	7	5	8	11	8	12	13	15	23	26	45	43	26	20	23	21	12	8	4	2		1		1																																			354
Four Year Class	Ocean Type	Males													1	1			8	2	6	4	5	8	13	9	23	16	16	26	21	22	22	17	24	30	30	22	27	18	12	12	9	9	7	4	5	5	1				1													436
		Females												1	1	1	1	2	3	13	16	25	36	39	45	59	61	72	63	68	44	54	36	26	25	19	17	18	5	4	2	5	1	3		2	3	3	2	1		1	1												778
		Total												1	2	2	1	2	11	15	22	29	41	47	58	68	84	88	79	94	65	76	58	43	49	49	47	40	32	22	14	17	10	12	7	6	8	8	3	1		1	2												1214
	Stream Type	Males								1	1	2	2	2	4	1	3	6	2	5	5	5		3	3	4	6	4	2		1	1		2																															65
		Females											1	1	4	2	13	3	8	11	14	3	7	6	3	5	2		2		1				1	2	1																												90
		Total								1	1	2	3	3	8	3	16	9	10	16	19	8	7	9	6	9	8	4	4		2	1		2	1	2	1																												155
Total 4 year fish									1	1	2	3	4	10	5	17	11	21	31	41	37	48	56	64	77	92	92	83	94	67	77	58	45	50	51	48	40	32	22	14	17	10	12	7	6	8	8	3	1		1	2												1369
Five Year Class	Ocean Type	Males																																1	2	1	1	2	7	5	9	4	8	7	10	10	7	5	3	8	4	5	1	4	2	3	2	3	1	6				1	122
		Females																							1				2				4		6	4	7	4	5	5	5	4	3	5	9	5	8	1	2	5	3	2		1	2	1									94
		Total																							1				2				4	1	8	5	8	6	12	10	14	8	11	12	19	15	15	6	5	13	7	7	1	5	4	4	2	3	1	6				1	216
	Stream Type	Males																						1	1		1	1	6	4	2	5	3	4	5	6	3	5	6	5	4	4	2	3	2	3	4	1	1	1	2	2	2			3					1	1	1		95
		Females																			1	4	4	3	4	6	5	13	9	5	6	5	4	3	6	3	4	3	3	3	4	1	2	2	1	1	1	1		3	1														111
		Total																			1	4	4	4	5	6	6	14	15	9	8	10	7	7	11	9	7	8	9	8	8	5	4	5	3	4	5	2	1	4	3	2	2			3					1	1	1		206
Total 5 year fish																			1	4	4	4	6	6	6	14	17	9	8	10	11	8	19	14	15	14	21	18	22	13	15	17	22	19	20	8	6	17	10	9	3	5	4	7	2	3	1	6	1	1	1	1	422
Six Year Class	Ocean Type	Males																																													1					1		1	1	2	1		2					1	10
		Females																																					1		2	1		1	1			1				1	1	1	2										12
		Total																																					1		2	1		1	1		1	1				2	1	2	3	2	1		2					1	22
	Stream Type	Males																																					1					1	1				1	1							1		1						7
		Females																																				1				1					1				1		1												5
		Total																																				1	1			1		1	1		1		1	1	1		1				1		1						12
Total 6 year fish																																						1	2		2	2		2	2		2	1	1	1	1	2	2	2	3	2	2		3					1	34

TABLE 27

KLAMATH RIVER 1920

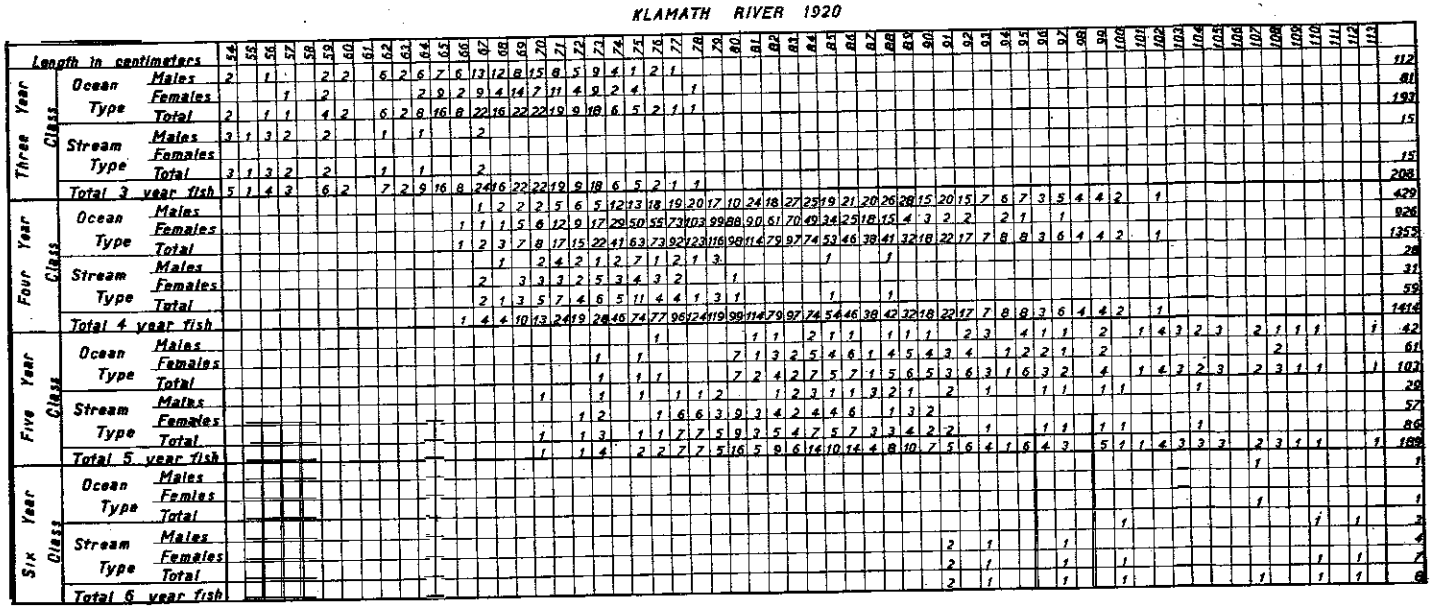

TABLE 28

KLAMATH RIVER 1923

			58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	
Three Year Class	Ocean Type	Males		1	3		1	2	3	1	6	2	9	11	7	4	10	10	6	4	6	1	2	1																																				90
		Females				1				2	2	7	11	19	24	20	22	12	13	15	2	4	1	1																																				156
		Total		1	3	1	1	2	3	3	8	9	20	30	31	24	32	22	19	19	8	5	3	2																																				246
	Stream Type	Males	1				1																																																		2
		Females																																																							
		Total	1				1																																																	
	Total 3 year fish		1	1	3	1	2	2	3	3	8	9	20	30	31	24	32	22	19	19	8	5	3	2																																		2
Four Year Class	Ocean Type	Males											1	1		1	1	2	3	3	3	4	7	7	9	10	10	21	10	9	17	9	8	6	7	2	10	4	10	2	4																248
		Females								1			3	4	7	6	16	24	19	44	55	64	19	84	82	78	66	59	37	41	16	14	8	7	4	3	2	1		1	1																181
		Total								1			4	4	8	7	18	27	22	47	59	71	86	93	92	88	87	69	46	58	25	22	14	14	6	13	6	11	2	5	1																826
	Stream Type	Males					1	1		1	3	2	2	1	1	2	4	4	2	2	2	1	1	1			2	1		1																												1007
		Females									1		6	6	10	11	10	12	7	6	1	3	2	1		2			1																												35
		Total					1	1		1	4	2	8	7	11	13	14	16	9	8	3	4	3	2		2	2	1	1																												79
	Total 4 year fish						1	1		2	4	3	12	11	19	20	32	43	31	55	62	75	89	95	92	90	89	70	47	59	25	22	14	14	6	13	6	11	2	5	1																114
Five Year Class	Ocean Type	Males																							1	1		1	1	2	1	1	1	4	2	6	1			1	3	3		3	1	1	1			1			1		1	1121
		Females																1		1	1	1		2	3	7	10	18	11	8	7	3	6	6	2	5	1	1	4	2			2	1											39
		Total																1		1	1	1	1	3	3	8	11	20	12	9	8	7	9	12	3	5	1	2	7	5		3	3	2	1			1			1		1	103
	Stream Type	Males																1	1					2					2		1		1		1	1	1	1					1		1									142
		Females																1	2	3		2	2	3	7	2	3	4	2	7	1	4	3			1					1			1										15
		Total																1	3	4		2	2	3	9	2	3	4	4	4	2	4	4		1	1	1	2				1	1		2										46
	Total 5 year fish																	1	4	4	1	3	3	4	12	5	11	15	24	16	11	12	11	9	13	4	6	3	2	7	5	1	4	3	4	1			1	1			1		1	61
Six Year Class	Ocean Type	Males																												1																									203
		Females																												1																									
		Total																												1																									1
	Stream Type	Males																								1					1			1		1			1																1
		Females																					1	1	1	2	1		2	1	1	2	1			1		1																	5
		Total																					1	1	2	2	1		2	2	1	2	2		1		1		1	1															15
	Total 6 year fish																						1	1	2	2	1		3	2	1	2	2		1		1		1	1															20
																																																							21

TABLE 29

Summary of Klamath River Age Classes

Year class	3			4			5			6			Totals			Percentages		
Year—	1919	1920	1923	1919	1920	1923	1919	1920	1923	1919	1920	1923	1919	1920	1923	1919	1920	1923
Males	238	127	92	501	457	216	217	71	54	17	4	5	973	659	367	45	36	23
Females	116	81	156	868	957	905	205	118	149	17	4	16	1,206	1,160	1,226	55	64	77
Ocean type	331	193	246	1,214	1,355	1,007	216	103	142	22	1	1	1,783	1,652	1,396	82	91	88
Stream type	23	15	2	155	59	114	206	86	61	12	7	20	396	167	197	18	9	12
Ocean type males	215	112	90	436	429	181	122	42	15	10	1	5	783	584	291	36	32	18
Ocean type females	116	81	156	778	926	826	94	61	103	12	0	1	1,000	1,068	1,086	46	59	68
Stream type males	23	15	2	65	28	35	95	29	15	7	3	5	180	75	57	8	4	4
Stream type females	0	0	0	90	31	79	111	57	46	5	4	15	206	92	140	9	5	9
Totals	354	208	248	1,369	1,414	1,121	422	189	203	34	8	21	2,179	1,819	1,593			
Percentages	16	11	16	63	78	70	20	10	13	1	.4	1						

That the fish of an age class should appear successively larger as the season advances, due to an extended period of ocean growth, might be presumed. Such is the case as is seen in the following table 30 from a series of four-year examples, measured at intervals as they were taken during the season of 1919.

TABLE 30

Date	Average length females in cm.	Number of examples	Averag length males in cm.	Number of examples
July 11–20	77.5	41	75.7	7
July 21–26	77.5	63	81.7	17
July 28–Aug. 2	77.7	122	81.2	48
August 4–9	78.9	73	84.3	27
August 11–26	77.4	72	86.2	54
August 18–23	78.9	114	86.3	57
August 25–30	78.4	80	85.1	51
September 1–6	79.5	123	85.1	99
September 20–25	82.9	26	86.9	25
September 26–October 1	86.8	10	85.6	10
October 2–7	87.9	11	88.9	15
October 8–13	89.7	18	91.9	9
October 14–18	93.2	12	101.1	9

The five- and six-year fish lag behind in the migration, and they are more nearly ripe when they arrive, as is evidenced by the condition of the gonads, by the color of the body and by the development of the snout and teeth. It is presumed that these fish proceed with greater speed to the spawning grounds.

The five-year class contributes 10 or 20 per cent to the catch, the larger percentage appearing when the season is extended to late fall. They measure from 70 to 115 cm. in length. Here again those which migrated to sea early in their stream history average somewhat larger than those which lingered a year or so in the river.

The six-year fish are found only occasionally, 34 examples among 2179 fish in 1919, eight with 1819 fish in 1920, and 21 with 1593 fish in 1923. They are not to be distinguished from the five-year fish in any particular.

From the observations here recorded it will appear that a shortening of the legal fishing season from the late end will allow a relatively greater number of fish which mature at an advanced age, and are consequently larger, to escape the nets. It is believed also that it will contribute in a measure toward a compensation for the straining out of the larger fish by gill net fishing.

The results of an age analysis of catches from Klamath River and also from the Sacramento are here recorded in tabular form. These are based in all cases upon pods of fish which have been received from the fishermen, and from which no selections had been made. Considerable numbers of individuals have been examined, and it is believed that the conditions here found represent the normal for the particular periods. It is to be kept in mind, however, that these are analyses of catches, and not of migrations. They represent individuals which have been selected by the nets. They take no account of fish which are too small to be intercepted, or of those which pass while the nets are inoperative.

TABLE 31

SACRAMENTO RIVER 1919

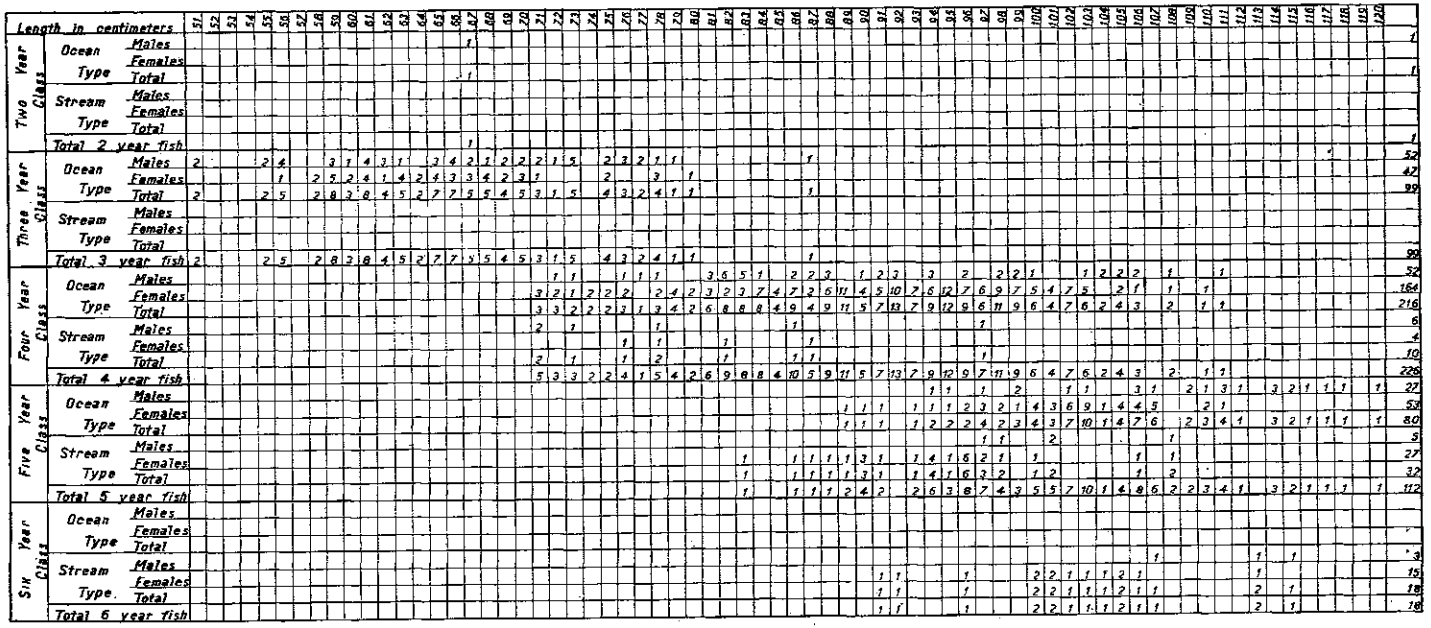

TABLE 32

SACRAMENTO RIVER 1921

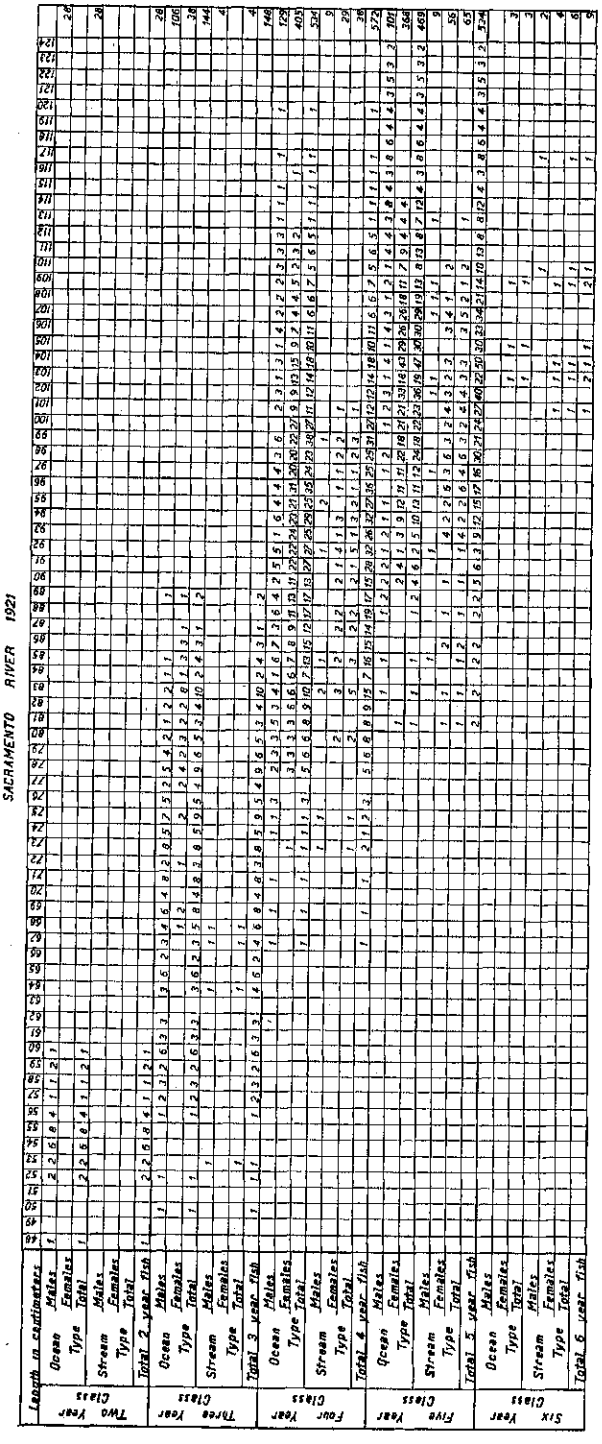

TABLE 33

Summary of Sacramento River Age Classes

Year class / Year—	2		3		4		5		6		Totals		Percentages	
	1919	1921	1919	1921	1919	1921	1919	1921	1919	1921	1919	1921	1919	1921
Males	1	28	52	110	68	138	32	110	3	2	146	888	32	30
Females	0	0	47	38	158	434	80	424	15	7	310	903	68	70
Ocean type	1	28	99	144	216	534	80	469	0	3	396	1,178	87	91
Stream type	0	0	0	4	10	38	32	65	18	6	60	113	13	9
Ocean type males	1	28	52	106	52	129	27	101	0	0	132	364	29	28
Ocean type females	0	0	47	38	164	405	53	368	0	3	264	81d	58	63
Stream type males	0	0	8	4	6	9	5	9	3	2	14	24	3	2
Stream type females	0	0		0	4	29	27	56	15	4	d6	89	10	7
Totals	1	28	99	148	226	572	112	534	18	9	456	1,291	------	------
Percentages	.2	2	22	12	49	44	25	41	4	.7	------	------	------	------

MARKING EXPERIMENTS

Since undertaking the study of Klamath River salmon the writer has come in contact with or initiated several marking experiments, the principal purpose of which was to determine as definitely as possible the ocean range of growing fish, and to test in some detail the parent stream theory.

Previous to this one or more carefully planned and executed experiments were undertaken by State authorities, from which no returns were secured. It was later suspected that failure was due, not to any methods used in the process, but rather to lack of an energetic attempt to secure returns. The method used in all cases was that of fin mutilation. Fishes were held in rearing ponds until of sufficient size, when the adipose together with all, or a part of some rayed fin (fig. 23) was so excised as to prevent regeneration. Returned fish have amply demonstrated the efficiency of the marking method when the

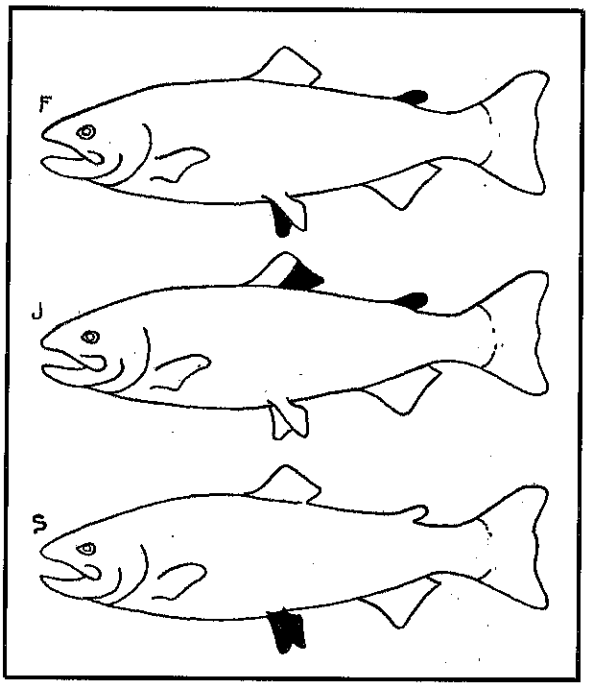

FIG. 23. Diagram showing how various lots of salmon were marked in experiments on the Klamath River.

details are in the hands of careful operators. The employment of good observers, and the cooperation of fishermen, dealers, and others have secured excellent returns from the later experiments.

