Yurok Tribe Fishery Socioeconomics Technical Report

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

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Abbreviations and Acronyms

CDFG	California Department of Fish and Game
CFQCR	Commercial Fish Quality Control Regulations
DOI	Department of the Interior
DRA	Dam Removal Alternative
EDRRA Model	Evaluation of Dam Removal and Restoration of Anadromy Model
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
HMP	Harvest Management Plan
IGD	Iron Gate Dam
KBRA	Klamath Basin Restoration Agreement
KFMC	Klamath Fishery Management Council
KRFC	Klamath River Fall Chinook
NAA	No Action Alternative
NMFS	National Marine Fisheries Service
PFMC	Pacific Fishery Management Council
SONCC Coho	Southern Oregon Northern California Coast Coho
USFWS	U.S. Fish and Wildlife Service

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I. Introduction

In March 2012, the Secretary of the Interior will make a determination regarding whether removal of four Klamath River dams (Iron Gate, Copco 1, Copco 2 and J.C. Boyle) owned by the utility company PacifiCorp advances restoration of salmonid fisheries and is in the public interest. This report analyzes the effects of three alternatives that will be considered by the Secretary as they pertain to fishing opportunities for the Yurok Tribe:

- Alternative 1 – No Action: This alternative involves continued operation of the four dams under current conditions, which include no fish passage and compliance with Biological Opinions by the U.S. Fish and Wildlife Service (USFWS) and NOAA National Fisheries Service (NMFS) regarding the Bureau of Reclamation's Klamath Project Operation Plan.

- Alternative 2 – Full Facilities Removal of Four Dams: This alternative involves complete removal of all features of the four dams, implementation of the Klamath Basin Restoration Agreement (KBRA 2010), and transfer of Keno Dam from PacifiCorp to the Department of the Interior (DOI).

- Alternative 3 – Partial Facilities Removal of Four Dams: This alternative involves removal of selected features of each dam to allow a free flowing river and volitional fish passage for all anadromous species. Features that remain in place (e.g., powerhouses, foundations, tunnels, pipes) would be secured and maintained in perpetuity. KBRA and transfer of Keno Dam are also part of this alternative.

Throughout this report, Alternative 1 is referred to as the no action alternative and Alternatives 2 and 3 as the action alternatives.

Section II discusses the Yurok Tribe's historical reliance on fish and tribal cultural and social practices associated with fish. Section III focuses on changes in fisheries and related practices that have occurred since the historical period. Section IV evaluates the effects of the no action and action alternatives on Yurok fisheries and associated cultural and social practices. Section V summarizes results and conclusions of the previous sections, and Section VI provides a list of references cited in the report. Appendix A discusses the biological assumptions that underlie the analysis of tribal fishery effects. Appendix B describes Yurok fishery management.

II. Historical and Cultural Context

The Yurok Tribe views fish and fisheries as inseparable from the Klamath River ecosystem.

> "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" (Sloan 2011, p 120).

II.A. Fish

The Yurok Tribe's seasonal round of fishing historically included Chinook and coho salmon, Pacific lamprey, steelhead, green sturgeon, and Pacific eulachon (candlefish). Yurok members used a variety of fishing methods adapted to particular species and locations.

- "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" (Sloan 2011, p 39).

- Pacific lamprey were harvested with baskets (which attract lamprey by creating eddies in the water), dipnets (when the water is muddy or lamprey are close to shore), and gaffs and manual extraction (for lamprey climbing over rocks) (Lewis 2009, pp 11-13).

Salmon was of primary importance to the Yurok Tribe:

> "The Yurok and their neighbors 'ate very largely of the acorn,' the staple food of most California Indians; but fish, principally salmon, constituted a greater portion of their food than was usual elsewhere….Salmon runs occurred on the Klamath in the spring and fall. These were the periods of the great ceremonies, whether or not they referred directly to the fish. Because of its great flow, there were few weeks when some variety of salmon were not running" (Bearss 1969, p 8).