Experiment in 1916.

On August 29, 1919, a king salmon measuring 43 inches, weighing 35½ pounds, and having the adipose and left ventral fins absent, was taken in the estuary of the Klamath. This was one, and the only one, recovered from 3500 marked yearlings released in the Klamath, February 15, 1916. The eggs were from Battle Creek, a tributary of the Sacramento. This merely served to show that a salmon introduced into the Klamath, although the egg which produced it was from another stream, would return to the Klamath. Also an age estimate made from a scale from the fish was in accord with its known age.

Experiment in 1918.

A later experiment? was somewhat more fortunate. Fry from Sacramento River eggs to the number of 18,000, and marked by removing the adipose and left ventrals, were liberated in Cold Creek, a tributary of the Sacramento on March 19, 1918. Three adults from these young fishes were secured in 1920. One was taken at Monterey, April 6; another was caught at Shelter Cove, August 17; a third entered the Sacramento and was secured near Pittsburg, September 15. From this it became apparent that Sacramento River salmon had a far more extensive ocean range than was suspected. The parent stream theory also found another fact in its support.

Experiment in 1919.

In November, 1919, 25,000 yearling king salmon, marked by the removal of the adipose and right ventral fins, were liberated in Fall Creek, Klamath River. The eggs from which these were hatched came from Mill Creek, a tributary of the Sacramento[12]. Considerable publicity was given to this experiment and a small reward was offered for data relating to captured fish. The following summary (table 34) presents the returns from this attempt.

Here, in accord with previously observed facts, the returning adult fish on their nuptial migration from the sea, entered the river into which they had been introduced, and proceeded toward the particular tributary in the waters of which they were reared. None was taken in the stream where the eggs were procured. It was also demonstrated among other things, that Klamath salmon migrate southward at least to Monterey Bay.

Experiment in 1920.

In September and October, 1920, 20,000 king salmon, hatched from eggs taken at Mill Creek, a tributary of the Sacramento, and reared in ponds at the Mt. Shasta Hatchery, were marked by removing the adipose and posterior half of the dorsal fin.[13] On April 8, 1921,

11 Snyder, J. O. Three California marked salmon recovered. California Fish and Game, vol. 7, no. 1, pp. 1-6, 1921.

12 Scofield, W. L. King salmon marking experiment at Klamath River, 1919. California Fish and Game, vol. 6, no. 3, p. 101, 1920.
Snyder, J. O. The return of marked king salmon grilse. California Fish and Game, vol. 8, no. 2, p. 102, 1922.
Snyder, J. O. A second report on the return of king salmon marked in 1919, in Klamath River. California Fish and Game, vol. 9, no. 1, p. 1, 1923.
Snyder, J. O. A third report on the return of king salmon marked in 1919 in Klamath River. California Fish and Game, vol. 10, no. 3, p. 110, 1924.

13 Scofield, W. L. Sacramento River salmon marking. California Fish and Game, vol. 7, no. 2, p. 125, 1921.

TABLE No. 34

Summary of Data Relating to the Capture of Fish Marked in 1919

Locality	Number of fish	1921	Number of fish	1922	Number of fish	1923	Number of fish	1924
Monterey Bay			2	June 7–14				
Off Point Reyes			1	July 7				
Off Fort Bragg								
Off Cape Mendocino			1	August 5	1	June 8		
Redding Rock			4	July 21–August 3	1	July 17		
Klamath Estuary			1	August 14	2	August 17–31		
Klamath Racks	23	October 24–November 14	15	October 19–November 15	8	October 24 November 15	1	November 8

the surviving 15,400 were introduced into Sullaway Creek, a tributary of the Sacramento.

The first reported returns from this experimental introduction came from Battle Creek (B on fig. 24) a, hatchery of the U. S. Bureau of Fisheries, where 7 grilse measuring from 53 to 63 cm. in length were taken. These were seen by W. E. Lupardus in charge of the station, on dates from November 4 to 21, 1922.

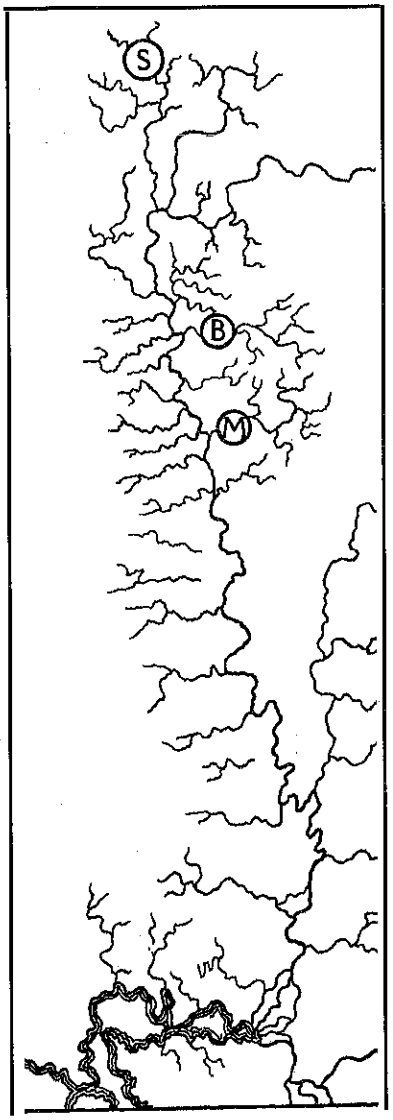

FIG. 24. Map of Sacramento River indicating where marked salmon were liberated when young and caught when mature.

Two were later taken at sea, the first on April 13, 1923, in Monterey Bay, the second July 25, near the Eureka Bar. Here again the wide sea range of Sacramento salmon was demonstrated.

In 1923, from October 27 to December 5, fish bearing the mark of this experiment entered Mill Creek and Battle Creek where they were taken by C. A. Hruby and also by Mr. Lupardus. These fish measured from 66 to 96 cm., and were representative of both sexes.

One other example was reported from Battle Creek, November 20, 1924.

A summary follows in table 35.

Here the yearlings were planted in the headwaters of the river (S on fig. 24), and on their return migration as adults were apparently scattered over the basin. There is no reason to presume that they entered only Mill Creek (M on fig. 24) and Battle Creek, but rather that these were the only places from which they were likely to be reported.

It has been recognized that the Sacramento is not a stream which is well adapted for experimental purposes. The river itself is tempermental, so to speak, responding quickly to periods of rain or drought, breaking over its banks and-flooding its bottoms at times, or shrinking and dwindling when the season is dry. Irrigation projects, dams for power purposes, commerce and pollution, have also contributed to its difficulties. And with all this it is not easy to get returns from experimental work because of the varied nationality of its fishermen. At the time of the return of these fish

the river was unusually low and conditions were not what might be considered as normal. Possibly the behavior of the migrating salmon was not altogether normal,

TABLE 35

Locality of capture—	Date	Sex	Length in cm.
IN 1922, THE THIRD YEAR OF THE EXPERIMENT			
Battle Creek	Nov. 4	Male	
Battle Creek	Nov. 4	Male	
Battle Creek	Nov. 13	Male	63
Battle Creek	Nov. 18	Male	63
Battle Creek	Nov. 18	Male	53
Battle Creek	Nov. 20	Male	53
Battle Creek	Nov. 21	Male	56
IN 1923, THE FOURTH YEAR OF THE EXPERIMENT			
Monterey Bay	April 13	Male	75
Near Eureka Bar	July 25	Female	86
Mill Creek	Oct. 27	Male	66
Mill Creek	Oct. 27	Male	66
Battle Creek	Nov. 7	Female	71
Battle Creek	Nov. 9	Male	74
Mill Creek	Nov. 13	Female	89
Mill Creek	Nov. 14	Female	76
Battle Creek	Nov. 15	Female	86
Battle Creek	Nov. 16	Male	96
Battle Creek	Nov. 17	Male	84
Battle Creek	Nov. 20	Male	86
Battle Creek	Nov. 22	Female	71
Mill Creek	Dec. 4	Male	71
Mill Creek	Dec. 5	Male	71
IN 1924, THE FIFTH YEAR OF THE EXPERIMENT			
Battle Creek	Nov. 20	Female	89

For some years salmon have been reared in the hatchery at Sisson and at opportune times allowed to escape into the upper part of the Sacramento. However, no return migration has been reported to that part of the stream above the mouth of Pit River, and the question has been raised as to what became of these fish. The results of this experiment offer a provisional answer, namely, that such as return are probably scattered over the entire basin, or because of adverse conditions they are forced to enter tributaries before they are able to reach the one into which they were originally introduced. The inference that some of them returned to the tributary from which the eggs were taken because of that, is scarcely to be entertained.

Experiment in 1922 (Sacramento River).

It was desired that evidence be obtained to show whether fish hatched from Klamath eggs, and introduced into the Sacramento would return to that, stream as adults. Accordingly, 15,000 yearlings from Klamath River eggs taken at the Klamathon racks and reared at Mt. Shasta, were marked by removing the adipose and both ventral fins, and introduced into the Sacramento basin from the hatchery in October; 1922. The marking of these fish was performed by E. A. McGregor.

One of these fish measuring 50 cm. was caught at Santa Cruz, May 13, 1924. The next year, 3 others were taken at Eureka, June 7, 15, and 25. Another was secured at Bodega Head, July 25. Nothing further came of this effort,

Experiment in 1922 (Klamath River).

In the fall of 1922 it was planned to initiate an experiment at Fall Creek which should demonstrate whether introduced salmon, on their return from the sea, would tend to enter the particular tributary in which they were planted. A sufficient number of yearlings was not available and the work was postponed. However, in lieu of the intended plantings, 18,500 yearlings from which the adipose and left ventral fins had been removed were released in Fall Creek in November. These fish were reared from eggs taken at the Klamathon station.

In 1924 six individuals carrying the mark of this experiment were secured in the estuary of Klamath River, August 19 to 26. They were all males measuring from 54 to 63 cm. From October 16 to November 1, 13 examples were collected at the Klamathon racks. These were males measuring 47 to 64 cm.

In 1925, 161 examples were observed. Four were caught off the coast near Eureka, May 18, June 25, July 31, and August 1; 1 near Cape Mendocino, May 30; 6 off Trinidad, June 21 to July 14; 2 near Patricks Point, June 22; 3 off Big Lagoon, July 10; 92 in Klamath estuary, July 23 to September 3; and 53 at the Klamathon racks, September 11 to November 3.

In 1926, 52 fish of this class were caught; 2 off Trinidad (no date); 1 near Eureka, August 25, and 2 more September 5; 33 in Klamath estuary, July 15 to August 28; and 14 at the racks at Klamathon, October 16 to 24.

In 1927,1 was taken off Eureka, July 8; 2 in Klamath estuary July 27; and 1 at the same place August 6.

Some of the 1925 fish, four years old, which came into Klamath River were measured with the following results:

TABLE 36

Length in cm.	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
Male	1	--	--	3	1	5	4	3	2	5	4	--	2	3	--	2	1	1	1	1	1	--	--	--	--
Female	2	2	2	6	11	9	10	4	5	8	6	2	6	2	1	2	--	--	2	1	--	--	--	--	1
Totals	3	2	2	9	12	14	14	7	7	13	9	2	8	5	1	4	1	1	3	2	1	--	--	--	1

When these length measurements are compared with those of a similar class, i. e., four-year fish bearing scales with a stream nucleus, assembled from examples observed in previous years, 1919, 1920 and 1923, to be particular, it appears that the fish of this experiment have attained a considerable greater stature. An inspection of the following table will confirm this:

TABLE 37

Length in cm.	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
Male	1	1	3	3	2	4	2	3	6	8	5	10	9	10	6	12	17	8	8	8	3	--	1	3	2	2	1	--	1
Female	--	--	--	--	1	1	4	4	4	12	17	24	27	18	22	17	12	5	5	2	4	--	3	--	--	1	1	2	1
Totals	1	1	3	3	3	5	6	7	10	20	22	32	36	28	28	29	29	13	13	10	7	--	4	3	2	3	2	2	2

The five-year fish which appeared in 1926 and entered the river measured from 69 to 98 cm. The sexes were about equally represented.

Experiment in 1923-1924.

An experiment was planned in 1923,[14] the purpose of which was to demonstrate whether returning fish would actually seek out and enter the particular tributary in which they were reared. It was also desired to learn something of the behavior of returning fish which had been reared in the water of one tributary and then introduced into an adjacent tributary. It is perhaps needless to remark that information of this sort is of great practical importance in artificial propagation and distribution.

The upper Klamath furnished an ideal layout for the experiment, as will be seen from an inspection of the accompanying figure 25. The division maintains a hatchery at Fall Creek, and an egg-collecting station on the main river at Klamathon. The racks at this station are so placed in the river as to trap every salmon which passes up during the fall migration, thus enabling an observer, if he so desires, to examine the fish individually. A particular fish after entering the trap may be held for a period between the racks, or it may be passed on and allowed to pursue its way up the river. About 15 miles above this trap is the great Copco dam which presents an impassible barrier to migrating fish. About 2 miles below the dam, Fall Creek enters the Klamath. This is a large, perennial stream of clear, cold water, with a high fall at a point about a mile above its mouth. The hatchery is located at the foot of the fall. The creek below the fall is small and clear enough to permit of inspection throughout its length, and salmon which enter it may be easily seen and taken if occasion warrants. Jenny Creek, a stream similar to Fall Creek, but unfortunately without barriers, enters the main river somewhat over 2 miles below the mouth of Fall Creek. Salmon are known to enter this stream, and there is no apparent reason why they should not do so at any time if so inclined. Several miles below the Klamathon racks, Shasta River enters the Klamath. It is a stream which formerly was famous for its salmon and trout.

The young salmon used for experimental purposes were selected from the large number reared at the Fall Creek hatchery. These were from eggs collected in 1922 and held in the rearing ponds until the following fall, 1923, when 75,000 of them were marked.

From 25,000, the adipose and right ventral fins were removed. (See fig. 23.) These were allowed to enter Fall Creek, October 8, where they might pass down and into the main channel of the Klamath.

Another 25,000 were marked by removing the adipose and posterior half of the dorsal. These were transported to Jenny Creek and introduced at a point about 500 feet above the mouth of the stream on October 4, 9 and 11.

A third lot of 25,000 had both ventrals removed. They were taken to Shasta River and introduced near the highway bridge, eight-tenths of a mile from the junction of that stream with the main river, October 5,10 and 14.

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[14] Snyder, John O., and Scofield, Eugene C. An experiment relating to the homing instinct of king salmon, California Fish and Game, vol. 10, no. 1, p. 9, 1924.

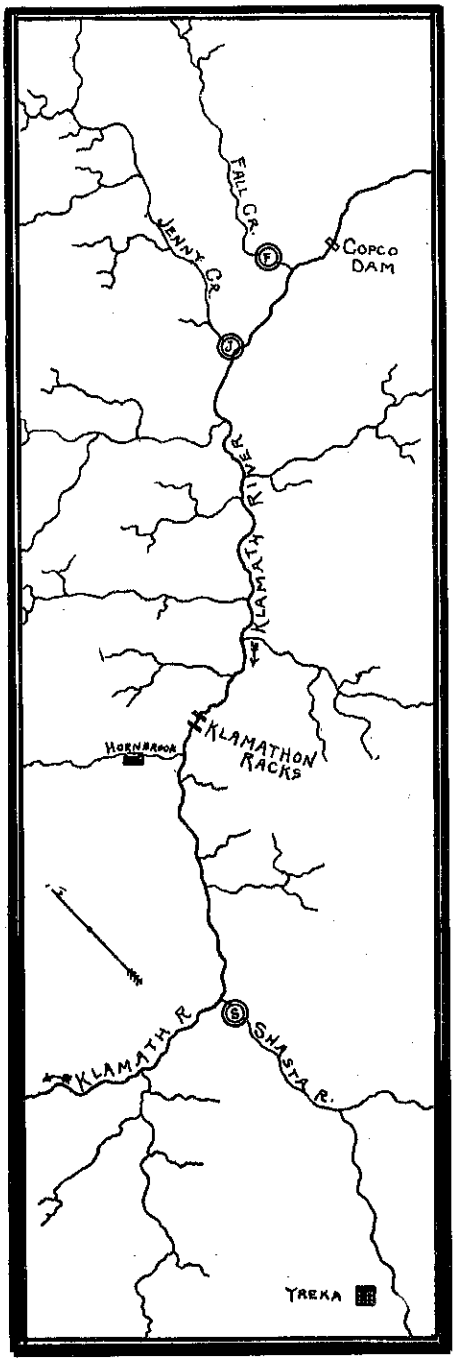

FIG. 25. Map showing location of salmon spawning and marking experiments on the Klamath River.

The first group had been hatched and reared in the waters of Fall Creek, and then allowed to enter the stream at a point which would necessitate a passage of one mile through its channel before entering the main river. The second group was given an exposure of only 500 feet to the waters of Jenny Creek. Some of them only loitered in the stream a few hours before entering the Klamath. Some of these might mingle with others of Fall Creek on their downward migration to the sea. The third lot had an exposure of nearly one mile to the water of Shasta River. It will be seen that if the adults return to the tributaries into which they were placed, all of them will pass the fishery at the mouth of the river; the Jenny Creek and Fall Creek fish will come into the racks at Klamathon; while the Shasta fish may enter this tributary, the one in which they were planted, or they may move up the main channel where they will be intercepted at the racks.

On the following year, 1924, the planting was repeated, each detail of the previous year having been observed.

The greatest care was taken throughout the work, so that no mixing of the fish would occur at the hatchery, and that no marked fish would accidentally escape into the river. Conditions were not favorable in Shasta River as the water was low at the time of both plantings, and fish could not be held at Fall Creek until later in the season when the water might be

expected to rise. It is obvious, however, that the introductions were all successful, for returns were received from them at sea, at the mouth of the Klamath and from points farther upstream as were expected.

A brief summary of the recorded captures of adult fish of this experiment follows:

TABLE 38

Fin marks	Date of capture							
	1925				1926			
	At sea	Klamath estuary	Klamathon racks	Shasta river	At sea	Klamath estuary	Klamathon racks	Shasta river
Right ventral, Fall Creek	8	8	29	0	31	81	140	0
Half dorsal, Jenny Creek	0	3	7	0	17	69	104	0
Both ventrals, Shasta River	0	2	0	1	5	6	2	2

TABLE 38--Continued

Fin marks	Date of capture								Totals
	1927				1928				
	At sea	Klamath estuary	Klamathon racks	Shasta river	At sea	Klamath estuary	Klamathon racks	Shasta river	
Right ventral, Fall Creek	36	185	21	0	9	35	0	0	583
Half dorsal, Jenny Creek	37	151	24	0	2	34	2	0	450
Roth ventrals, Shasta River	8	35	5	1	2	5	2	0	76
Totals									1,109

As might have been predicted, that part of the experiment which pertained to Shasta River was not rewarded by very abundant returns. Fishes bearing its mark were not caught anywhere in large numbers. None the less, they appeared in marine catches and they came into the Klamath on their nuptial migration. The fact of particular interest is that part of them entered the Shasta, while others pursued their course up the main river until they encountered the racks at Klamathon. Apparently all of those fish which were planted in Fall and Jenny creeks and which escaped the nets in the estuary, moved up the main channel and entered the racks as if bound for the tributaries from which they had once migrated toward the sea.

On observing the split in the migration of the Shasta fish, one's curiosity is at once aroused as to how the Fall and Jenny creek fish might have behaved if not intercepted by the racks, and fortunately an answer is at hand.

In 1926, 124 fish bearing the Fall Creek mark and 85 of the Jenny Creek planting were taken out of the Klamathon trap and allowed to pass on up the river. A considerable number of these were tagged with metal bands on the upper lobe of the caudal, that they might be easily recognized in the water. This tagging was soon abandoned because of

the weakened condition of many of the fish, some being unable to stem the strong current after being released. Marked fish were passed over the racks from September 26 to November 7.

Of the fish which were allowed to pass up the river, 59 were eventually recovered as follows :

34 Fall Creek fish caught in----------Fall Creek
3 Fall Creek fish caught in----------Bogus Creek
2 Fall Creek fish caught in----------Klamath River
1 Jenny Creek fish caught in----------Jenny Creek
16 Jenny Creek fish caught in----------Fall Creek
1 Jenny Creek fish caught in----------Bogus Creek
2 Jenny Creek fish caught in----------Klamath River

The fish which came into Bogus Creek (Fig. 26) were intercepted by the traps at an egg collecting station. The single one caught in Jenny Creek was taken in an improvised trap over which others might possibly have escaped, as it was difficult to keep it free from floating leaves.

It would appear from the results of this experiment that when yearlings are introduced into, and given a sufficient exposure to the waters of a particular tributary, they tend on their return migration to seek out and enter that tributary, while under other conditions, they may scatter to a considerable extent.

Observations seem to confirm the belief that in nature a species is under a condition similar to water in a reservoir, namely a proclivity to break down its barriers and spread. The homing instinct is a barrier to dispersal in the case of the salmon, and apparently in many other species as well. For example, striped bass and shad which were introduced into the Sacramento basin, returned there in large numbers after their seaward migration, but a small scatter occurred, the species having attempted to extend their ranges both north and south of the place of introduction. It may be inferred that at least a slight dispersal accompanies the return of either artificially or naturally propagated salmon, the tendency of a few individuals to scatter or break over the natural barrier to dispersal offering the species an opportunity to extend its range.

The four-year-old marked fish which came into the nets of the estuary in 1926 and 1927, and of which measurements and sex detemina-tions are available are very similar to fishes of the same age and type usually taken, as will appear when the following summary is compared with tables 26, 27, and 28.

The summary, table 38, indicates that the toll of marked fish taken by the nets at the mouth of the river grew relatively greater as the fish increased in size. In 1925 when only the small three-year fish returned, the nets stopped 13, while 36 came to the Klamathon trap. In 1926 when both three- and four-year fish appeared, the nets caught 156 while 246 reached Klamathon. Nine of those taken in the nets, and 21 of those taken between the racks at Klamathon were three-year fish In the following year the nets took 371 fish, leaving only 50 to be caught at Klamathon. In 1928, when the largest fish, five- and six-year individuals entered the river, 74 were caught in the estuary, and only 4 were seen at Klamathon. As a matter of fact the number caught in the

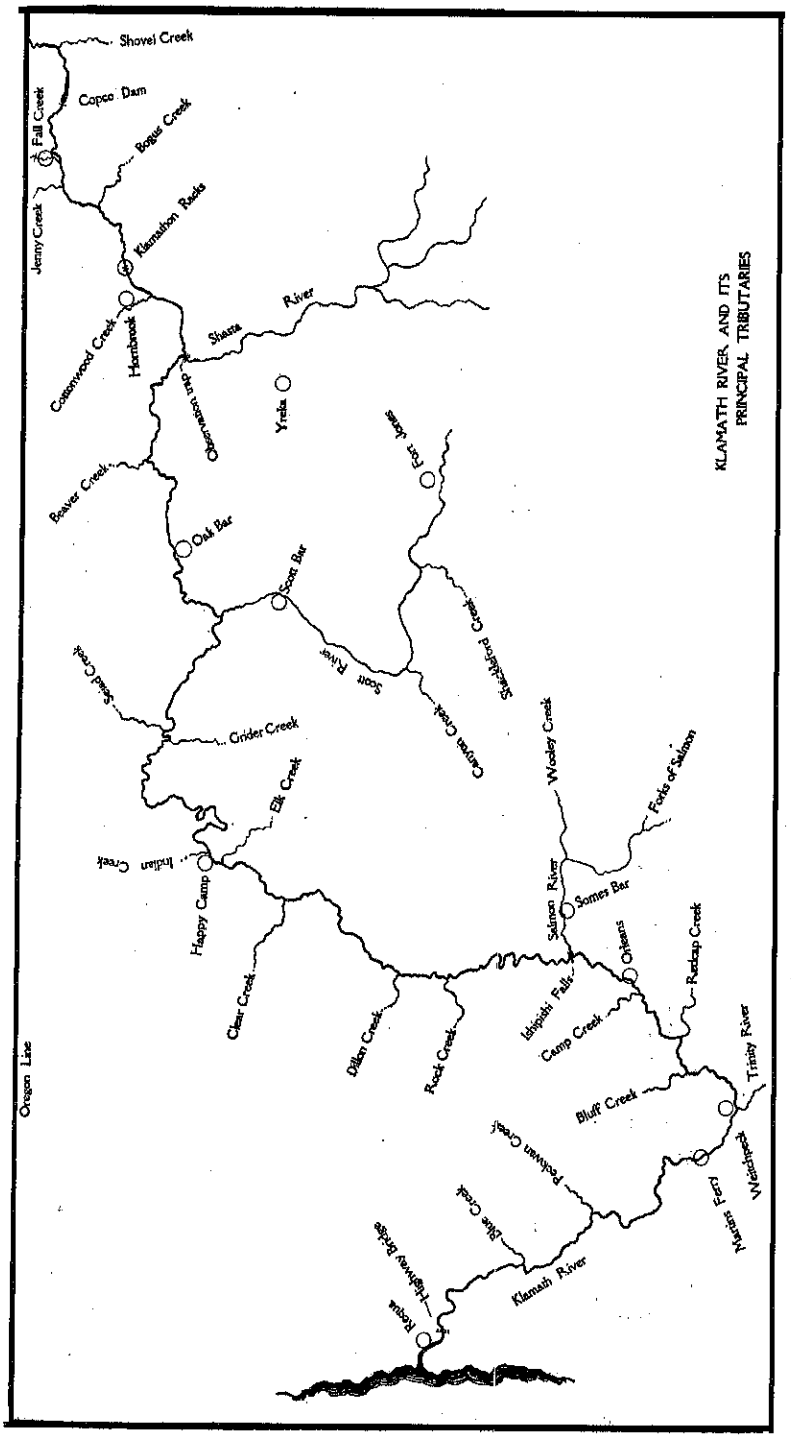
KLAMATH RIVER AND ITS
PRINCIPAL TRIBUTARIES
Shovel Creek
Copco Dam
Fall Creek
Bogus Creek
Jenny Creek
Klamathon Racks
Cottonwood Creek
Hornbrook
Shasta River
Quartz Mountain
Yreka
Fort Jones
Beaver Creek
Oak Bar
Scott Bar
Scott River
Seiad Creek
Grider Creek
Elk Creek
Indian Creek
Happy Camp
Clear Creek
Oregon Line
Dillon Creek
Rock Creek
Ishipishi Falls
Camp Creek
Orleans
Redcap Creek
Trinity River
Bluff Creek
Weitchpec
Hoopa
Johnson Creek
Klamath River
Blue Creek
Requa
Wooley Creek
Forks of Salmon
Salmon River
Somes Bar
Sandy Bar Creek
Coyote Creek

FIG. 26.

nets is considerably larger, for the returns here recorded came almost exclusively from the plant of the Klamath River Packers Association, the various dealers who ship fresh fish from the Klamath being unwilling to delay long enough to report the appearance of marked fish.

TABLE 39

Length in cm.	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Four-year fish of 1926—																								
Males	1	-	1	--	--	1	2	--	1	2	2	3	4	4	7	2	9	5	2	2	5	2	2	1
Females	1	--	--	--	--	2	2	1	1	6	5	8	10	15	3	10	5	0	6	2	2	1	--	--
Totals	2	--	1	--	--	3	4	1	2	8	7	11	14	19	10	12	14	11	8	4	7	3	2	1
Four-yew fish of 1927																								
Males	--	1	1	1	--	--	1	2	--	1	--	1	3	--	1	3	6	6	8	2	1	--	--	--
Females	--	--	--	--	--	--	--	1	--	4	4	10	14	10	10	10	17	12	7	7	2	--	--	--
Totals	--	1	1	1	--	--	1	3	--	5	4	11	17	10	11	13	23	18	15	9	3	--	--	--
Total four-year fish	2	1	2	1	--	3	5	4	2	13	11	22	31	29	21	25	37	29	23	13	10	3	2	1

The results of this experiment agree with the observation made on a previous page, that the method of fishing now pursued at the mouth of the river is a deleterious straining process that permits the escape of small fish which later appear in ill-proportioned numbers on the spawning beds. The use of seines under proper regulation might avoid this.

The time of arrival of the market fish in the river was well spread over the migratory season. They appeared in varying numbers much as did the fish of the entire catch as illustrated in table 40.

The writer is convinced that nothing of importance may be determined from a comparison of the number of recorded returns with the number of marked and liberated fish. In these experiments the percentage of captured adult fish is no measure of either the success or failure of artificial propagation. The number of returns depends in a large measure upon the effort put forth in obtaining them. For example, the marine returns in the last experiment were as follows :

1925

5 marked fish near Trinidad, June 23 to July 11.
1 marked fish near Patricks Point, June 22.
2 marked fish near Eureka, July 27, 30.

1926

12 marked fish near Trinidad, June 21 to August 17.
41 marked fish near Eureka, June 21 to September 5.

1927

81 marked fish near Eureka, May 12 to July 8.

1926

13 marked fish near Eureka, July 7 to August 13.

It will be noted that not a single marked fish was reported south of Eureka. It may be stated also that a special observer was located at Eureka, and that he was responsible either directly or indirectly for the recovery of nearly all of the marked fish reported from that region.

TABLE 40

Date (1927)	July 19	July 25	July 26	July 27	July 28	July 29	July 30	Aug. 1	Aug. 2	Aug. 3	Aug. 4	Aug. 5	Aug. 6	Aug. 8
Catch of Klamath River Packers Association	154	51	82	44	240	134	88	239	92	57	72	240	114	66
Number of marked fish	2	---	6	3	12	5	---	16	---	4	7	9	1	5
Fourth year fish	---	---	3	1	1	1	---	5	---	2	3	3	---	---
Fifth year fish	2	---	3	2	11	4	---	11	---	2	4	6	1	5

Date (1927)	Aug. 9	Aug. 10	Aug. 11	Aug. 12	Aug. 13	Aug. 15	Aug. 16	Aug. 17	Aug. 18	Aug. 19	Aug. 20	Aug. 22	Aug. 23	Aug. 24	Aug. 25
Catch of Klamath River Packers Association	141	237	258	153	2,014	3,531	225	561	631	1,674	507	235	107	130	649
Number of marked fish	3	9	2	2	44	50	8	15	15	26	6	11	2	3	5
Fourth year fish	---	---	1	1	14	17	5	10	6	13	5	5	---	2	3
Fifth year fish	3	9	1	1	30	33	3	5	9	13	1	6	2	1	2

Date (1927)	Aug. 26	Aug. 27	Aug. 29	Aug. 30	Aug. 31	Sept. 1	Sept. 2	Sept. 3	Sept. 5	Sept. 6
Catch of Klamath River Packers Association	435	298	414	911	788	528	365	189	145	44
Number of marked fish	8	5	8	9	11	10	3	1	1	---
Fourth year fish	6	3	7	7	4	5	1	1	1	---
Fifth year fish	2	2	1	2	7	5	2	---	---	---

In 1927, 41 fish bearing the mark of this experiment were found in Astoria, Oregon, by Harlan B. Holmes of the United States Bureau of Fisheries. They had all been shipped there after having been purchased from a barge which was anchored in Humboldt Bay near Eureka.

It seems quite probable that the fish marked in 1923-1924 migrated just as far at sea as did those of previous experiments, but the novelty of finding a marked fish had lost its freshness, and in spite of the publicity given to the experiment, and the offer of a small reward for fin scars, the marked fish were pretty generally overlooked.

It was intended that during the season of 1926, salmon should be caught with a seine in the estuary of the river, marked with a metal tag and then liberated. It was thought that the recovery of some of these fish might furnish facts relating to the length of time they linger in the estuary, their progress and speed during the stream migration, the relative number which would come to the Klamathon racks, etc. The work was in charge of E. C. Scofield, and he expected to proceed with it as the migration progressed. One unavoidable delay followed another, however, and productive operations were not begun until August 28. From that date to September 15, 343 fish were caught, tagged and liberated. Recoveries were eventually made as follows:

TABLE 41

Date when tagged	Date of capture	Place of capture
September 13, 1926	October 3, 1926	Johnsons
September 13, 1926	October 17, 1926	Klamathon racks
September 13, 1926	October 20, 1926	Klamathon racks
September 14, 1926	September 25, 1926	Ishipishi Falls
September 14, 1926	October 5, 1926	Johnsons
September 14, 1926	October 13, 1926	Klamathon racks
September 14, 1926	October 17, 1926	Klamathon racks
September 14, 1926	October 19, 1926	Klamathon racks
September 14, 1926	October 20, 1926	Klamathon racks
September 14, 1926	October 26, 1926	Shasta River
September 14, 1926	October 30, 1926	Klamathon racks
September 15, 1926	October 20, 1926	Blue Creek
September 15, 1926	October 3, 1926	Ishipishi Falls
September 15, 1926	October 24, 1926	Shasta River
September 15, 1926	October 26, 1926	Shasta River
September 15, 1926	November 11.1926	Camp Creek

Not enough was accomplished to warrant any generalization, yet the results indicate the possibilities of such an experiment.

OCEAN TAGGING

Attempts to tag salmon at sea were made in 1926 and 1927. The only source of supply was the trolled fish. Because of adverse conditions the project was not successful.

In 1926, 130 fish were tagged at points along the California coast from Monterey Bay to Trinidad. One of these tagged near Trinidad, August 8, was recovered at Mill Creek Hatchery, Sacramento basin, November 14, 1927.

In 1927, 53 fish were tagged in Monterey Bay from April 28 to June 14. This attempt was more successful, 16 of the fish having been retaken. A summary follows:

TABLE 42

Tag number	Tagged		Recovered	
	Date	Locality	Date	Locality
IPSIF 5	May 10	Monterey Bay	Aug. 5, 1927	Monterey Bay
7	May 10	Monterey Bay	Aug. 4, 1927	Monterey Bay
11	May 11	Monterey Bay	July 23, 1927	Monterey Bay
12	May 11	Monterey Bay	Aug. 7, 1927	Off Point Reyes
13	May 11	Monterey Bay	Bug. 6, 1927	Oft Point Reyes
17	May 16	Monterey Bay	July 25, 1927	hlonterey Bay
19	May 16	Monterey Bay	April 27, 1928	Monterey Bay
22	May 16	hlonterey Bay	Aug. 15, 1927	Olf Point Reyes
27	May 25	Monterey Bay	Sept. 12, 1927	Near Rio Vista
28	May 25	Monterey Bay	July 20, 1927	Monterey Bay
33	May 27	hlonterey Ray	May 22, 1928	Monterey Bay
38	June 12	hfonterey Bay	Sept. 7, 1927	San Francisco Bay
USBF 50	June 14	hlonterey Bay	May 26, 1928	Off Eureka
306	May 18	Monterey Bay	April 27, 1928	Monterey Bay
307	Mav 18	Monterey Bay	Aug. 6, 1927	Monterey Bay
308	May 19	Monterey Bay	May 25, 1927	Monterey Bay

DEPLETION

It has been said, even of late, that the salmon population of Klamath River is holding its own. That this is not the case, and that rapid depletion of the stock is not only threatened, but is actually under way, will appear.

In an attempt to discover whether the salmon population of Klamath River is being maintained or whether depletion is threatened or is actually in progress, there must be considered not only the conditions in the river itself, but attention must be directed to the fishery of the entire coast to the southward, and also to other rivers of the state where salmon are taken. As the supply from other and more accessible streams becomes reduced, the attack on the Klamath will become more vigorous. As sea fishing in Monterey Bay, where Klamath salmon along with those from other streams are caught, becomes less profitable, the center of effort will move northward and approach the river itself. A decline in the entire catch of the state, or in the region of Monterey Bay, or off the coast to the northward, or even in the Sacramento River, spells decline in the Klamath, even though superficial indications in the river do not now point in that direction.

Dependable salmon statistics for the State date from about 1918, when the catch was somewhat over 13,000,000 pounds. In the following year it was about equally large, but in 1920 a decline began, and this has continued with occasional recoveries until 1928 when about 4,400,000 pounds were taken. Figure 27 illustrates the situation.

With the general decline of the catch of the entire State, there has occurred a somewhat similar falling off in every section, whether the fish were taken at sea or in the rivers.

The condition in Monterey Bay is perhaps more serious than that of any other part of the State. Here a reported catch of over 5,000,000 Pounds in 1916 has dwindled to less than 52,000 pounds in 1926. This

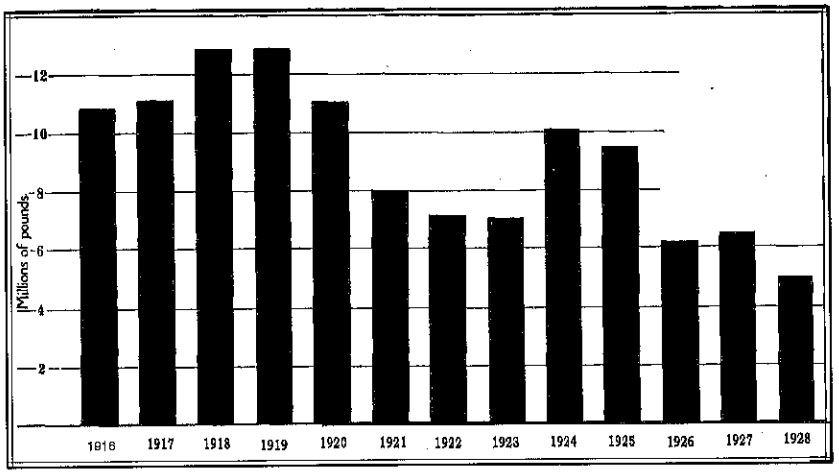

FIG. 27. The salmon catch of California expressed in millions of pounds.

depletion in the catch is not due to a restricted fishing period as will be readily seen by an examination of table 43 and figure 28, where the catch is represented by monthly periods. Here the catch of any month shows a decline through a period of years.

The rapid growth of the fishery near Fort Bragg and along the coast in the vicinity of Eureka has not only suffered a check, but also shows unmistakable evidence of serious decline. The rapid advance and the later recession of the fishery in this region is depicted in figure 29.

Attention is called to table 44, which was compiled from data furnished by the Division of Fish and Game.

During the season of 1928 it became evident that a considerably larger proportion of small fish was being brought to the markets from sea trolling than ever before. The fishermen attempted as usual to account for this in various ways, but a small sampling of the Monterey catch seemed to indicate that a large proportion of young and immature fish was being taken. Of 383 representative examples secured from June 22 to July 15, 56.9 per cent were in the second year of growth; 31.4 per cent were in the third year, 10.9 per cent in the fourth year, and 0.8 per cent in the fifth year. This was an enormous increase in the relative number of two- and three-year fish over what may be regarded as the normal of preceding years.

In 1929 a careful survey of the situation was made at Monterey from April 23 to July 29, inclusive, when samples of the catch were taken. Scales were collected, measurements and sex determinations were made of 2847 fish. Of these 17.5 per cent were in the second year of growth and 62.3 in the third year. Only 17.2 per cent were in the fourth year, 2.9 in the fifth and 0.1 of one per cent in the sixth year. It appears then that 79.8 per cent of the catch was made up of two- and three-year fish. (Fig. 30.) (Full particulars are given in table 45.)

Here is a notable departure from the normal as indicated in tables 64 and 67. It is not only evident that an unusually large number of

TABLE 43

Monthly Salmon Catch of Monterey Bay from 1916 to 1928, Expressed in Pounds

1916		1917		1918		1919		1920		1921		1922		1923		1924		1925		1926		1927		
ita Cruz	Monterey	Janta Cruz	Monterey	Santa Cru	Monterey	anta Cruz	Monterey	Santa Cruz	Monterey	Santa Cruz	Monterey	Santa Cruz	Monterey	Santa Cruz	Monterey	Santa Cruz	Monterey	/Santa Cruz	Monterey	Santa Cruz	Monterey	Santa Cruz	Monterey	
	3,085	531	33,960	0	62,784	0	2,418		2,315	0	161	0	10	0	0	0	0	43	32,874				0	
11:	156,571	6,119	806	0	70,406	0	3 765	29	40,550	73	33,192	0	0	0	0	0	0	248	68,547	8	48	8	0	
1,717	214,726	24,494	498,166	337	187,440	1,687	210 24;	82	104,153	5,620	141,230	0	0	35,169	83,152	98,698 847	842	8,837	238,095	0			4	
8,253	654,361	26,390	512,786	22,938	973,904	74,072	536 83:	54,525	455,531	46,395	150,687	75,243	245,495				222,412	89,248	167,582	0	22 8	3,451 120	137,752	
49,653	2,039,919	61,061	1,197,533	79,104	1,029,262	311,247	956 92;	66,048	311,223	208,528	406,643	136,777	101,519	173,753	186,615	90,744	123,088	45,864	157,239	1,968	30,832	23,647	180,318	
22,511	663,232	135,262	908,283	29,911	187,948	57,237	520 50:	47,221	331,779	116,830	123,654	169,660	130,205	47,990	102,468	47,112	51,768	49,121	180,942	7,778	8,031	35,327	145,063	
38,009	728,572	15,947	277,646	75,309	127,675	13,563	83 415	22,967	34,970	6,112	5,790	15,500	5,527	11,456	25,751	104,734	78,692	45,001	8,430	2,016	28:	90,857	29,653	
22,531	377,355	980	170,331	2,309	43,480	1,212	2,676	8,249	11,179	0	45	55	15	37,960	23,970	30,037	28,153	6,233	333	306		6,660	8,052	
14,150	150,571	31	8,936	0	0	150	0	10	0	0	0	13	0	0	0	59	0	78				0	0	
0	0	0	0	0	0	0	0	0	0	0	0	10	0				0	0	8	167	8	0	0	
1,624	82,719	0	88	0	0	0	67	0	0	0	0		0	0		0	0		0	8		0	0	
75	5,780	0	137	15	54	0	0	0	38	0	0	8	0	0	50 0	40	0	8	0	0	8	0	0	
158,948	5,071,891	270,815	3,608,672	209,923	2,682,953	499,168	2,316 854	199,139	1,291,738	383,558	860,402	397,358	482,771	306,336	421,960	372,231	504,955	244,673	854,042	12,235	39,520	216,185	500,842	