Because their fishing areas included the estuary, the Yuroks had first access to anadromous species returning to the Klamath Basin and thus a special responsibility to ensure adequate escapement for spawning and for other Basin tribes. A central feature of the Yurok fishery was the Kepel weir:

> "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 Northwest California region" (Kroeber and Barrett 1960, p 12 as cited by Sloan 2011, p 39).

The Kepel weir was managed to ensure sustainability of the salmon runs and the fishery:

> "…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 ensure 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*. 1999, p 3-214).

Fishing that occurred at private fishing sites was also subject to rules and common understandings:

- "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, p 3 as cited by Sloan 2011, p 48).

- "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, p 287 as cited by Sloan 2011, p 48).

II.C. Associated Cultural and Social Effects

For the Yurok Tribe, fishing is more than just a means of physical sustenance. For instance, construction of the Kepel weir was preceded by the First Salmon Ceremony – a ritual that had strong social and cultural connotations.

- "Many years after he was stationed on the Klamath, Maj. Gen. George Crook [who established Fort Ter-Waw in 1857 at the current site of Klamath, California] recalled that the Yurok had a yearly ceremony on placing a weir in the river at Kepel, to catch salmon. It was one of the occasions when all the wealth was paraded. All of those who were present at the ceremony would have all past blood feuds erased" (Bearss 1969, p 5).

- "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" (Sloan 2011, p 45).

Tribal members frequently gathered in camps at major fishing sites:

> "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" (Sloan 2011, p 49).

Historical abundances of fish enabled the Yuroks to engage in extensive trade and barter.

> "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" (Sloan 2011, p 42).

III. Recent History

III.A. General Conditions

The Yurok Tribe is the largest tribe in California; tribal enrollment was 4,912 in 2005. The unemployment rate (defined as the percentage of adults who are available for work but unemployed, regardless of whether or not they have recently looked for work) was 74 percent in 2005 (BIA 2005). Per capita income of Indians residing on the Yurok Reservation and Indians residing in Del Norte County (including but not limited to Yurok tribal members) in 1999 was $6,839 and $9,638 respectively – both lower than per capita income of the general population of Del Norte County ($14,573). The percent of the population below the poverty level follows a similar pattern: 40 percent of Indians on the Yurok Reservation, 26 percent of Indians in Del Norte County, and 20 percent of the general Del Norte County population (U.S. Census 2000).

III.B. Fish

According to Snyder (1931) and Sloan (2011), the first non-Indian commercial fishery for salmon on the Klamath River was established in 1876. The first cannery opened at Requa in the late 1880s; cannery production peaked during 1912-15. Although the canneries were owned by non-Indians, all of the fish received by the canneries and most of the cannery labor were provided by Indians, who were the only people allowed to fish inriver. Several decades later, the State of California closed the inriver fishery:

> "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" (Sloan 2011, p 49).

In subsequent decades, citations issued by California Fish and Game wardens to Hupa and Yurok tribal members for illegal gillnetting on the lower Klamath was a source of ongoing tension and confrontation. In 1969, Yurok fisherman Raymond Mattz challenged State jurisdiction over Indian fishing on the Reservation. The case was lost in two lower courts. In 1973 the U.S. Supreme court reversed the lower court decisions, and in 1977 the DOI reopened the lower Klamath to Indian gillnet subsistence and commercial fishing. DOI subsequently imposed a

moratorium on the tribal commercial fishery during 1978-1986 for conservation reasons (Sloan 2011, pp 49-52). The moratorium was lifted in 1987, with subsequent tribal harvests based on an allocation agreement brokered by the Klamath Fishery Management Council (KFMC). In 1993, the DOI Office of the Solicitor issued an opinion requiring that 50 percent of the allowable harvest of Klamath-Trinity salmon be reserved for the Yurok and Hoopa Valley tribes (DOI 1993). This was considerably higher than the 30 percent tribal reserve brokered by the KFMC during 1987-91 (Pierce 1998). The Yurok Tribe receives 80 percent of the tribal reserve, i.e., 40 percent of the total allowable harvest of Klamath-Trinity salmon.

Fish abundances have declined considerably from the historical period: "Today, Candlefish (once an important subsistence food) no longer exists in the Klamath River. Coho Salmon and Green Sturgeon are on the Endangered Species list. Pacific Lamprey has experienced dramatic decreases and Chinook salmon has declined to such numbers that only a short commercial 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" (Sloan 2011, p 5). Today Yurok harvest consists largely of Klamath River fall Chinook. Since 1980, tribal harvest has varied widely, depending on the size of the fall Chinook run and the size of the tribal set-aside in each year (Table III-1).

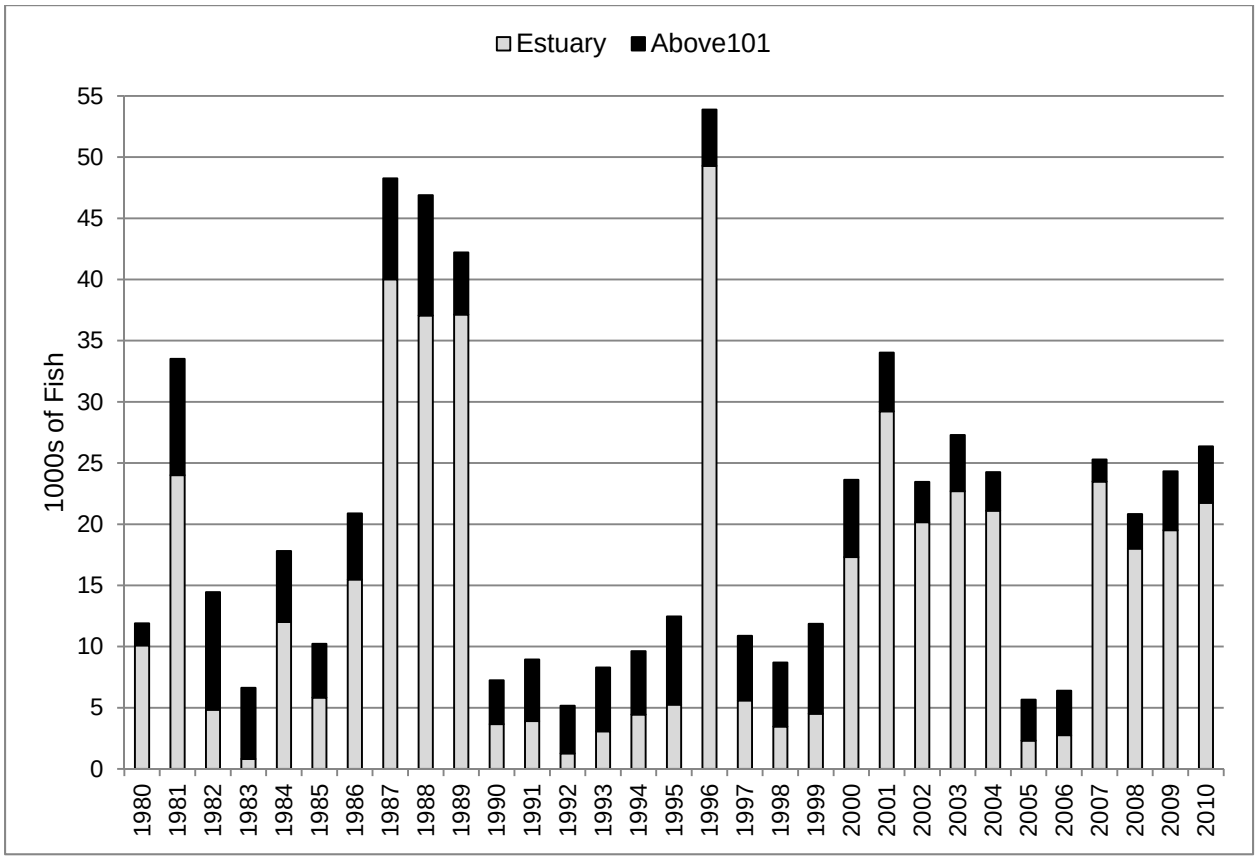

Figure III-1. Chinook harvest by Yurok tribal members in the estuary (below Highway 101) and above Highway 101, 1980-2010 (source: CDFG 2011).