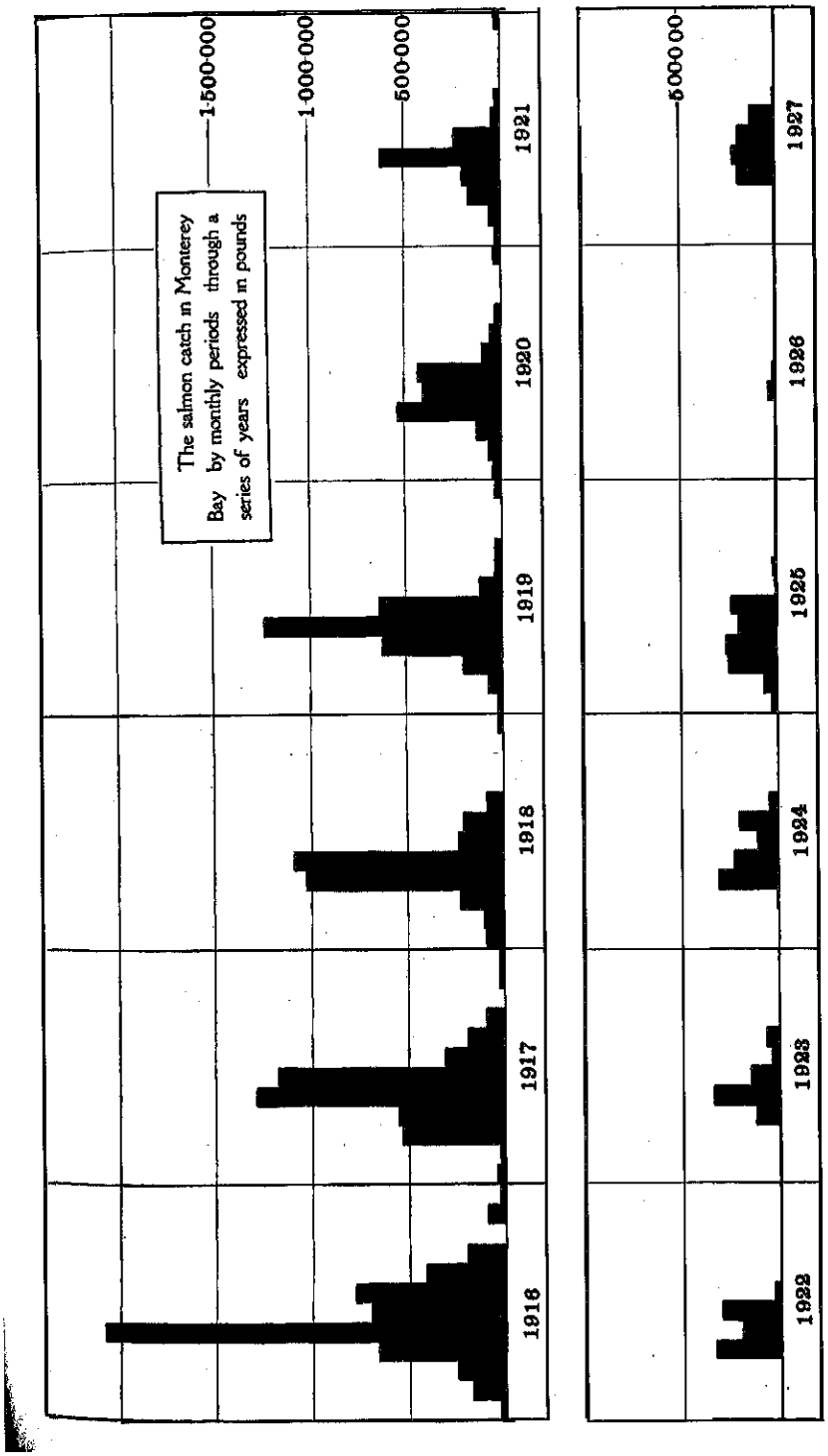
The salmon catch in Monterey Bay by monthly periods through a series of years expressed in pounds
1,500,000
1,000,000
500,000
600,000
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927

FIG. 28.

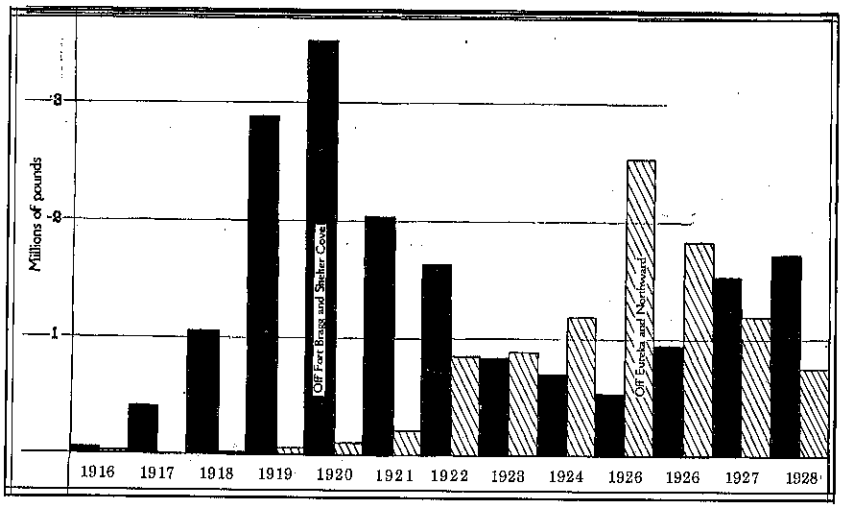

FIG. 29. Salmon catch off Fort Bragg and Shelter Cove, and off Eureka and northward, expressed in millions of pounds.

TABLE 44

Salmon Catch of California from 1916 to 1928 Expressed in Pounds

Year	Monterey	Santa Cruz	Near San Francisco	Year Ft. Bragg and Shelter Cove	Off Eureka and northward
1916	5,071,891	158,948	260,030	7,654	90,699
1917	3,608,672	270,815	1,242,913	401,460	522 742
1918	2,682,953	209,923	1,756,134	1,097,771	12,840
1919	2,316,854	499,168	1,427,137	2,809,803	50,039
1920	1,291,738	199,139	1,451,270	3,015,130	100,251
1921	880,403	383,558	987,452	2,084,080	216,179
1922	482,771	397,358	951,137	1,621,760	875,081
1923	422,000	300,336	1,283,748	812,807	880,844
1924	504,955	372,231	3,616,455	687,240	1,193,102
1925	854,042	244,673	1,270,918	682,194	2,529,691
1926	39,520	12,236	936,330	982,295	1,866,214
1927	500,842	216,185	1,488,746	1,528,898	1,186,908
1928	259,408	75,246	815,815	1,562,715	731,117

young fish were being killed, but it is also reasonable to presume that there is before us ample evidence of extreme depletion. Unless an unsound inference is being made, it would seem that the supply of old fishes is inordinately reduced, and that the Monterey Bay catch of 1929 was greatly reducing the population of young fish which should be left to mature in the near future.

Other offered explanations of the exceptional abundance of small fish in the catch, such as "these fish did not grow large as usual," "the large fish are feeding farther out," or "the abundance of young fish is the precursor of large catches next year," do not seem to be borne out by the facts.

There is no room for the presumption that a large harvest of male fish which would presumably mature as grilse was made, for it is found that sex representation in the catch of 1929 was about normal.

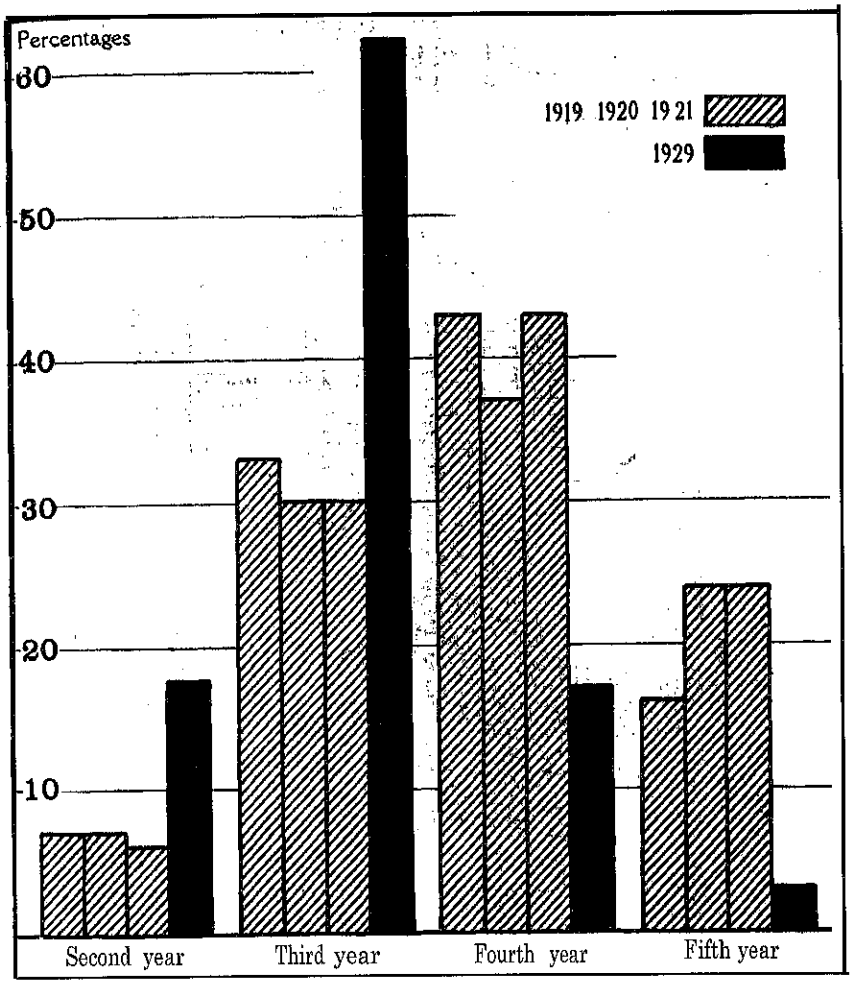

FIG. 30. Graph expressing the percentage of each year class in the Monterey catches for four years. Note the great relative increase of two- and three-year fish (black) in the season ,of 1929.

In the Sacramento River the catch has fallen away in an unmistakable manner as is evidenced by table 48.[15]

Depletion in the Sacramento can only affect the Klamath indirectly, in that an increased demand for fresh fish' will call attention to the nearest supply. But depletion in the ocean affects the Klamath directly, for it has been definitely shown that the feeding grounds of Klamath salmon extend to Monterey Bay.

Previous to the appearance of G. R. Field in the fishing activities of Klamath River no records relating to the catch appear to have been kept. Access to his books which was generously given, revealed a continued expansion of statistics other than those relating to business

15 Clark, G. H. Sacramento-San Joaquiq salmon *(Oncorhynchus tschawytscha)* fishery of California. California Division of Fish and Game, Fish Bull., no. 17, 1929.

TABLE 45

MONTEREY BAY 1929

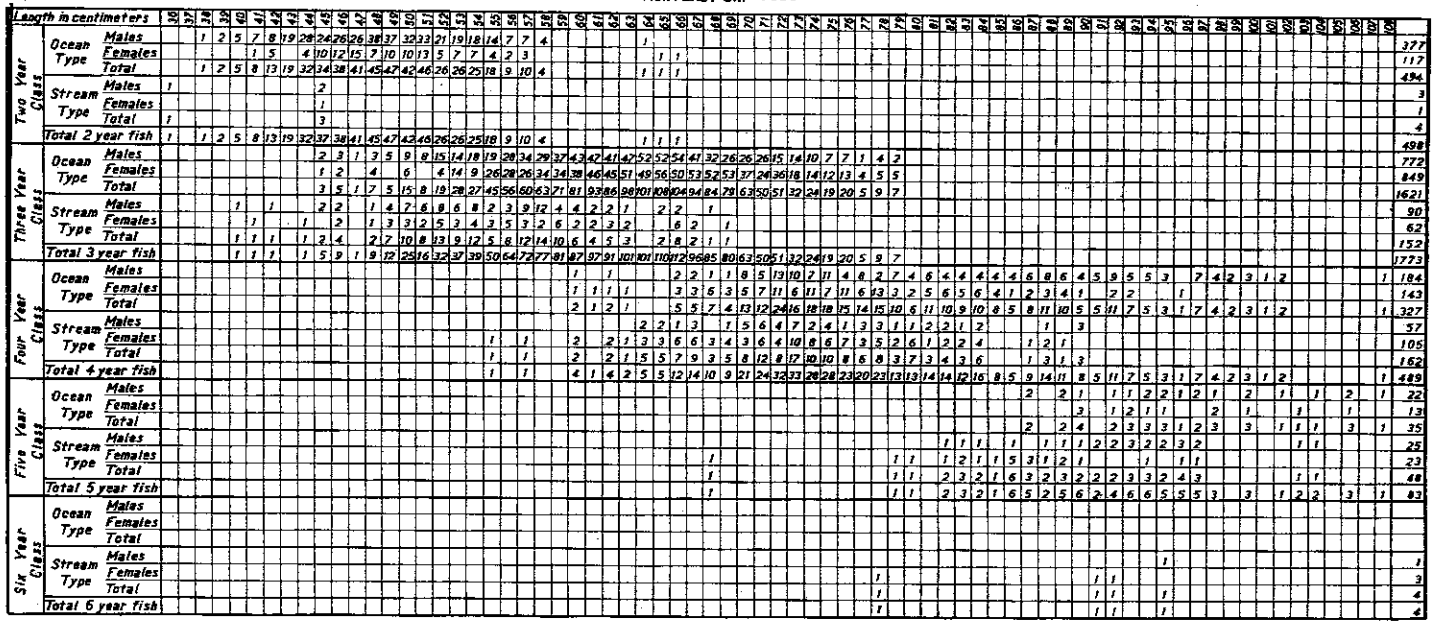

TABLE 46

Summary of Monterey Bay Age Classes, 1929

Year classes	Two	Three	Four	Five	Six	Totals	Percentages
Males	380	862	241	47	1	1,531	53.8
Females	118	911	248	36	3	1,316	46.2
Ocean type	494	1,621	327	35		2,477	87.0
Stream type		152	162	48	4	370	13 0
Ocean type males	376	772	184	22		1,355	47.6
Ocean type females	117	849	143	13		1,122	39 4
Stream type males	3	90	57	25	1	176	6.0
Stream type females		62	105	23	3	194	6.9
Totals	498	1,773	489	83	4	2,847	
Percentages	17 5	62.3	17.2	2.9	.1		

TABLE 47

Catch of	Percentages of	
	Males	Females
1929	53 8	46 2
1919	54.0	46 0
1920	51 0	49 0
1921	51 0	49 0

TABLE 48

Salmon Catch in Sacramento River

Date	Pounds live weight
1916	3,450,786
1917	3,795,486
1918	5,938,029
1919	4,529,222
1920	3,860,312
1921	2,511,127
1922	1,705,066
1923	2,243,945
1924	2,640,110
1925	2,778,846
1926	1,261,776
1927	917,525
1928	553,777

transactions up to 1917 when an interesting record appears, which takes separate account of the king salmon, silver salmon and even the steelheads, when the latter happen to be caught. The year 1912 is there said to have witnessed the greatest run of salmon known to white men. The pack was something over 1,384,000 pounds, and a conservative estimate of the number of fish caught amounted to 141,000. In one day 17,000 were taken. Three plants were then operating and the river was fished to the limit.

A digest of fishing activities compiled partly from Field's notes and partly from records in the State Division of Fish and Game follows :

NOTES RELATING TO THE SALMON CATCH OF KLAMATH

1912. The plant of the Klamath River Packing Company began operations June 4. From June 4 to July 5, 426 cases of halves and 116 cases of one-pound cans were packed. (One case=48 cans) ; July 5 to 15, 550 halves; July 15 to 17, 4 halves. Number salmon caught in June, 1190 ; July, 12,042 ; no detailed data for remainder of season. Total for season, an amount equal to 13,300 cases of one-pound cans.

Three plants operated: Klamath River Packing Company, 13,300 cases of ones; Klamath River Canning Company, 10,611 cases of ones; Del Norte Salmon Canning Company, 5000 cases of ones ; all king salmon. Season's pack, 28,911 cases of ones. Halves were packed, but they are reduced to ones in the above account.

1913. Three plants operated ; Klamath River Packing Company, 5800 cases of ones; Klamath River Canning Company, 3400 cases of ones ; Del Norte Salmon Canning Company, 3000 cases ones. Total, 12,200 cases of ones.

The Klamath River Packing Company took during June, 596 fish; July, 6242 ; August, 19, 276; September, 2479.; total, 28,593 No detailed fall record.

1914. Klamath River Packing Association operated alone. Summer pack, 11,829 cases ones; fall, 5260 cases ones. June, 417 fish; July, 12,758 ; August, 47,558 ; September, inc. 6, 2775 ; total to September 6, inc., 63,508 fish; September 21 to October 1, 127,199 lbs., live weight ; October 1 to 24, 233,985 lbs. ; total, September 21 to October 24, 361,184 lbs., live weight. September-October includes silver salmon. The fall pack was ; Kings, 508 cases of ones ; silvers, 4752 cases of ones. No silver salmon before September 21.

1915. Klamath River Packing Association opened June 21, closed October 25. June, 871 fish; July, 7252 ; August, 55,327 ; September to September 5, 8807; total to date, 72,257, all king salmon; September from 20th, 74,526 lbs. ; October, 146,105 lbs. ; total, September-October, 220,631 lbs., both king and silver salmon. Total for year, about 1.232,229 lbs.

1916. Klamath River Packers Association, June 26 to July, 342 fish ; July, 6841; August, 21,309 ; September 1 to 6, 2327 ; 30,819 king salmon. September 22 to October, 57,761 lbs. ; October, 178,904 lbs. ; total, 236,665 lbs. king and silver salmon. Total for year about 668,131 lbs.

1917. Two companies operated: Klamath River Packers Association as follows : June 27, 2 fish ; July, 427, ; August, 3284 ; September 1 to 6, 1250. Total, 4963. September 20 to October, 2250 fish; October, 10,300 ; November 1 to 26, 1638. Total, 14,188. Total fish for year, 19,151 ; total weight, 241,910 lbs. Forty-four boats in use.

Requa Cooperative Packing Company. No data from this source. The Fish and Game Commission reports all fish from the river as follows: 265,537 lbs. king and silver salmon; 1710 lbs. steelheads.

1918. Two companies operated; Klamath River Packers Association, April, 47 fish; May, 109 ; July, 312 ; August, 12,140 ; September 1 to 6, 3226; September 20 to 30, 1106; October 1 to 23, 466. Total 17,406 king salmon weighing 221,949 lbs.; from September 20 to end of season, 10,893 silver salmon and steelheads weighing 71,014 lbs. were caught.

Requa Cooperative Packing Company—no data.

There were reported from all sources, 672,845 lbs.

1919. Klamath River Packers Association opened April 30. April-May, 1030 fish ; July 7, to August, 1668 ; August, 23,591 ; September 1 to 6, 1605. Total, 27,894 king salmon weighing 375,472 lbs. September 20 to October, 2560 ; October 1 to 30, 670. Total 3230 king and silver salmon weighing 64,023 lbs. Total fish for season, 31,124; weight, 439,495 lbs.

Total reported from river to Fish and Game Commission, 535,198 lbs., including steelheads.

1920. Klamath River Packers Association opened April 19. April-May, 247 fish; July, 2964 ; August, 46,851; September 1 to 6, 4311. Total, 54,373 king salmon; weight, 809,040 lbs.

Total reported to Fish and Game Commission, 872,295 lbs. salmon; 5910 lbs., steelheads.

1921. Two companies operated: Klamath River Packers Association opened July 20. July, 948 fish; August, 38,521 ; September 1 to 6, 3527. Total, 42,996 fish; weight, 604,877 lbs.

The Del Norte Packing Company reported 10,148 lbs.

Total from river reported to Fish and Game Commission, 614,247 lbs.

1922. Two companies: Klamath River Packers Association opened July 29. July, 2227 fish; August, 51,163; September 1 to 6, 8112. Total, 61,502 fish; weight, 903,509 lbs.

Del Norte Packing Company-no data.

Total reported from the river, 1,039,680 lbs. of salmon; 2345 lbs. steelheads.

1923. Klamath River Packers Association opened July 16. July, 2093 fish; August. 47.092 ; September 1 to 6, 7814. Total, 56,999 king salmon; weight, 826,134 lbs.

1924. Klamath River Packers Association opened July 30. July-August, 38,659 fish; September 1 to 6. 7212. Total, 45.871 king salmon; weight, 685,469 lbs.

Several small dealers bought fish, bringing the reported catch up to 814,572 lbs.

1925. Klamath River Packers Association. July 7 to 31, 6317 fish: August, 430,901; September 1 to 6, 4610. Total, 54,828 king salmon, weight, 867,103 lbs.

Some small dealers operated, bringing the reported catch up to 956,393.

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16 Mr. H C. Roberts aided in the preparation of this summary of Field's notes. He also contributed observations relating to the habits of salmon in the estuary.

1926	July	August	September
Ellis	6,692	7,249	
Klamath River Packers Association	13,855	375,997	141,768
Paladini	2,320	25,805	19,924
Patterson Bros.	13,647	138,793	48,230
Fisher		12,632	823
Womack		3,949	
Total pounds	36,544	564,425	210,745

Total for 1926 season: 811,714 pounds.

1927	July	August	September
Horn	11,235	48,257	913
Patterson	3,957	68,044	3,693
Klamath River Packers Association	12,528	208,735	17,981
Ellis		13,290	6,642
Estes		2,798	857
Fisher		2,325	4,163
Paul		1,108	837
Total pounds	27,720	344,557	35,086

Klamath River Packers Association received 239,244 lbs. (16,843 fish in, 1927.
A total of 408,081 lbs. was reported to the State Fish and Game Commission for 1927.