Deterioration in water quality has affected not only fish populations but the operation of the fishery:

> "… the presence of the dams on the upper reaches of the Klamath River has brought about changes. Sites of fishing and traditional use have become clogged with debris and algae, and fish populations have continued to decline. Observers report the discouraging fact that when tribal members try to use their traditional nets, they fill with algae that grows because the water temperatures are rising – a sign of an unhealthy river" (Gates 2011, p 3-8).

Traditional practices continue to play an important role in Yurok fisheries. The rights of certain families or family members to fish at particular locations and the communal sharing of fish are still honored practices. In years when there is no commercial fishery, tribal members who harvest for subsistence share their fish with elders and other community members who are unable to fish for themselves. In years where there is a commercial fishery, the Tribe purchases fish from commercial gillnetters for distribution to elders. During the commercial fishery, tribal members (including non-fishers and those who live off the Reservation) continue to gather in 'fish camps' along the river to renew their social and cultural ties.

As part of their stewardship responsibilities, the Yurok Tribe conducts water quality monitoring and riparian and upslope restoration on Reservation lands. In terms of fishery management, a Yurok tribal biologist serves on the Pacific Fishery Management Council's Salmon Technical Team, provides tribal harvest and biological data that help determine the status of stocks, and advises the Council on scientific and regulatory matters. The Yurok Tribe has a sizeable Fisheries Department that conducts biological research and data collection and is responsible for the Tribe's Harvest Management Plan (HMP), which serves as the basis for regulation, monitoring and enforcement of the Tribe's commercial, subsistence and recreational guide fisheries (see Appendix B).

III.B. Associated Cultural and Social Effects

Historical declines in habitat conditions and fish populations have affected Yurok fisheries and associated cultural and social practices in a variety of ways. For instance:

- "Hupa and Yurok rarely left their territories. Today, the inability to meet subsistence needs from the fishery, a perception that the rivers are dirty, and a general malaise in our communities have compelled many to seek employment and community elsewhere. Even tribal health has experienced a decline as processed foods have replaced the fish and other natural foods that were once a staple of our diets (Byron Nelson as quoted in USFWS *et al.* 1999, p 3-225).

- "The world-renewal religion that had underwritten the Indians' former way of life decayed gradually as the older people who could still remember the ceremonies died and more and more of their children took up jobs on the outside. The Kepel weir and dance lapsed shortly after 1910: Not enough men could get together at one time to build the dam, and there were none left who knew the ceremony in its entirety" (McEvoy 1986, pp 61-62).

- While the First Salmon Ceremony is currently not practiced, the World Renewal Ceremonies, which had not been conducted since 1912, were revived in 2000 (Sloan 2011, p 43). These Ceremonies and other rituals (including the Brush Dance and Flower Dance) involve the use of basket materials that grow along the river and immersion of some ceremonialists in the river. Low flows and poor water quality at certain times of year affects the quantity and quality of basket materials and also exposes basket makers (who wade in the river and also strip willows and other materials with their teeth) and ceremonialists (who engage in ritual immersion) to adverse water conditions. Availability and use of medicinal plants is also adversely affected.

- The Yurok Tribe hosts the World Renewal Ceremonies (including the Deerskin Dance and Jump Dance) in the lower Basin every other year in rotation with the Hoopa Valley Tribe. When fish is scarce, the Yurok Tribe must supplement the harvest with sources off the reservation to meet their obligation to share salmon and other food with ceremonial participants and attendees (USFWS *et al*. 1999, Gates and Novell 2011).

- "Despite significant degradation of the river ecosystem of the Klamath region during the latter 19th and first half of the 20th centuries, the Yuroks persist in their traditional reliance on the river and its resources. Although it became increasingly difficult, the tribe continued to practice its ceremonies and gather vegetation for baskets, food, medicines, and other purposes. As much as possible, Klamath River fish caught by the Yurok tribal membership continued to be an important component of their diets. Thus, many of today's older Yurok grew up with a strong physical connection to the river and a great appreciation for the traditions and ways of life of their ancestors" (Gates 2011, p 3-8).

IV. Effects of Alternatives
IV.A. Alternative 1 – No Action
IV.A.1. Fish

Little change in harvest opportunity is expected under the no action alternative:

- Chinook: "Under conditions with dams, commercial and in-river harvest would continue as restrictions and quotas (met before escapement) allow as has occurred in the past" (p 4 of "Questions for Expert Panel on Chinook Salmon in the Klamath Basin" – Goodman *et al*. 2011).

- SONCC coho ESU: The Southern Oregon Northern California Coast (SONCC) coho Evolutionarily Significant Unit (ESU)[1] was listed as 'threatened' under the Endangered Species Act (ESA) in 1997. Based on viability criteria specified by Williams *et al.* (2008), the SONC coho ESU is not likely to be de-listed under current conditions (see Appendix A.1).

[1] An Evolutionarily Significant Unit is a population or group of populations that is reproductively isolated and of substantial ecological/genetic importance to the species (Waples 1991).

- Steelhead: "Current Conditions will not, in the short to medium term, result in an expansion of the [steelhead] fishery. Projecting harvest under the Current Conditions depends on the fate of the hatcheries and specifics of harvest policies into the future, which are insufficiently defined at this time" (Dunne *et al*. 2011, p 58) (see Appendix A.3.a).

- Pacific lamprey: "In the absence of dam removal, the habitat conditions described previously [for Pacific lamprey] will persist with only subtle changes due to foreseeable hydrological changes" (Close *et al*. 2011, p 23) (see Appendix A.4).

IV.A.2. Associated Cultural and Social Effects

Consistent with the lack of change in harvest opportunities expected under the no action alternative, little change in associated cultural and social practices (as described in Section III.A and III.B) is likely to occur under this alternative.

IV.B. Alternative 2 – Full Facilities Removal of Four Dams

IV.B.1. Fish

Sedimentation and water quality changes associated with dam removal may have adverse short term effects on fish stocks that inhabit areas below the dams. However, these effects are generally expected to be short- lived.

- Chinook salmon: "Dam removal does not have a substantial multi-year adverse impact on mainstem Chinook salmon" (Goodman *et al*. 2011, p ii) (see Appendix A.2.d).

- SONCC coho ESU and steelhead: "The short-term effects of the sediment release will be sediment concentrations in the range of 1,000 to more than 10,000 milligrams per liter (mg/L), which will be injurious to upstream migrants of both species [coho and steelhead], and especially to any adult steelhead or 'half pounders' that hold or spawn in the mainstem. However, these high sediment concentrations are expected to occur for periods of a few months in the first two years after the beginning of reservoir lowering and sediment flushing. For a few years after that period, suspended sediment concentrations are expected to be higher than normal, especially in high flow conditions, but not injurious to fish" (Dunne *et al*. 2011, pp 18-19) (see Appendices A.1. and A.3.a).

- Pacific lamprey: "Because they live burrowed in the soft sediments, there will likely be minimal increases in larval mortality rates of existing Pacific lamprey larvae in the mainstem Klamath River after dam removal. The larvae will likely relocate or adjust their burrow tubes to maximize feeding and respiration" (Close *et al*. 2010, p 33) (see Appendix A.4).

Over the longer term, dam removal and successful implementation of the KBRA are expected to increase harvest opportunities for the Yurok Tribe. These effects can be summarized as follows:

- Chinook: The Evaluation of Dam Removal and Restoration of Anadromy (EDRRA) model projects a 50 percent increase in tribal harvest under the action alternative; this increase is

relative to the current allocation of Klamath River fall Chinook received by the Yurok and Hoopa Valley tribes (Appendix A.2.a). What this means for each individual tribe in the Basin is not clear. For members of tribes with federally recognized fishing rights, expanded harvest opportunity will likely take the form of additional subsistence and/or commercial fishing. Members of tribes without such rights are still able to fish recreationally and thus receive some (albeit smaller) benefit. Such harvest opportunities are much more likely to be realized on the Klamath River (rather than the Trinity), since the restoration associated with the action alternatives would occur on the Klamath. Thus Chinook availability is assumed to increase for each tribe residing on the Klamath River relative to what that tribe currently harvests.