A summary of the above data may be made as follows (table 49) (This table is also graphically represented by figure 31.)

TABLE 49

Year	The catch of the Klamath River Packers Association	Entire catch as reported to Division of Fish and Game
	(lbs.)	(lbs.)
1915	1,232,229	1,232,229
1916	668,131	801,150
1917	241,910	265,537
1918	292,963	672,345
1919	439,495	535,198
1920	809,040	872,295
1921	604,877	614,247
1922	903,509	1,039,580
1923	826,134	824,291
1924	685,469	814,572
1925	867,103	956,082
1926	531,650	811,714
1927	230,244	408,081
1928	164,470	308,826

An inspection of the table and graph might make it appear that depletion is not serious, but it is known that the catch of the Klamath has been maintained chiefly through increased effort. The large catch of 1915 was made with a maximum of 40 boats in service, while in 1926, 126 boats and a correspondingly large number of fishermen were engaged. The only available measure of the effort required to make the catch is the number of boats employed, and all things considered, it appears to be a fair measure. Detailed data relating to boats as furnished by Harry Roberts follows. Figure 32 represents in a graphic way the gradual increase in fishing effort.

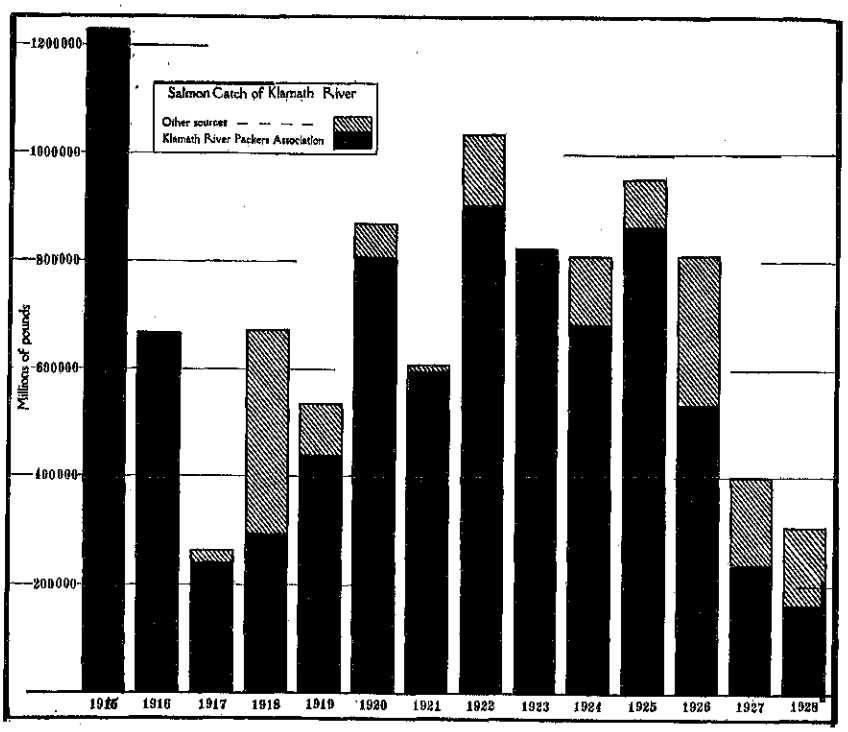

FIG. 31.

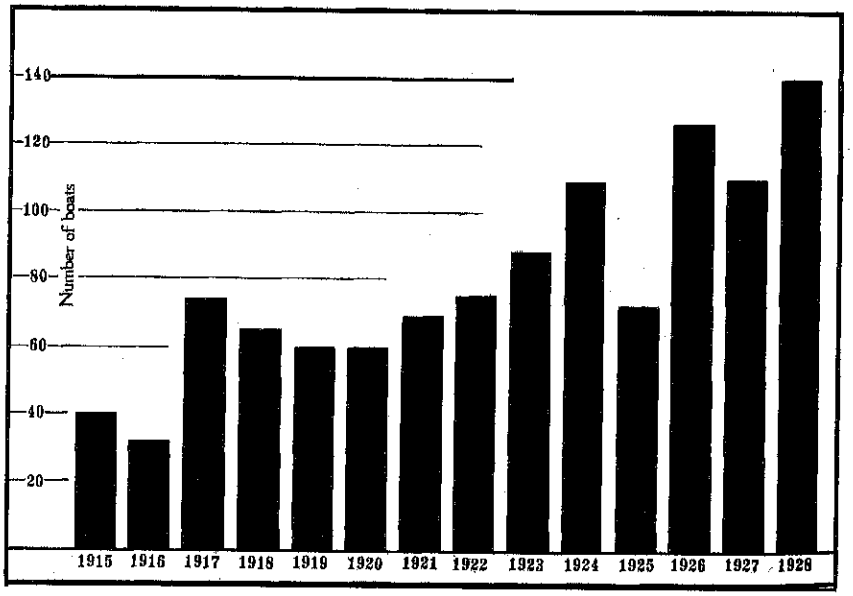

FIG. 32. Graph showing the number of boats annually employed in taking the commercial catch in Klnmath River.

TABLE 50

Number of Boats in Service During the Month of August of Each Year

1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928
40	32	74	65	60	60	69	75	88	109	97	126	110	140

Since a greatly increased effort has not resulted in a corresponding increase of the catch, the only inference to be made is that the supply has diminished.

In 1921 the writer spent some time along the river and its main tributaries in an attempt to learn something of the migration of salmon. In interviews at that time it was constantly affirmed by people living in the region, that the supply of salmon had been greatly depleted in recent years.

The number of spawning fish taken at the racks at Klamathon have greatly decreased since 1925 as is shown by the census recorded in the following table.

TABLE 51

Summary of Klamathon Station Spawning Records

	1925	1926	1927	1928	1929	1930
KING SALMON						
Grilse	1,277	3,401	----------	----------	*1,822	924
Males of spawning age	4,202	1,250	600	540	226	260
Females spawned	4,605	3,872	1,365	1,577	950	618
Males dead on the racks	184	317	----------	----------	506	260
Females dead on the racks	152	302	----------	----------	527	330
Marked salmon	36	246	50	4	0	----------
Totals	10,420	9,387	----------	----------	4,031	2,392
SILVER SALMON						
Males	269	1,301	----------	----------	--------	----------
Females	26	307	----------	----------	--------	--------
Totals	295	1,608	----------	----------	--------	----------

*On December 26, 1929, E. V. Cassell wrote: "The dead females were all spent. Hundreds of undersize grilse came into Fall Creek during the fall season. These fish slipped through the one and one-half inch spacing of the upper racks at Klamathon. This is unusual."

Fishermen and others interested in the industry report that the migration is appearing later each year. This statement usually accompanies a plea for an extension of the legal season. As expressed elsewhere in this paper, it is believed by the writer that this is a phenomenon of depletion. Instead of the run appearing later in the season, the fish are becoming less numerous, and as a result the curve representing the migration is being reduced, and hence shortened. What is meant may be better illustrated than said by figure 33. Here the catches of the Klamath River Packers Association for the years 1915 and 1926 are represented by curves. A reduction of the curve of 1926 causes it to make its appearance later in the season. The September ends of both curves are lost because of the legal closure of the fishing season on September 6. It is known, however, that this end of the curve falls away very rapidly.

No trustworthy evidence is at hand which may be invoked to show that the supply of salmon is on the increase, or that the stock is being

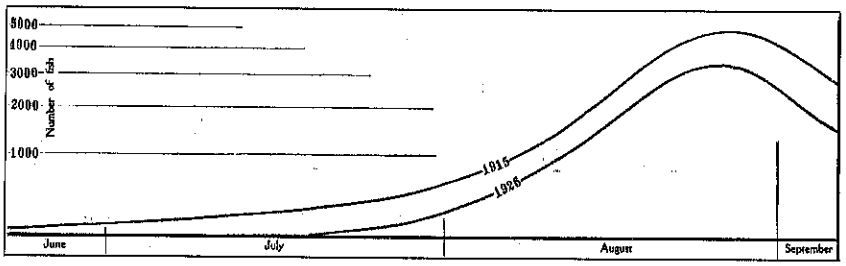

FIG. 33. Curves representing the migrations of 1915 and 1926.

maintained, while on the contrary there is ample reason to believe that the fishery will not long stand the draft that is now being levied against it.

There are indications that some efforts at protection which are now applied are not entirely effective. For example, the short closed period may be mentioned. That this is of little avail may be demonstrated by an inspection of table 12 or figure 4, where it appears that a distinctly large catch usually follows an inactive period. The closed periods accomplish little more than to allow fish to accumulate in the estuary to be taken on the following day.

Whether or not the facts here offered be accepted as an indication of depletion, it goes without question that evidence of a more exact sort should be produced. Such evidence will only come from careful observation. There is at present no certainty that all of the phenomena are known which may manifest themselves as the population of a species of salmon suffers great depletion, and hence the direction of observations which may result in the detection or measure of depletion is difficult and more or less uncertain. There is no question, however, as to the value of a yearly census of the population, when such may be secured. In addition to what we may now get from the catch at the mouth of the river and from the racks at Klamathon, there should be a careful yearly examination of certain representative spawning areas in the Klamath basin which should be made by a competent observer. Also, one or more typical streams should be barred with a rack and traps, in such a way as to furnish the conditions for taking an accurate census of each year's migration.

THE OCEAN CATCH

Until quite recently it was not thought that salmon produced by Klamath River were contributing in any substantial way to the ocean catch. Under the supposition that fish on their nuptial migration from the ocean must return to their native streams, it was presumed that during their ocean life they did not stray far from the mouth of the river of their nativity. The late George R. Field, manager of the plant of the Klamath River Packers Association, was a careful observer and by nature a naturalist. He had implicit confidence in the above presumption and frequently expressed himself as not being disturbed by ocean fishing as long as boats did not operate north of Trinidad. But before boats appeared north of that port, occasional fish came into the Klamath bearing indisputable evidence of contact with marine fishermen, in the shape of hooks, spoons and other pieces of tackle.

Recent observations[17] have amply demonstrated that ocean migrations are extensive, and any study which involves questions of river conservation or depletion, or practices relating to artificial propagation, must take into account many factors of ocean life.

In recent years the catch from the ocean has been gaining in importance when compared with that from the rivers, as expressed in the following table 52, and likewise in figure 34.

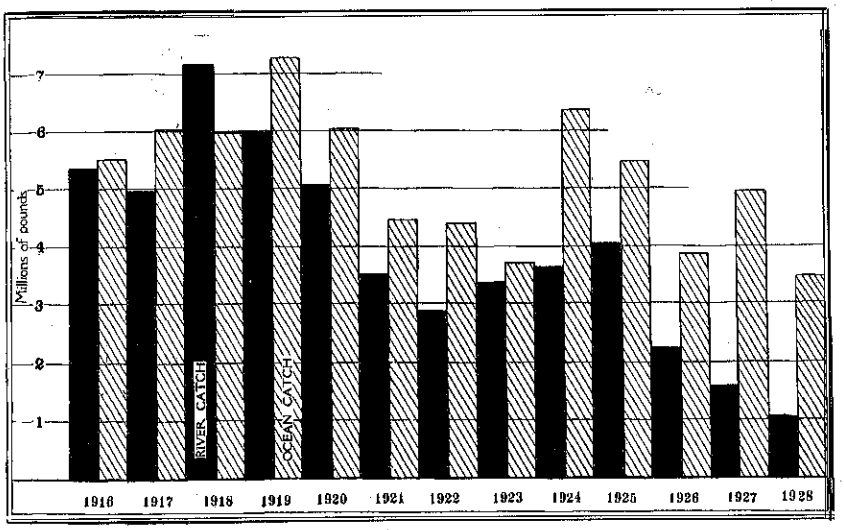

FIG. 34. The river and ocean catches of salmon in California expressed in millions of pounds.

TABLE 52

Year	Total salmon	
	Caught in rivers	Caught in ocean
1916	5,347,378	5,502,081
1917	4,074,584	6,083,091
1918	7,154,542	5,932,281
1919	5,937,296	7,208,372
1920	5,060,705	6,066,190
1921	3,501,663	4,483,100
1922	2,896,807	4,338,317
1923	3,353,336	3,736,924
1924	3,040,696	6,374,573
1925	4,044,217	5,481,536
1926	2,220,402	3,863,677
1927	1,590,329	4,921,600
1928	1,034,260	3,444,306

17 Mottley, Charles McC. Pacific salmon migration: Report on the study of the scales of the spring salmon *Oncorhynchus tschawytscha* tagged in 1926 and 1927 off the west coast of Vancouver Island. Contributions to Canadian Biology and Fisheries, n.s., vol. 4, no. 30, pp. 471–494, 1929.

Rich, Willis H., and Holmes, Harlan B. Experiments in marking young chinook salmon on the Columbia River, 1916 to 1927. U. S. Bureau of Fisheries, Bull. (for 1928), vol. 44, doc. 1047, pp. 215–264, 1929.

Rich, Willis H., and Morton, Frederick G. Salmon-tagging experiments in Alaska, 1927 and 1928. U. S. Bureau of Fisheries, Bull. (for 1929), vol. 45, doc. 1057, pp. 1–23, 1930.

Snyder, John O. A third report on the return of king salmon in 1919 in Klamath River. California Fish and Game, vol. 10, no. 3, pp. 110–114, 1924.

Some difficulty is encountered in segregating the reports of either ocean or river caught fish, but the amounts here given are sufficiently accurate for the purpose of comparison. Discrepancies may be checked against a record of the entire catch in California for the same period.

TABLE 53

Total Catch of Salmon in California Expressed in Pounds

Year	Pounds
1916	10,939,594
1917	11,060,581
1918	13,093,188
1919	13,145,727
1920	11,133,819
1921	7,990,932
1922	7,285,124
1923	7,090,260
1924	10,015,269
1925	9,525,753
1926	6,084,079
1927	6,511,929
1928	4,478,566

The above data are expressed graphically in figure 27. In 1916 the rivers produced an amount about equal to that of the ocean, in 1917 a decided gain appeared in favor of the sea, while in 1918 the river catch was considerably the larger. From 1919 to the present, the ocean catch has remained larger and also increased in relative importance.

Fishermen and others, who have had opportunity to observe king salmon at sea, state that they move in schools. One frequently hears the sea fishermen speak of "finding the school, " "striking the school, " *etc.* Salmon frequently, if not always, enter the river in schools, and the school may remain in compact formation for a time while in the estuary. An observation of the catch will occasionally demonstrate this. For example, in 1922 on the evening of August 23, the Klamath River fishermen, unaware that anything unusual was about to occur laid out their nets in the customary way. The nets which were spread below Windy Point were almost at once clogged with enmeshed fish, and so many were captured in such a brief time, that a lookout, fearing that the cannery would be overtaxed blew the recall whistle. Upon assembly of the boats it was found that 4406 fish had been taken, and that practically all of them were from a small area of the river between Windy Point and Pecheco Rock. Fishermen who laid their nets elsewhere caught very few fish or none at all. Here it was apparent that a large and compact school had been intercepted.

A sample of 69 fish taken at random from the catch gave 61 examples with the ocean type of nucleus, 26 of which were in the third year, 33 in the fourth year and 2 in the fifth. Of the stream type, 3 were four-year fish, while 4 were five and 1 six. Of 200 specimens which were examined for sex, 66 were males and 134 females. It appears then that the school was made up of a rather heterogeneous assemblage, remarkable perhaps for the unusual number of three-year fish. Of these, 14 were females with the ocean type of nucleus.

Sometime ago an observation was made in connection with a marking experiment, which appears to indicate that certain fishes may remain for a considerable time, if not throughout their entire life, in the same

school.[18] The so-called homing instinct of king salmon was understudy and a number of marked fish were turned loose in Klamath River at Fall Creek. When some of these fish returned as grilse in the third year it was apparent that the scales of each one bore a peculiar growth mark in the region representing the period just preceding the winter check. (See C and *D* in fig. 35. This mark, an anatomical peculiarity was unusual and very distinct. From experience gained in the examination of many such scales it was assumed that *D* represented the winter check in the growth of the fish. Abundant material from Monterey Bay demonstrates that this check or slowing down in the normal growth of the fish occurs in the winter or early spring, but not in all individuals at the same time. This winter check is a normal anatomical feature of practically all king salmon scales. The check C which appears within the other occurred at a previous time and may be spoken of as a secondary check. It represents a period in which the rapid growth of the fish was suddenly interrupted for a time, after which growth was resumed only to be again interrupted by the usual period of winter quiescence. This same secondary check appeared in the scales of marked fish of the same experiment, which were taken in the following years.

If one accepts the hypothesis that the growth of the individual is reflected by the growth of the scale, and that the growth is influenced by environment, whatever that may be, the assumption follows that all of these fish must have been in contact with the same environmental conditions for at least a short time during the second year of growth. It suggests that associations formed in the stream continued through the second year at sea, the fish remaining together, possibly in the same large school.

When the marked fish to the number of 25,000 were liberated in Klamath River, approximately 250,000 yearlings with the same life history except that they bore no distinctive fin marks, were set free with them. If any number of these remained together at sea it was to be expected that some of them would bear scales like those of the marked fish. Such was the case, as was found in the returned grilse and also in older fish. (See C and *D* in Fig. 35.) It was thought that unmarked individuals might be found at sea associated with the others and that they might be recognized by scale structure. Accordingly, when marked fish were discovered in a sea catch near Eureka, scales were taken from all fish in the same boat. A search among the scales of 155 individuals so taken from several boats revelead 6 which the writer is satisfied may be regarded as fishes of the 1919 liberation although they bore no fin marks. A scale of one of these is illustrated. (Figs. 36 and 37.)

Here then is evidence, meager though it may be, that salmon may remain closely associated, individuals possibly schooling together while in the ocean, and for a considerable period of their life.

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18 Snyder, J. O. The return of marked king salmon grilse. California Fish and Game, vol. 8, no. 2, pp. 102-107, 1922.

Snyder, J. O. A second report on the return of king salmon marked in 1919, in River. California Fish and Game, vol. 9, no. 1, pp. 1-11, 1923.

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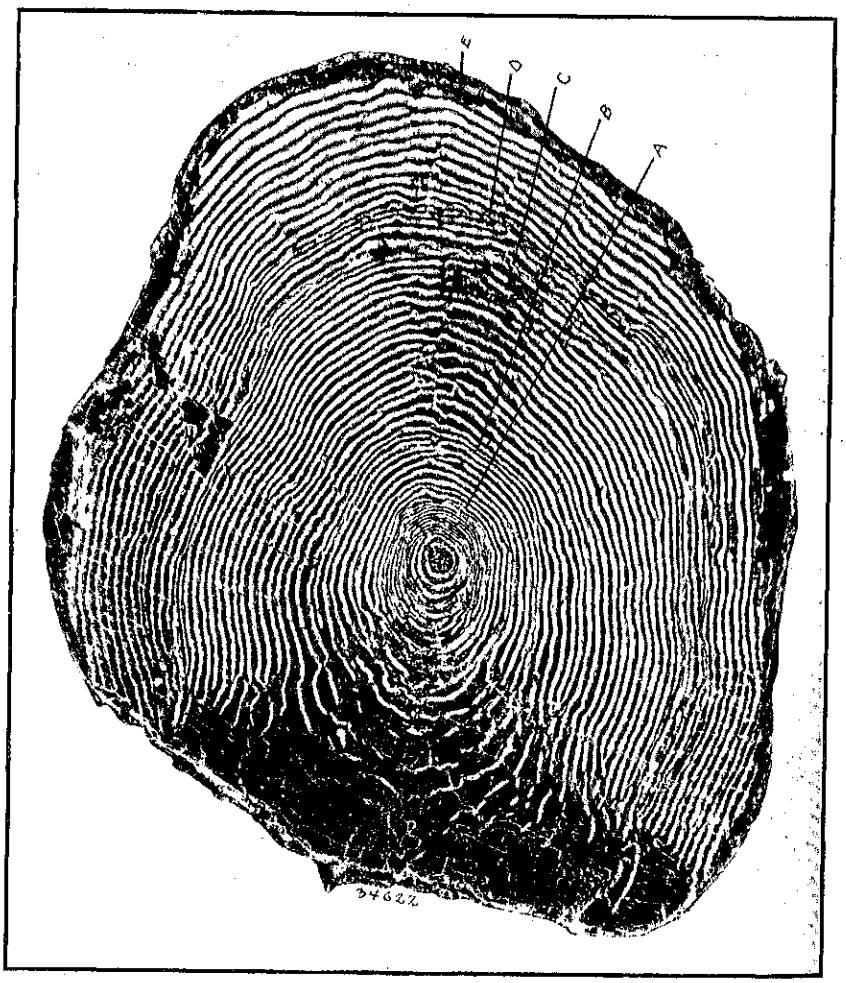

FIG. 35. Photomicrograph of a scale of a marked king salmon grilse which returned to Klamathon racks in 1921.

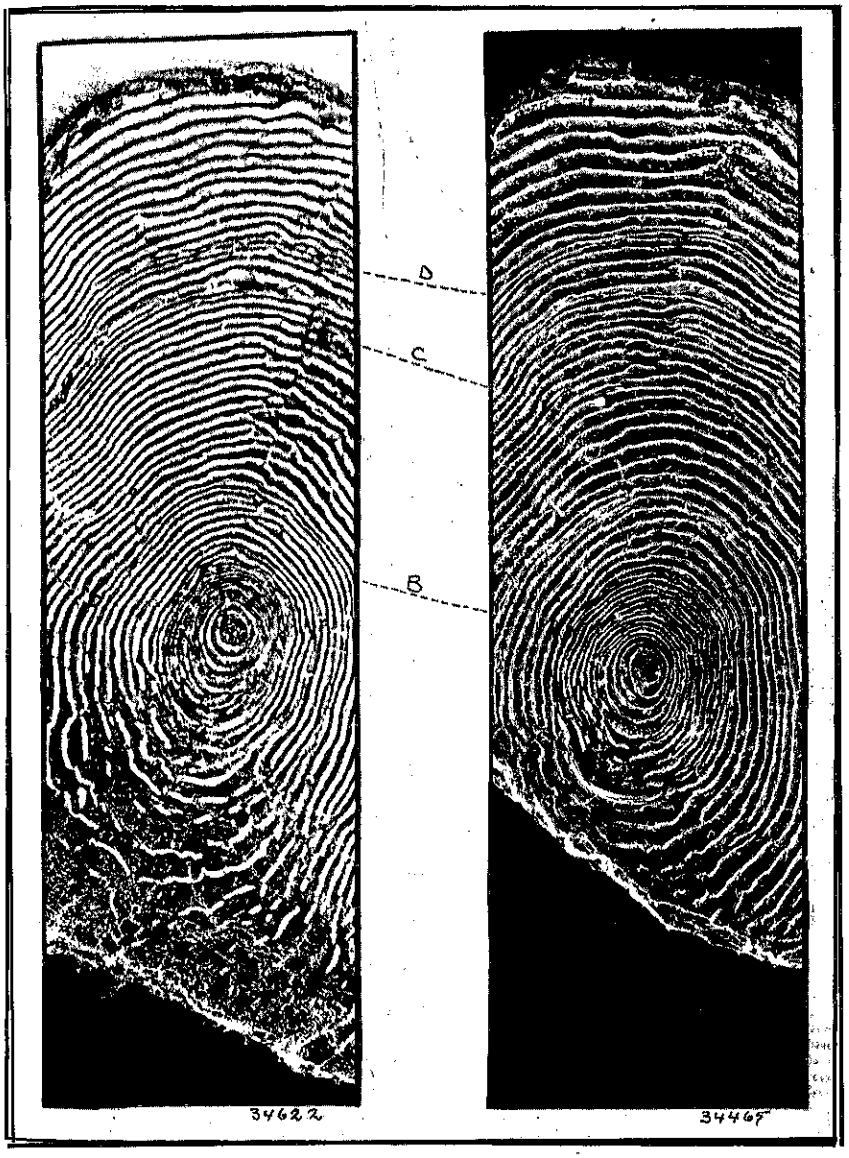

FIG. 36. Scales of marked (34622) and unmarked (34465) king salmon grilse which returned to Klamathon racks in 1921.

FIG. 37. Photomicrograph of a scale of a salmon taken off Cape Mendocino, August 5, 1922, which shows convincing structural resemblance to scales of fish of the 1919 planting.

Ocean trolling[19] for salmon in this state originated in Monterey Bay where a fleet of small sailing craft grew in numbers, only to be replaced by larger, swifter, and more capable power boats. The explorations of the more venturesome operators of these boats extended the fishing area somewhat farther at sea, and also to the northward along the coast until now their activities reach the northern boundary of the state.

Success in the relatively shallow waters in the vicinity of Point Reyes led to fishing beyond Point Arena where a safe harbor was found in the estuary of Noyo River near Fort Bragg. About 1916, salmon from this point began to enter the market in quantity, and in two years a cannery and several mild cure plants were assisting in the care of a rapidly growing catch which reached its maximum in 1920 (fig. 29) and then began to decline. The Noyo industry extended to Shelter Cove where anchored barges took care of a part of the catch. A better picture of the activities in Noyo Estuary than appears from an examination of the statistics of the catch is presented by photographs and a sketch map made by the writer in 1920. The photographs (figs. 38, 39, and 40) were taken from points indicated on the map (fig. 41).

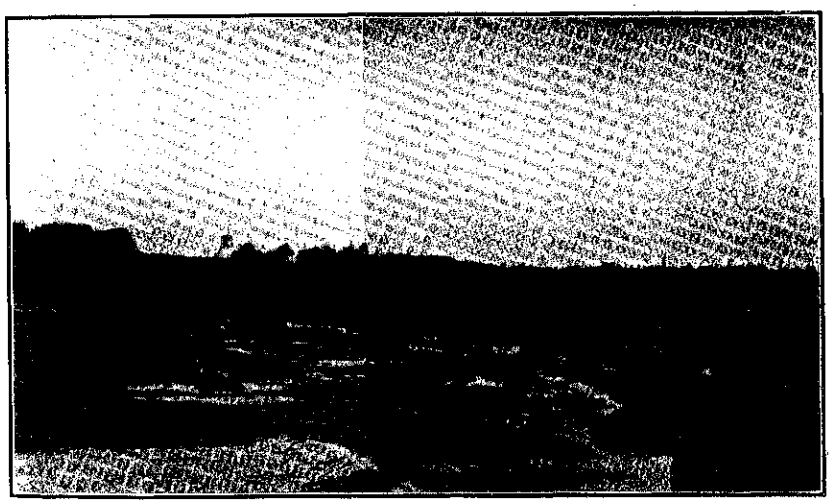

FIG. 38. View of Noyo Bay, from point marked *A* on map, figure 41.

As in Monterey Bay, decline began in the Fort Bragg region, and its progress was followed by a rise in the industry along the coast near Eureka where the greatest harvest was taken in 1925. Here the fishery has already been greatly overtaxed and in spite of increased effort the results rapidly diminish.

An inquiry as to whether ocean caught fish weigh less or more than those of equal length which are taken in the rivers is of interest, as some observers contend that the stream caught fish are heavier and more plump. An entirely satisfactory answer is not forthcoming however as will be seen. A direct comparison is not possible because the salmon

[19] An excellent account of the methods of ocean trolling is given by W. L. Scofield (Gear Used for Salmon Trolling in California in 1920. California Fish and Game, vol. 7, no. 1, pp. 22-38, 1921).

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Fig. 38. View of Noyo Bay, from point marked *A* on map, figure 41.

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FIG. 39. Salmon boats in Noyo River, from point *B*, figure 41.

FIG. 40. Salmon boats Noyo River as seen from point *E*, figure 41.

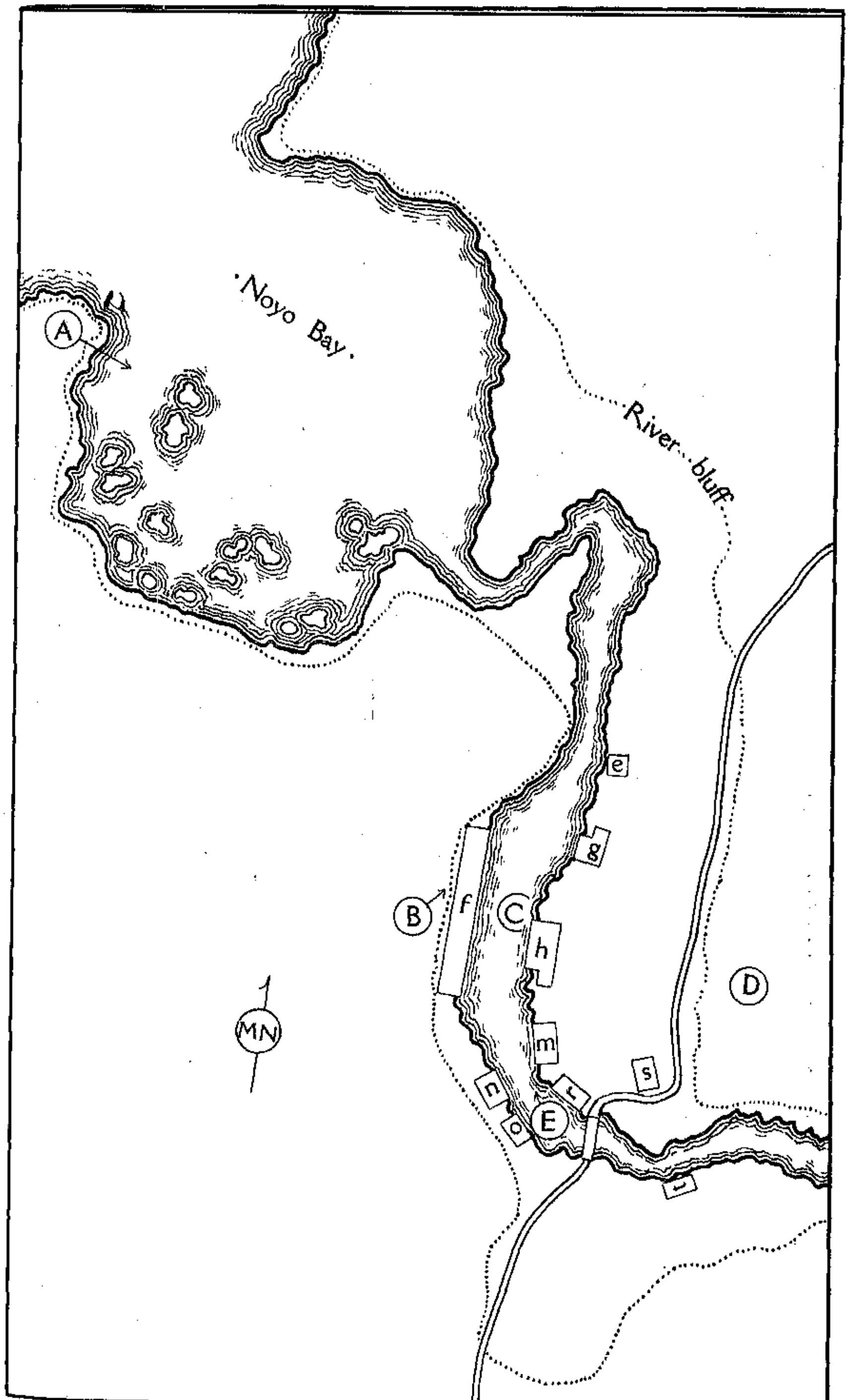

FIG. 41. Map of Noyo Bay near Fort Bragg showing the salmon fishery as of June 21, 1920; *e*, Repair shop; *f*, Noyo Fishermen's Association; *g*, Western California Fish Co.; *h*, Small and Urie; *m*, Columbia and Northern Fishing and Packing Co.; *n*, Independent Fish Co.; *o*, San Francisco

of an ocean catch are probably from a composite mass, in so far as their stream origin is concerned and no means has as yet been discovered which will enable one to identify without question any 'ocean caught California salmon with the stream of its nativity.20

It has been shown that slight differences are to be found between the fish of Klamath and Sacramento rivers, but nothing of the kind has been determined for the inhabitants of other coastal streams. It is known from experimental evidence that fish taken in Monterey Bay may be from any salmon producing stream in the State. Possibly some Monterey Bay fish may come from rivers which enter the ocean north of the State.

However, numbers of ocean caught fish may be compared with numbers from the streams, and such a comparison is here attempted. Length-weight relations have been computed and it appears that when fish of marine origin are compared with those from the rivers, the later are slightly heavier. Tables 54 and 55, illustrating the length-weight relation of numerous salmon taken in Monterey Bay and off Fort Bragg, are here given. These may be compared with similar tables computed from river fish and presented in tables 2 and 3.

TABLE 54

Length-Weight Relation of Fish Taken in Monterey Bay. 1920

Length of fish in cm.	Average weight 20 males recorded in pounds and tenths	Average weight 20 female recorded in pounds and tenths	Extreme weights of males recorded in pounds and ounces	Extreme weights of females recorded in pounds and
46	2.7	2.5	2- 0 to 3- 0	2- 4 to 2-12
48	2.9	2.9	2- 8 to 3- 8	2-12 to 3- 0
50	3.5	3.2	3- 0 to 3-12	2-12 to 3- 8
52	3.8	3.7	3- 6 to 4- 4	3- 4 to 4- 0
54	4.2	3.9	3- 8 to 4- 8	3- 4 to 4- 4
56	4.9	4.3	4- 8 to 5- 4	3- 8 to 4-12
58	5.4	5.2	5- 0 to 6- 4	4- 8 to 8-12
60	5.9	5.5	5- 4 to 6-8	4-12 to 6- 0
62	6.5	6.1	5- 8 to 7- 0	5- 8 to 7- 0
64	7.1	7.0	6- 8 to 7- 8	5-12 to 8-12
66	7.6	7.6	6-12 to 8- 8	7- 4 to 8- 8
68	8.4	8.3	8- 0 to 9-12	6- 8 to 10- 0
70	8.9	9.4	9- 0 to 10- 8	8- 4 to 10- 8
72	10.0	9.8	9- 4 to 10-12	9- 0 to 12- 0
74	11.2	11.4	Q-12 to 13- 0	10-12 to 14- 8
76	11.8	12.0	9- 0 to 13- 0	11- 8 to 14- 8
78	12.7	12.5	12- 4 to 15- 0	11-12 to 14- 4
80	13.9	13.6	Q-12 to 16- 4	12- 8 to 17-12
82	14.9	14.7	13- 8 to 18- 0	11- 2 to 16- 4
84	15.4	16.0	14- 0 to 18- 4	14- 0 to 19- 4
86	16.5	16.9	14- 8 to 19-12	15- 0 to 19- 4
88	17.5	18.5	16- 4 to 19- 4	16- 0 to 24- 8
90	19.1	19.8	18- 8 to 23- 4	17- 8 to 24-12
92	20.4	20.9	18- 8 to 25- 4	19- 0 to 23- 4
94	22.4	23.0	20- 8 to 26- 8	22- 8 to 26- 8
96	23.8	24.3	21- 0 to 27-12	21-12 to 26- 8
98	24.7	27.5	21- 4 to 26-12	25- 8 to 32- 0
100	28.2	28.1	27- 0 to 31- 8	26- 4 to 31- 8
102	29.9	32.0	25- 4 to 34- 0	29-12 to 33- 8
104	32.8	33.5	29- 8 to 30- 0	30- 0 to 33-12
106	33.4	35.0	27-12 to 36- 4	34- 8 to 35- 8
108	34.4	36.0	25- 4 to 42- 4	36- 0 to 37- 0
110	36.1	37 5	35-12 to 44- 4	37- 0 to 38- 0

20 Notable success has been attained in Washington, British America and Alaska in tagging salmon caught at sea, and many of these have been traced to their native streams. Similar work attempted in California resulted in near failure,

TABLE 55

Length-Weight Relation of Fish Taken at Sea off Fort Bragg, 1819

Length of fish in cm.	Average weight 20 males recorded in pounds and tenths	Average weight 20 females recorded in pounds and tenths	Extreme weights males recorded in pounds and ounces	Extreme weights females recorded in pounds and ounces
58	5.0	4.5	3- 0 to 7- 0	4- 0 to 4-12
60	6.0	5.0	5- 8 to 6-10	5- 0 to 5-10
62	6.4	6.6	6- 0 to 7- 8	6- 0 to 7- 8
64	6.9	6.8	6- 0 to 8- 0	6- 2 to 7- 8
66	8.0	7.9	7-12 to 8- 8	6-12 to 8- 0
68	8.6	8.0	8- 0 to 9- 8	7- 4 to 9- 0
70	9.4	9.5	8- 4 to 10-12	9- 0 to 12- 8
72	10.5	10.2	9- 0 to 13: 0	9- 4 to 11-12
74	11.7	10.7	10- 0 to 13- 2	9- 8 to 13- 0
76	12.2	11.1	10- 8 to 13-12	9- 4 to 13- 2
78	13.1	12.9	11- 4 to 15- 8	9- 5 to 15- 4
80	14.0	13.6	12- 8 to 15- 0	12- 0 to 20- 0
82	15.5	15.4	13- 4 to 16-12	13- 4 to 20-12
84	16.0	16.3	14- 0 to 17- 8	14-12 to 18- 8
86	17.3	17.8	15-12 to 21- 0	16- 0 to 24- 8
88	18.3	18.2	16- 0 to 25- 0	16- 0 to 20- 0
90	19.8	19.4	18- 4 to 24- 0	18-10 to 23- 8
92	22.0	20.8	19- 0 to 28- 8	20- 2 to 26- 8
94	23.2	22.8	20- 8 to 26- 0	19- 2 to 27- 0
96	24.4	24.1	14 8 to 27- 6	20- 0 to 27- 2
98	25.7	26.2	22- 8 to 28- 8	24- 0 to 28- 4
100	28.4	28.2	24- 4 to 36- 0	20- 6 to 31- 8
102	30.7	30.0	26- 8 to 35- 0	26- 4 to 33- 8
104	32.0	33.0	28- 4 to 34-12	28- 8 to 38- 8
106	33.0	35:0	22- 0 to 37- 0	31- 4 to 38- 8
108	35.2	----------	28- 8 to 40: 8	----------
110	37.3	----------	36- 8 to 40- 8	----------
112	39.3	----------	35- 0 to 47- 0	----------

Attention was called to the composite character of the ocean catch. This is well shown when measurements of large numbers of fish of a given age from different streams and from the ocean are brought together. The graph, figure 22, was constructed from a table of measurements, (table 1) consisting of 7441 individuals examined, all of the four-year class; 2730 were from Monterey Bay, 798 from Sacramento River and 3913 from the Klamath. It will be seen that the average length of Klamath fish is near 80 cm., that of Sacramento fish about 95, while the ocean fish represented by the Monterey Bay curve, fall somewhere between.

Conditions permitted of rather extended observations relating to sex occurence in the catch at Monterey during 1919, 1920, and 1921, when a total of 9539 fish was examined, 51.7 per cent of which were males. Of 2371 fish observed in 1919, 1288 or 54.3 per cent were males ; of 3501 in 1920, 1765 or 50.4 per cent were males ; and of 3667 in 1921, 1877 or 51.2 per cent were males. More detailed data are set forth in tables 56-58.

It appears from this that sea fishing does not discriminate in any great measure against either sex. It is evident from an inspection of the tables that a larger proportion of males comes to the market in the later part of March and the early half of April than later in the season. This is graphically shown in figure 42 which is intended to represent the seasonal distribution by weekly periods.

TABLE 56

Sex Representation, Monterey, 1919, Daily and Weekly Periods

Dates	Males		Females		Males		Females	
	Number	Average length in cm.	Number	Average length in cm.	Number	Per cent	Number	Per cent
April 23	36	78.7	34	72.6				
April 24	51	80.0	38	75.4	132	54	112	46
April 25	45	80.0	40	73.7				
April 29	28	76.9	32	77.3				
April 30	45	83.0	33	76.3	100	54	86	46
May 1	27	81.6	21	78.0				
May 4	25	79.3	11	77.3				
May 5	16	72.0	15	66.7				
May 6	17	77.0	15	63.4	153	60	102	40
May 7	41	85.8	25	74.5				
May 8	24	86.4	15	78.0				
May 10	30	78.9	20	70.7				
May 11	10	81.5	10	67.5				
May 12	14	85.5	11	81.5				
May 13	26	76.6	24	77.7	155	52	145	48
May 15	22	78.7	18	77.0				
May 16	71	84.2	74	80.9				
May 17	12	84.8	8	81.0				
May 18	32	78.0	28	83.1				
May 19	27	74.6	23	74.3				
May 21	22	80.0	18	78.5	210	56	172	44
May 22	30	89.0	24	79.9				
May 23	57	86.1	37	77.1				
May 24	48	89.6	42	81.7				
May 26	44	90.9	26	85.2				
May 27	36	80.5	29	79.1	160	62	98	38
May 28	40	92.2	29	83.1				
May 29	31	91.7	14	85.5				
June 4	11	77.3	7	82.3				
June 5	9	89.6	11	87.7	84	62	52	38
June 6	42	90.8	23	84.3				
June 7	22	89.3	11	86.0				
June 8	17	81.6	7	69.5				
June 9	15	74.8	15	70.5	70	60	46	40
June 12	16	86.8	7	78.7				
June 13	22	81.3	17	75.9				
June 16	10	74.3	15	66.1				
June 17	24	67.4	25	76.5				
June 19	12	67.9	23	75.2	64	38	105	62
June 20	10	73.8	10	72.5				
June 21	8	73.0	32	73.5				
June 22	25	63.1	30	68.5				
June 23	40	71.4	40	75.1				
June 26	7	80.7	13	72.0	100	44	125	56
June 27	23	71.4	34	75.3				
June 28	5	78.2	8	84.2				
July 11	10	90.5	10	87.0	10	50	10	50
July 21	10	69.2	9	73.5				
July 22	21	62.1	15	64.0	37	59	26	41
July 23	6	72.5	5	86.2				
July 26	7	78.0	4	90.2	7	64	4	36
Totals					1,289	54	1,083	46