Fall run Chinook (consisting largely of hatchery fish) is currently a much larger component of tribal harvest than spring Chinook, which is at low levels of abundance. A modest harvestable surplus of spring Chinook may become available under the action alternatives. This harvest opportunity would largely accrue to inriver (including tribal) fisheries, as the season structure of ocean fisheries does not provide much opportunity to harvest spring Chinook before they return to the river. Spring run Chinook salmon are highly desirable for their fat content and have the potential to expand inriver harvest opportunities beyond the current season (see Appendix A-2).

- SONCC coho ESU: The SONCC coho ESU is comprised of coho populations both inside and outside the Klamath Basin. The action alternatives are expected to lead to an increase in the viability of Klamath River coho populations and advance the recovery of the ESU. However, since these alternatives do not include coho restoration outside the Klamath Basin, they alone will not create conditions that would warrant de-listing of the SONCC coho ESU throughout its range (see Appendix A.1).

- Steelhead: Steelhead is expected to increase in abundance and extend its distribution to areas currently under the reservoirs and upstream to Keno Dam; expansion upstream of Keno Dam is promising but less certain (see Appendix A.3).

- Pacific lamprey: Pacific lamprey harvest potential below Keno Dam is expected to increase from one to ten percent over the long term due to habitat improvement and recolonization of the reach between Iron Gate Dam and Keno Dam. Harvest potential above Keno Dam is possible but less certain (see Appendix A.4).

IV.B.2. Associated Cultural and Social Effects

Fish population effects will provide greater opportunities for the Yurok Tribe to engage in subsistence and commercial fishing and associated cultural practices (e.g., sharing of fish with elders, transmitting values to the next generation, trade and barter). The return of spring Chinook – even in modest numbers – is of particular importance as it would allow for revival of the First Salmon Ceremony. Also, spring Chinook are highly desirable for their fat content and would provide quality benefits to the subsistence and commercial fisheries and lengthen the duration of the seasonal round for salmon. The tribal guide fishery would benefit and also bring additional money into the community. Poverty and rural isolation have constrained the ability of

tribal members to replace fish with healthy food alternatives. Improved fishing opportunities would increase opportunities for healthy food consumption.

Dam removal and KBRA are also expected to expedite water quality improvements (Total Maximum Daily Loads) being undertaken for the Klamath River under the no action alternative (Water Quality Subteam 2011). In addition to fish population benefits, these changes are expected to enhance other Yurok practices such as basket making and use of medicinal plants, and to reduce tribal concerns pertaining to ritualistic immersion in river waters. Perhaps most importantly, the overall changes in water and fish populations would be emblematic of a better functioning river ecosystem, which is consistent with the Yurok view that stewardship pertains to the entire ecosystem.

The KBRA provides the Yurok Tribe with funding for fishery and habitat management and restoration, administration of fishery programs, and long-term economic revitalization (KBRA Part VII, p 170). These provisions would enhance economic self-sufficiency and self-determination and allow the Yurok Tribe to expand their existing capabilities in fishery and habitat management.

IV.C. Alternative 3 – Partial Facilities Removal of Four Dams

Alternative 3 is intended to provide the same habitat conditions as Alternative 2 (i.e., fish passage unencumbered by dams and a free-flowing river), as well as benefits of the KBRA. Thus the effects of this alternative on harvest opportunities for the Yurok Tribe are expected to be the same as Alternative 2.

V. Summary and Conclusions

For the Yurok Tribe, the action alternatives are expected to result in increased harvest opportunities, expand engagement in resource monitoring and management, enhance cultural values and practices, generate jobs and income, and provide greater opportunity for healthy food consumption (Table V-1).

Table V-1. Effects of the no action and action alternatives on the Yurok Tribe.

Indicator	*No Action*	*Change from No Action*
Harvest opportunities:		
• Chinook	Very low abundance of spring Chinook, moderate abundance of hatchery-dominated fall Chinook	Potential adverse short-term effect due to sedimentation associated with dam removal. Some increase in spring and fall Chinook after dam removal Spring Chinook particularly valued for high fat content and potential to extend salmon season.