TABLE 57

Sex Representation, Monterey, 1920, Daily and Weekly Periods

Dates	Males		Females		Males		Females	
	Number	Average length in cm.	Number	Average length in cm.	lumber	'er cent	lumber	'er cent
January 29	3	71.3	2	71.0				
January 30	3	68.3	2	68.0	6	60	4	40
February 21	4	77.2	4	71.0	4	50	4	50
February 23	10	74 2	18	73.3				
February 25	19	72.6	21	73.3	57	40	86	60
February 26	22	73.1	38	70.7				
February 27	6	71.8	9	74.2				
March 3	1	75.0	3	74.5	1	25	3	75
March 8	3	74.3	1	83.5				
March 9	0		1	75.0	85	47	94	53
March 11	26	77.1	43	75.3				
March 12	56	80.2	49	70.2				
March 17	10	78.3	20	72.8				
March 18	31	72 9	54	72.8	105	37	175	63
March 19	36	70 9	64	71.1				
March 20	28	70.4	37	69.5				
March 21	10	71.7	29	72.2	23	29	56	71
March 23	13	71.7	27	70.5				
April 5	48	79 3	52	78.3				
April 6	36	81.2	44	75.6				
April 7	22	81.4	61	74.6	157	42	221	58
April 8	30	85 8	40	76 4				
April 10	21	90.7	24	78 7				
April 12	81	91.9	49	86.9				
April 13	71	92.1	39	87.8	235	64	135	36
April 14	35	91.0	25	89.5				
April 16	48	94.3	22	88.1				
April 21	27	89 3	33	x5.7				
April 22	31	83.9	39	81.3	110	47	125	53
April 23	30	76.4	35	78.5				
April 24	22	84.4	18	74.4				
April 26	60	90.2	44	82.8	207	62	127	38
April 27	51	95.6	29	82 4				
April 28	96	95.3	54	88.7				
May 8	57	97.2	38	90.7	57	60	38	40
May 10	50	90.7	40	86 8				
May 11	69	95.2	56	84.6				
May 13	63	94.1	41	78.9	214	58	155	42
May 14	32	98.6	18	89.2				
May 17	27	89.5	38	85.7	59	44	74	56
May 18	32	87.5	36	83.2				
June 2	32	83 6	52	79.0				
June 3	76	66.2	68	72.0	134	45	162	55
June 4	26	81.9	42	83.3				
June 14	62	7o.c	43	80.4				
June 15	32	73 9	24	79.5	188	57	143	43
June 16	38	80.3	32	82.0				
June 17	56	70 3	44	80.1				
June 21	42	60 4	38	72.7				
June 22	13	75.2	16	85.6				
June 23	26	83.6	38	79.0	123	48	134	52
June 24	5	66.6	5	74.0				
June 25	20	70.2	19	80.3				
June 26	17	70.8	18	74.4				
Totals					1,765	51	1,736	49

TABLE 58

Sex Representation, Monterey, 1921, Daily and Weekly Periods

Dates	Males		Females		Males		Females	
	Number	Average length in cm.	Number	Average length in cm.	Number	Per cent	Number	Per cent
January 21	1	72.0	0	0	6	50	6	50
February 2	2	76.0	3	65.3				
February 4	3	71.0	2	69.5				
February 7	4	74.0	6	69.5				
February 10	51	68.9	58	67.5	86	45	103	55
February 11	31	66.9	39	65.5				
March 1	6	72.8	1	82.0				
March 2	5	66.8	5	74.4	52	52	48	48
March 3	41	70.8	42	68.5				
March 11	1	96.0	0	0	23	68	11	32
March 12	22	69.3	11	68.8				
March 13	1	75.0	0	0				
March 14	19	74.3	41	74.6				
March 15	21	73.8	40	71.0	111	35	204	65
March 16	21	71.2	33	70.6				
March 17	22	69.9	32	69.9				
March 18	27	70.3	58	70.3				
March 21	27	71.6	43	72.4				
March 22	12	71.5	8	73.3				
March 23	12	82.9	8	79.2	108	47	120	53
March 24	35	77.1	34	73.6				
March 25	12	80.4	16	73.8				
March 26	10	80.6	11	79.7				
March 28	32	73.6	27	73.0				
March 29	20	87.8	23	81.6				
March 30	30	81.1	20	79.7	140	56	112	44
March 31	21	77.7	24	75.5				
April 1	33	95.0	11	86.5				
April 2	4	92.7	7	89.1				
April 5	1	91.0	2	101.0				
April 6	13	96.9	2	88.0				
April 7	3	102.0	1	85.0	27	80	7	20
April 8	1	100.0	0	0				
April 9	9	77.4	2	68.5				
April 10	2	85.5	3	62.7				
April 11	15	93.8	9	89.8				
April 12	17	98.7	3	91.0	39	65	21	35
April 13	0	0	2	95.0				
April 15	5	101.8	4	94.2				
April 19	5	97.2	3	81.3				
April 20	1	75.0	0	0	6	60	4	40
April 21	0	0	1	91.0				
April 25	6	101.2	4	90.5				
April 26	46	95.6	18	89.8				
April 27	30	98.1	20	89.9	237	58	172	42
April 28	70	95.3	60	86.5				
April 29	40	88.7	45	84.8				
April 30	45	89.8	25	82.4				
May 2	19	90.7	35	82.4				
May 3	30	91.6	24	87.6	93	55	75	45
May 4	16	99.4	4	82.2				
May 5	20	100.7	3	95.0				
May 7	8	102.3	9	88.4				
May 9	57	97.2	24	91.0				
May 10	32	97.4	13	94.2				
May 11	30	98.1	14	94.0				
May 12	53	95.8	37	89.6	272	60	179	40
May 13	64	94.5	55	87.6				
May 14	36	86.7	36	86.4				

TABLE No. 58—Continued

Sex Representation, Monterey, 1921, Daily and Weekly Periods

Dates	Males		Females		Males		Females	
	Number	Average length in cm.	Number	Average length in cm.	Number	Per cent	Number	Per cent
May 16	9	96.9	10	82.5				
May 17	3	94.7	1	85.0				
May 18	23	96.6	12	86.4	200	56	159	44
May 19	83	88.1	57	82.7				
May 20	65	90.1	60	82.9				
May 21	17	94.6	19	88.8				
May 23	22	96.8	10	86.4				
May 24	21	94.2	31	85.0				
May 25	40	92.1	32	83.5				
May 26	30	94.5	5	79.6	142	54	123	46
May 27	17	89.7	22	81.7				
May 28	12	94.5	14	93.0				
May 30	2	89.5	6	79.7				
May 31	15	83.1	27	82.6	56	43	73	57
June 1	18	76.7	18	78.8				
June 4	21	85.3	22	80.9				
June 6	26	91.0	20	84.8				
June 7	26	90.6	23	87.0				
June 8	12	88.9	22	81.5	116	45	140	55
June 9	31	81.9	32	77.1				
June 10	21	88.6	43	80.2				
June 13	13	85.4	29	72.9				
June 14	2	79.5	2	76.0				
June 15	2	63.0	0	0	66	41	96	59
June 17	13	79.3	23	76.3				
June 18	36	74.0	42	75.2				
June 21	6	70.8	12	79.3				
June 22	28	82.4	40	77.9				
June 23	28	84.5	44	78.9	93	42	128	58
June 24	17	82.3	12	81.2				
June 25	14	64.8	20	72.2				
June 27	4	79.8	9	71.3	4	30	9	49
Totals					1,877	51	1,790	49

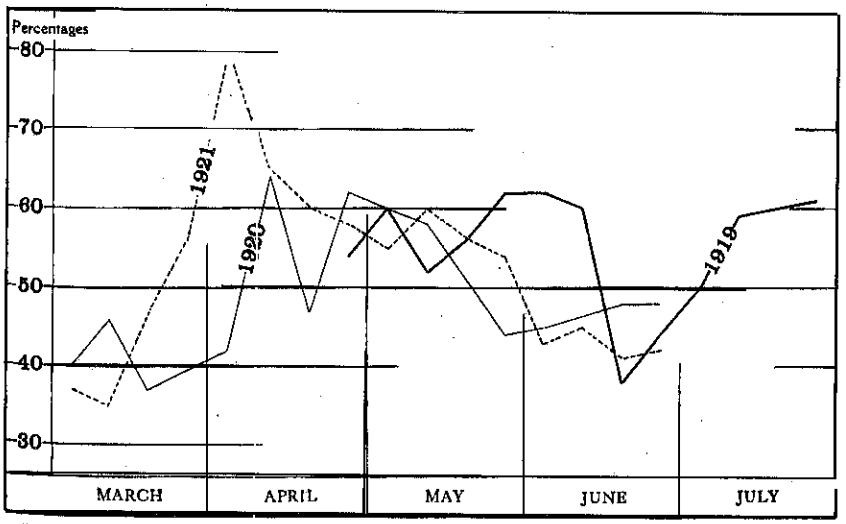

FIG. 42. Occurrence of male fish in the catch at Monterey for three consecutive years over weekly periods, and expressed in percentages.

AGE CHARACTERISTICS OF THE OCEAN CATCH

The ocean catch is made up of fish which range in age from two to six years. Although details are given in tables 61–71, a brief summary in percentages for fish examined at Monterey is offered here.

TABLE 59

Ocean Catch at Monterey

Year	Percentage of fish in each year class					Size of sample	Date of sample
	2	3	4	5	6		
1919	7	33	43	16	1	1,742	April 23 to July 26
1920	7	30	37	24	2	2,171	January 30 to June 26
1921	0.6	30	43	24	2	2,758	February 2 to June 20

As the number of fish examined at Monterey was large, and as every opportunity for obtaining a fair sample was presented, it is reasonably safe to assume that the age representation here is about normal, and any marked deviation from this assumed normal which may occur at a future time will be regarded with interest. Observers have not been able to obtain representative samples during an extended period of time at either Fort Bragg or Eureka, because of selection which often occurred before access to the fish was obtained.

The ocean catch when compared with that of the river is relatively rich in two- and three-year fish as will appear from a comparison of the following table with the previous one.

TABLE 60

Klamath River Catch

Year	Percentage of fish in each year class					Size of sample
	2	3	4	5	6	
1919	0	16	63	20	1	2,179
1920	0	11	78	10	0.4	1,819
1923	0	16	70	13	1	1,593

In the Sacramento River catch the proportion of three-year fish is somewhat greater than in that of the Klamath, the four-year fish are fewer in number, while the five- and six-year individuals are more numerous. In this connection it should be noted that the Sacramento River samples are numerically smaller than those from the Klamath, and that their time of capture extends over a shorter period.

For purposes of comparison, and as a possible check against conditions which might appear in the future, it was found necessary to make age analyses of the catches at Monterey Bay and elsewhere along the coast. At the receiving houses in Monterey the fish arrived in undisturbed boat-loads, just as caught, and it was possible at all times to secure data from a fair sample of the catch, just as at the mouth of the Klamath. At Noyo Estuary near Fort Bragg, at Shelter Cove, and

at Eureka selection was so often made from the boats before the observer came to them, that large samples covering an extended period of time could not be secured.

The samples taken at Monterey may be considered as fairly representative of the ocean catches of 1919, 1920 and 1923, and as a total they probably represent the normal proportions of the various age and other group classes of the period.

There is no knowing how these would have compared with the past, and one looks with interest to the future. Tables which record the results of these analyses are here presented.

TABLE 61

Monterey Bay, 1919

Year class	Number of examples of a given age taken during weekly periods					
	2	3	4	5	6	Totals
April 20–26	5	75	95	24	0	199
April 27–May 3	5	51	69	18	1	144
May 4–10	18	82	77	28	1	206
May 11–17	15	57	87	48	1	208
May 18–24	16	67	120	46	2	251
May 25–31	3	23	80	43	3	152
June 1– 7	1	9	59	30	3	102
June 8–14	7	27	28	11	1	74
June 15–21	13	61	36	6	0	116
June 22–28	15	82	73	25	5	200
July 6–12	3	7	6			16
July 20–26	20	24	13	6	1	64
July 27–August 2	2	1	5	1	1	10
Totals	123	566	748	286	19	1,742

TABLE 62

Proportion of Two and Three Year Fish in the Catch, Monterey Bay, 1919

	Year class			Number individuals examined	Approximate per cent of two and three year fish
	2	3	2+3		
April 20–16	5	75	80	199	40.0
April 27–May 3	5	51	56	144	39.0
May 4–10	18	82	100	206	48.5
May 11–17	15	57	72	208	34.6
May 18–24	16	67	83	251	33.0
May 25–31	3	23	26	152	17.0
June 1– 7	1	9	10	102	9.8
June 8–14	7	27	34	74	46.0
June 15–21	13	61	74	116	64.0
June 22–28	15	82	97	200	48.5
July 6–12	3	7	10	16	62.5
July 20–26	20	24	44	64	68.5
July 27–August 2	2	1	3	10	3.0
Totals	123	566	689	1,742	39.6

TABLE 63

MONTEREY BAY 1919

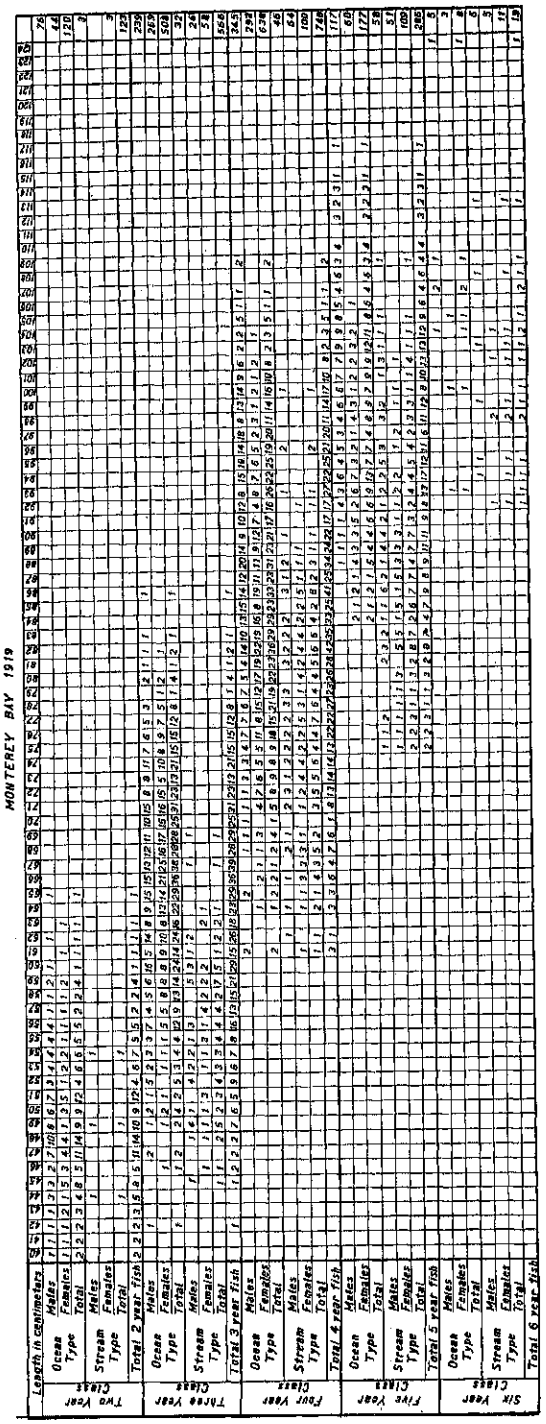

TABLE 64

Proportion of Two and Three Year Fish in the Catch, Monterey Bay, 1919

Year	Year class			Number individuals examined	Approximate per cent of wo and three year fish
	2	3	2+3		
January 25-31		6	6	7	
February 15-21		6	6	9	
February 22-28	1	81	82	120	68.3
March 1-6		3	3	4	
March 7-13	1	67	68	132	51.5
March 14-20	5	98	103	164	62.8
March 21-27		35	35	53	66 0
April 4-10	2	94	96	232	41 4
April 11-17	3	5	8	195	4.0
April 18-24	1	47	48	181	26.5
April 25-May 1	2	14	16	151	10 6
May 2-8		2	2	58	3 5
May 9-15	2	32	34	204	16 6
May 16-22		21	21	102	20 6
May 30-June 5	26	27	53	186	44 6
June 13-19	63	28	91	221	45.7
June 20-26	41	45	86	152	56.5
Totals	147	641	788	2,171	26.3

ARTIFICIAL PROPAGATION IN KLAMATH RIVER

Although some experimental attempts at artificial propagation were early made near the mouth of Klamath River, and a hatchery was later established on Trinity River, active work of this sort dates from 1896, when under the direction of the United States Commission, some fry resulting from eggs taken at Battle Creek, a tributary of the Sacramento were introduced into the upper Klamath. Just why it was deemed necessary to import fish to the Klamath, or why a stream where depletion was already apparent should be further robbed does not appear. However, large numbers of Sacramento eggs were again taken in 1907, 1911, 1913, and later, something like 5,000,000 in all according to hatchery methods of enumeration, and the resulting fry liberated in the Klamath. More detailed information appears in table 72 and a digest of further hatchery operations in table 73. Since 1917 no salmon from other streams have been brought to the Klamath excepting a small number for experimental purposes. Of late years large numbers of Klamath eggs have been sent to the Mt. Shasta hatchery from where the resulting fry have been liberated in the Sacramento.

Upon the closure of the upper reaches of the Klamath by the great dam at Copco, a hatchery was established at Fall Creek (Fig. 26) and a particularly efficient trap, placed in the river near Hornbrook. This trap is sometimes spoken of as the "Klamathon Racks." Its function is to stop all migrating salmon and retain them until they are ripe enough for artificial spawning. Unless some accident occurs which would destroy the racks at a critical time, or our notion of the homing instinct of salmon is at fault, it is apparent that there is here an opportunity to demonstrate that artificial propagation may maintain the species, at least on a par with natural propagation elsewhere in the basin.

A census of all salmon entering the racks was begun in 1925 and has been continued with results as indicated in table 51. It will be seen

TABLE 66

MONTEREY BAY 1920

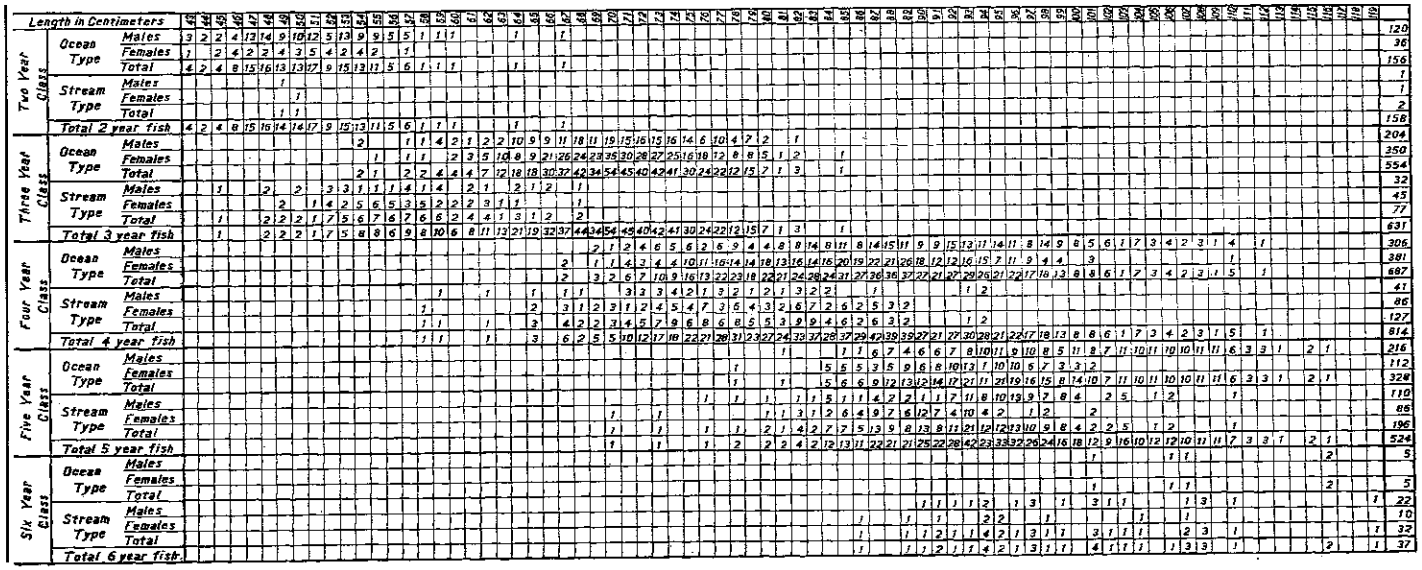

TABLE 66

Monterey, 1921

Year class	Number of examples of a given age taken during weekly periods					
	2	3	4	5	6	Totals
January 20–February 5		9	3			12
February 6–12	2	121	21	1		145
February 27–March 5	2	46	27	1		76
February 6–12		21	8	1		30
February 13–19	3	157	74	3	1	238
February 20–26		106	76	6		188
February 27–April 2		76	72	62	5	215
April 2–9		4	9	14	1	28
April 10–16		5	17	36	1	59
April 17–23			6	6	10	12
April 24–30		15	171	86	15	282
May 1–7		12	64	63		154
May 8–14		11	113	162	10	296
May 15–21		23	81	55	7	166
May 22–28		20	115	51	6	192
May 29–June 4	3	24	40	30	6	103
June 5–11	2	46	124	66	1	
June 12–18	3	54	67	7	2	132
June 19–25	1	68	80	19		179
June 26–July 2		1	5	1		7
Totals	16	819	1,182	670	71	2,758

TABLE 67

The Proportion of Two and Three Year Fish in the Catch, Monterey Bay, 1921

Periods	Year class			Number of individuals examined	Approximate per cent of two and three year fish
	2	3	2+3		
January 20–February 5		9	9	12	75.0
February 6–12	2	121	123	145	84.8
February 27–March 5	2	46	48	76	63.2
March 6–12		21	21	30	70.0
March 13–19	3	157	160	238	67.2
March 20–26		106	106	188	56.3
March 27–April 2			76	215	35.3
April 3–9		74	4	28	14.3
April 10–16		5	5	59	8.5
April 17–23				12	0.0
April 24–30		15	15	282	5.3
May 1–7		12	12	154	7.7
May 8–14		11	11	296	3.7
May 15–21		23	23	166	13.8
May 22–28		20	20	192	10.4
May 29–June 4	3	24	27	103	26.2
June 5–11	2	46	48	244	19.6
June 12–18	3	54	57	132	43.2
June 19–25	1	68	69	179	38.5
June 26–July 2		1	1	7	14.3
Totals	16	819	835	2,758	30.2

TABLE 68

MONTEREY BAY 1921

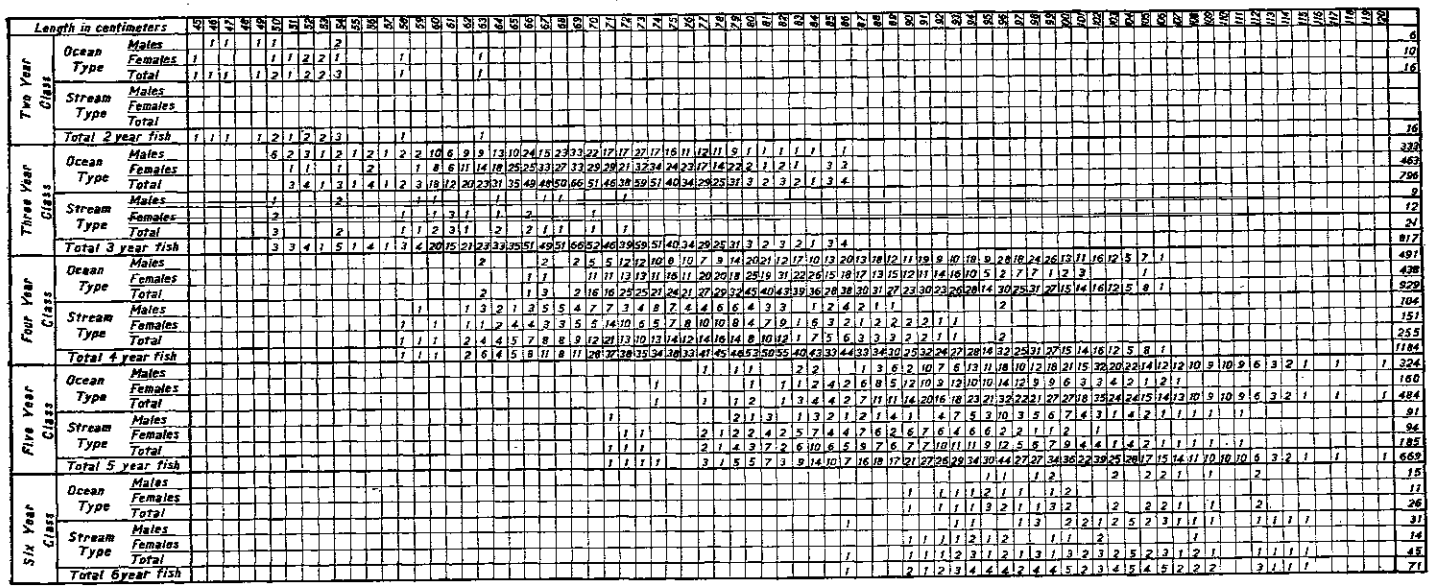

TABLE 69

Summary of Monterey Bay Age Classes

Year	2			3			4			5			6			Totals			Percentages		
Year—	1919	1920	1921	1919	1920	1921	1919	1920	1921	1919	1920	1921	1919	1920	1921	1919	1920	1921	1919	1920	1921
Males	79	121	6	271	236	342	391	347	696	175	326	416	11	27	46	927	1,057	1,405	53.2	48.8	51
Females	44	37	10	295	395	475	357	467	589	111	198	254	8	10	25	815	1,107	1,353	46.8	51.2	49
Ocean type	120	156	16	508	554	796	688	687	929	177	328	484	8	5	26	1,451	1,730	2,251	83.2	79.9	82
Stream type	3	2	0	58	77	21	110	127	255	109	196	186	11	32	45	291	411	507	16.8	20.1	18
Ocean type males	76	120	6	239	204	333	345	306	491	117	216	324	5	5	15	782	851	1,169	44.9	39.3	42
Ocean type females	44	36	10	269	350	463	293	381	438	60	112	160	3	6	11	669	879	1,082	38.4	40.7	39
Stream type males	3	1	0	32	32	9	46	41	104	58	110	92	6	22	31	145	206	236	8.3	9.5	9
Stream type females	0	1	0	26	45	12	64	86	151	51	86	94	5	10	14	146	228	211	8.4	10.5	10
Totals	123	158	16	666	631	811	748	814	1,184	286	524	670	19	37	71	1,472	2,164	2,758			
Percentages	7	7.3	.6	33	29.2	30	43	37.6	43	16	24.2	24	1	1.7	2						

TABLE 70

FORT BRAGG 1920

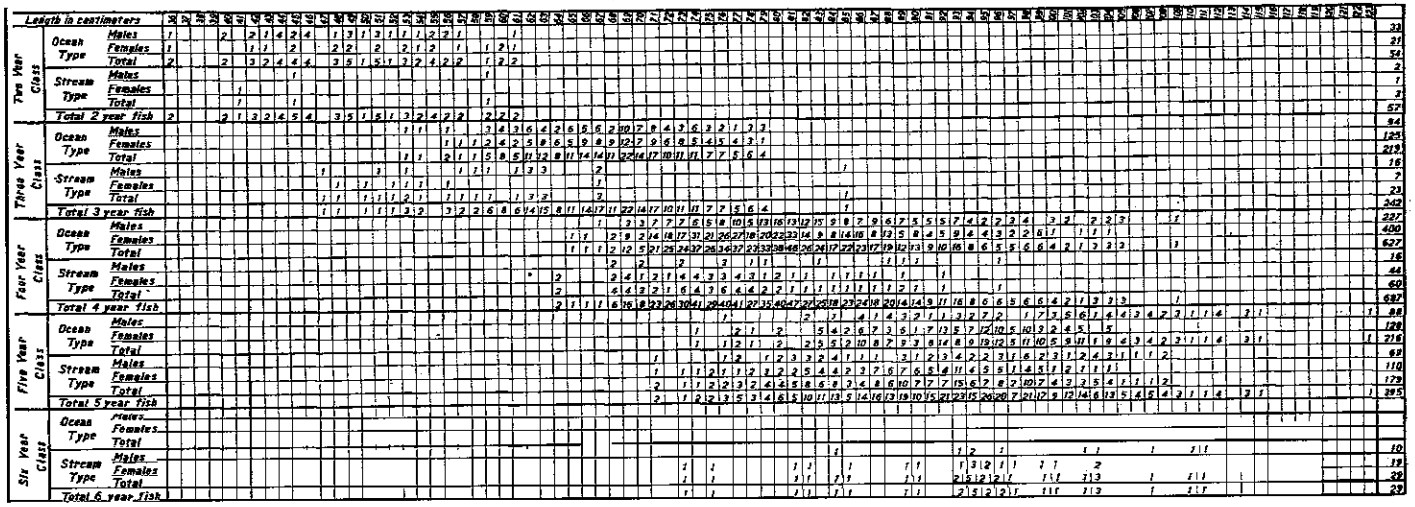

TABLE 71

Summary of Fort Bragg Age Classes, 1920

Year classes	2	3	4	5	6	Totals	Per-centages
Males	35	110	243	157	10	555	39
Females	22	132	444	238	19	855	61
Ocean type	54	219	627	216	0	1,116	79
Stream type	3	23	60	179	29	294	21
Ocean type males	3 3	94	227	88		442	31
Ocean type females	21	125	400	128	8	674	48
Stream type males	2	16	16	69	10	113	8
Stream type females	1	7	44	110	19	181	13
Totals	57	242	687	395	29	1,410	
Percentages	4	17	48.7	28	2		

that a rapid decline in fish of spawning age has occurred. While the number of spawning fishes was less in 1926 when compared with 1925 the number of grilse was considerably greater, possibly indicating a more intensive straining by the nets in the estuary. For some unknown reason the records for 1927 and 1928 are incomplete.

Hatchery operations on Trinity River did not meet with marked success as the following account will show.

The report of the United States Commissioner of Fish and Fisheries for 1889 to 1891 (p. 51) recites, "In view of the urgent and many requests from citizens in the regions of the Rocky Mountains and the Pacific coast to stock their waters ... Lieut. Commander J. J. Brice, U. S. Navy. . . was directed to make a reconnaissance. Upon his recommendations' the reservation at Fort Gaston, Humboldt County, California, was decided upon as offering the necessary requirements." Here then, in one of the most inaccessible parts of the state in so far as transportation was concerned, the Commission established a hatchery. Operations began by shipping salmon eggs from Baird, a station in the Sacramento basin, to Fort Gaston. Owing to difficulties encountered in securing spawning fish at Ft. Gaston, an egg-taking station was later established on Redwood Creek, and finally after several years the Fort Gaston hatchery was abandoned because of its remoteness. A summary of reported[21] hatchery activities in the region of Trinity River follows:

According to W. H. Bailey, a small hatchery was established by R. D. Hume on a stream near the mouth of Klamath River "in the nineties." Eggs were brought from Rogue River somewhere near Grant's Pass. Fish in large numbers were successfully hatched and introduced into the main river near the mouth, and also into Hunter and High Prairie creeks. Many were retained for about a year and then liberated. These were fed with canned salmon eggs, ground-up sturgeon, smelt and other fish. Adults later returned to the creeks into which they had been introduced, but no permanent run was established in either stream. None of the young salmon was ever carried up the Klamath beyond the mouth of Hunter Creek.

There is not available at present any exact information relating to the contribution of natural spawning of king salmon as compared with artificial propagation. Casual observation points to the probability that

21 From the Reports of the U. S. Commissioner of Fisheries.

investigation of the results of natural propagation will receive more attention in the near future by those who seek fundamental facts pertaining to conservation. Incidents like the following are apt to arrest one's attention.

Shasta River, once a noted salmon stream, has of late years been regarded as of little consequence as a contributor to the population of Klamath River. Its decline, as such, has been attributed to local causes such as diversion of water for agriculture, mining, and power purposes, spearing fish on the spawning beds, and what not. When examining

TABLE 72

The following record of artificial propagation of King Salmon in Klamath River was furnished by W. H. Shebley, of Bureau of Fish Culture)

Eggs received at Mt. Shasta during fall and winter of	Source of eggs	Date of planting	Number planted in Klamath River	
1896	Battle Creek	Mar. 8, 1897	200,000	
1896	Battle Creek	Mar. 9, 1897	300,000	
1896	Battle Creek	Mar. 10, 1897	300,000	
1896	Battle Creek	Mar. 11, 1897	300,000	
1896	Battle Creek	Mar. 12, 1897	300,000	
				1,400,000
1907	Battle Creek	Mar. 16, 1908	120,000	
1907	Battle Creek	Mar. 22, 1908	120,000	
1907	Battle Creek	Mar. 23, 1908	120,000	
1907	Battle Creek	Mar. 24, 1908	120,000	
1907	Battle Creek	April 3, 1908	120,000	
				600,000
1911	Battle Creek	April 2, 1912	350,000	
				350,000
1913	Battle Creek	April 5, 1914	330,000	
1913	Battle Creek	April 7, 1914	350,000	
1913	Battle Creek	April 16, 1914	335,000	
1913	Battle Creek	April 18, 1914	335,000	
				1,350,000
1914	Klamathon	May 2, 1915	450,000	
1914	Klamathon	May 4, 1915	200,000	
1914	Battle Creek	Oct. 13, 1915	200,000	
1914	Battle Creek	Nov. 19, 1915	30,000	
				880,000
1915	Klamathon	April 3, 1916	627,000	
1915	Klamathon	April 4, 1916	769,000	
1915	Klamathon	April 5, 1916	691,000	
1915	Klamathon	April 6, 1916	751,000	
1915	Klamathon	April 7, 1916	722,000	
1915	Klamathon	April 8, 1916	667,000	
1915	Klamathon	April 19, 1916	554,000	
1915	Klamathon	April 20, 1916	518,000	
1915	Klamathon	April 21, 1916	700,000	
1915	Klamathon	April 22, 1916	864,000	
1915	Klamathon	Nov. 2, 1916	200,000	
1915	Klamathon	Nov. 4, 1916	200,000	
1915	Klamathon	Nov. 20, 1916	150,000	
1915	Klamathon	Nov. 22, 1916	150,000	
				7,563,000
1916	Klamathon	May 17, 1917	210,000	
1916	Klamathon	May 18, 1917	218,000	
1916	Klamathon	Oct. 19, 1917	150,000	
1916	Klamathon	Oct. 22, 1917	125,000	
1916	Klamathon	Oct. 25, 1917	125,000	
1916	Klamathon	Oct. 27, 1917	100,000	
				928,000
1917	Battle Creek	April 6, 1918	75,000	
1917	Battle Creek	April 8, 1918	75,000	
1917	Battle Creek	April 10, 1918	75,000	
1917	Battle Creek	April 12, 1918	75,000	
1917	Battle Creek	Sept. 12, 1918	150,000	
1917	Battle Creek	Sept. 14, 1918	150,000	
1917	BattleCreek	Sept. 16, 1918	150,000	
1917	Battle Creek	Sept. 17, 1918	150,000	
1917	Battle Creek	Sept. 18, 1918	150,000	
				1,050,000
Total				14,121,000

TABLE 73

Record of Egg Collections on Klamath River and Tributaries

Year	King Salmon	Silver Salmon	Rainbow Trout
1916	15,872,000		1,189,000
1917	1,000,000		4,439,000
1918	277,000		1,709,000
1919	2,102,000	254,000	3,788,000
1920	4,974,000		5600,000
1921	7,110,000		7,677,000
1922	19,178,000		9,780,000
1923	20,824,000		5,842,000
1924	5,762,000		4,941,000
1925	6,735,000	3,295,000	10,667,000
1926	18,042,000		5,838,000
1927*	11,797,000	397,000	1,765,000
1928	4,541,000		5,203,000
Totals	118,214,000	3,946,000	68,438,000

*The year 1927 was one of very high water, and every trout station on the Klamath River and its tributaries was damaged, and most of them were put out of commission for the season.

a part of the stream bed in 1926 in search for marked salmon, the writer assisted by E. C. Scofield, took occasion to make a careful estimate of the number of spawning salmon which might be actually seen between the power dam and the mouth of the stream, a distance of about 6.9 miles. The method employed was to count all individuals actually seen in such parts of the stream as could be approached, and from these counts estimate the number in inaccessible places. No account was taken of fish which might have been concealed in deep pools, nor of those carried away by spearmen. The census thus taken gave an enumeration of 7500 individuals. Any experienced observer appreciates the difficulty of seeing fish in even a small stream, and he will no doubt agree that an estimate made in this way is conservative. Grilse, small three-year males, were almost entirely absent. Spawning fish in numbers had probably passed above the dam, and it seems quite probable that the entire number of fish in the river was far in excess of the above estimate. During the same season 9387 fish by actual count entered the racks at Klamathon on the main river. From what we now know of the return migration of salmon, it is believed that the fish which entered the racks at this time owed their origin to artificial propagation, and it seems equally certain that those of Shasta River were the result of natural propagation.

The relatively small, steady flow of Shasta River during the salmon migration, together with the accessibility of the stream, would suggest it as an ideal place for a study of natural propagation.

SUMMARY

The king salmon which is indigenous to Klamath River differs in size and certain anatomical characters from that of the Sacramento River.

Two species, the king salmon and the silver salmon, are represented in sufficient numbers to be of commercial importance. The humpback and dog salmon are only occasionally seen. The redfish (*Oncorhynchus nerka*) is not found in the river.

Two definite immigrations of king salmon have been observed, a spring and a summer run. The spring run is now so depleted as to be

TABLE 74

Summary of Hatchery Activities on Trinity River

Date	Eggs received	Species	Origin	Eggs distributed	Fish distributed	Destination
1889–90	10,000	King Salmon	Baird			Trinity River
1890–91	45,000	King Salmon	Trinity River			Trinity River
1890–91	30,000	King Salmon	Redwood Creek			Redwood Creek
1891–92	160,000	King Salmon	Redwood Creek		147,600	Supply Creek (Trinity River)
1891–92	160,000	King Salmon	Redwood Creek		142,500	Redwood Creek
1891–92	21,000	Rainbow Trout	Redwood Creek			
1891–92	20,000	Brook Trout	Caledonia, New York			
1891–92	25,000	Von Behr trout	Northville, Mich.			
1892–93		Rainbow Trout	Brood fish		16,000	Local streams (Trinity)
1892–93		Von Behr Trout	Last year, Ft. Gaston		19,960	Local streams (Trinity)
1892–93		Brook Trout	Last year, Ft. Gaston		6,193	Local streams (Trinity)
1892–93	180,000	King Salmon	Redwood Creek, Trinity River		117,000	Local streams (Trinity)
1892–93	375,000	King Salmon	Redwood Creek, Trinity River		540,000	Local streams (Trinity)
1893–94	800,000	King Salmon	Redwood Creek, Trinity River		660,000	Local streams
1893–94	460,000	Rainbow Trout	Redwood Creek, Trinity River	10,000		Wytheville Station, Virginia
				100,000		Northville Station, Michigan
				50,000		Sisson, California
1893–94		Rainbow Trout	"Yearlings"		5,450	Waters of Trinity Mountain
1894–95	221,000	King Salmon	Redwood Creek		220,000	Redwood Creek, Trinity River
1894–95		Silver Salmon	Redwood Creek			
1894–95	241,800	Rainbow Trout and "Steelhead"	Redwood Creek	30,000		Japan
				91,860		Northville Station
				100,000		Duluth Station
				25,000		St. Johnsbury Station
					1,000	Elk River
1894–95	20,800	Von Behr Trout	Brood stock, Ft. Gaston		277,500	Redwood Creek
					1,000	Yager Creek
					3,000	Streams in Marin County
1895–96	73,000	King Salmon	Redwood Creek		65,700	Adjacent streams
1895–96	795,000	Rainbow Trout	Redwood Creek		107,808	Redwood Creek
				686,000		Shipped out of state
1895–96	17,000	Von Behr Trout	Brood stock, Ft. Gaston	10,000		California Fish Commission
1895–96	87,000	Rainbow Trout	Brood stock, Ft. Gaston	30,000		Marin County Country Club
1896–97	406,000	King Salmon	Redwood Creek		405,000	Redwood Creek
1896–97	800,000	Rainbow Trout	Brood stock, Ft. Gaston		202,000	Redwood Creek
				600,000		Shipped out of state
1897–98	1,283,450	King and	Redwood Creek	710,000		Redwood Creek
		Silver Salmon	Redwood Creek	710,000		Shipped out of state
1897–98	1,451,000	Rainbow Trout	Redwood Creek		35,950	Trinity River
					Balance of rainbow trout	Redwood Creek

scarcely evident. The summer run is the only one of commercial importance.

The incoming fish show an increase in average size and weight as the season advances. This is due to both additional growth in the sea, and to the incursion of very large fish late in the season.

The time of immigration varies somewhat through a period of years, but it is not growing later as some presume.

From the results of experimental work it is safe to infer that king salmon which have been introduced into a particular tributary of a river usually seek out and enter the same tributary on their return migration, if when planted they were given a sufficient amount of exposure to its waters before they entered the main channel. The homing instinct is a barrier to dispersal. However, a small scatter may follow both natural and artificial propagation, thus constantly affording the species an opportunity to extend its range. It follows that when young salmon are introduced into a basin, they should be planted in widely separated localities if it is desired that the returning fish should distribute themselves to some extent over the basin.

The summer immigration occurs at a time of low water in the river. An emigration of young salmon also occurs, or is at least well begun, before the approach of winter floods.

Emigrating young appear in the estuary in late summer and early fall, where they linger and rapidly grow. There is evidence that at least some of these attain the maximum part of the first year's growth here. Many artificially propagated yearlings appear to tarry for a time in the estuary also.

Increasing knowledge of the habits of Klamath salmon strengthens the belief that the construction of high dams in the river will cause the extinction of the species above the dams.

Klamath salmon are found to mature at ages of from two to six years. No seven-year-old fish has been seen. Three-year females are at times fairly common in the catch. Precocious males occur during the first year of growth, and sperm from these will fertilize eggs. The ensuing young reach maturity and do not appear to differ from other adults.

Depletion of Klamath salmon is not only apparent, but it seems to be progressing at an alarming rate. There is evidence also that artificial propagation alone is not able to cope with the situation.

Gill net fishing at the mouth of the river is a deleterious straining process that permits the escape of small fish which later appear in ill-proportioned numbers on the spawning beds. If the tendency to mature early is inherited, the result may be a weakening of the entire stock in so far as it is of commercial worth.

The week-end closed period during the fishing season does not seem to accomplish its intended end.

During their ocean life, salmon migrate long distances from the mouths of their native streams.

Klamath salmon range at sea as far south as the marine habitat of the species extends. The extreme northern migration is unknown, but

from what has been learned of the movements of Sacramento fish it may be inferred that Klamath salmon migrate northward also.

Ocean trolling results in the capture of immature fish in considerable numbers. Therefore, when an ocean catch is compared with that of a river, it is found to be relatively rich in two- and three-year fish.

In so far as we are able to determine, artificially propagated salmon do not differ in their habits from fish of the same species in a state of nature. Artificially propagated fish become adults which are similar in growth, stature, and other particulars to those produced in nature.