• Coho	ESA-listed	Improved viability of Klamath Basin coho but no change in listing status
• Steelhead	Stable/declining abundance	Potential adverse short-term effect due to sedimentation associated with dam removal. Increased abundance and distribution some years after dam removal.
• Pacific lamprey	Very low abundance	One to ten percent increase in harvest potential
• Sturgeon	Very low abundance	Limited documentation of potential effects
• Eulachon	ESA-listed	Limited documentation of potential effects
Engagement in resource monitoring and management	Active engagement in data collection, research and management pertaining to fish, wildlife, habitat and fisheries.	Engagement would be expanded and supported by new funding for fisheries and conservation management (KBRA section 32.2),
Cultural practices	No First Salmon Ceremony. Participation in ceremonies (e.g., World Renewal, Brush Dance, Flower Dance – including ritual immersion of ceremonialists and daily feasting) and other cultural practices (e.g., basket weaving, medicinal plants) impaired by limited fish abundance and poor water quality.	Return of spring Chinook would allow for revival of First Salmon Ceremony. Increase in fish populations and expedited water quality improvements would enhance opportunities to engage in traditional harvesting, ceremonial and cultural practices and transmit these practices to younger generation.
Employment, income, standard of living	Employment provided by Yurok Tribal Fisheries Program and participation of tribal members in commercial and guide fisheries. Subsistence fishery contributes to standard of living.	Increased employment and income opportunities associated with funding for fisheries and conservation management and economic development study (KBRA Sections 32.2, 33.1, 33.2). Increased harvest opportunities would provide additional employment and income for commercial and guide fisheries. Increased subsistence fishing opportunities would improve standard of living, increase opportunities for trade and barter,

		and enhance food security for tribal members (particularly important for elders).
Health	Subsistence fishery provides limited but healthy source of sustenance. Poverty and rural isolation constrain ability to replace fish with healthy food alternatives.	Greater opportunity for healthy food consumption associated with enhanced subsistence fishing opportunities.

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Appendix A – Biological Assumptions

This Appendix discusses the effects of the no action and action alternatives on a number of species historically and/or currently harvested by the Yurok Tribe: SONCC coho, Klamath River fall and spring Chinook, steelhead , and Pacific lamprey. A number of expert panels were convened to evaluate these effects. The conclusions of those panels, as well as advice from the Biological Subgroup (a team of federal biologists) and results of several biological models, were used to inform this evaluation.

A.1. SONCC Coho

The SONCC coho ESU consists of 28 coho population units that range from the Elk and Rogue Rivers in southern Oregon to the Eel River in Northern California, including the coho populations in the Klamath Basin. NMFS' framework for assessing the biological viability of the SONCC coho ESU involves categorization of these component populations into seven diversity strata that reflect the environmental and genetic diversity across the ESU. Risk of extinction is evaluated on the basis of measurable criteria that reflect the biological viability of individual populations, the extent of hatchery influence, and the diversity and spatial structure of population units both within and across diversity strata (Williams *et al*. 2008).

The Klamath diversity stratum includes five population units, three of which (Upper Klamath, Shasta, Scott) are potentially affected by the action alternatives. According to the Biological Subgroup, "None of the population units of Klamath River coho salmon is considered viable at this point in time" (Biological Subgroup 2011, p 89) and "…all five of these Population Units have a high risk of extinction under current conditions" (Biological Subgroup 2011, p 90).

According to the Coho/Steelhead Expert Panel, adverse effects of dam removal on coho would likely be short-lived:

> "The short-term effects of the sediment release will be sediment concentrations in the range of 1,000 to more than 10,000 milligrams per liter (mg/L), which will be injurious to upstream migrants of both species [coho and steelhead], and especially to any adult steelhead or 'half pounders' that hold or spawn in the mainstem. However, these high sediment concentrations are expected to occur for periods of a few months in the first two years after the beginning of reservoir lowering and sediment flushing. For a few years after that period, suspended sediment concentrations are expected to be higher than normal, especially in high flow conditions, but not injurious to fish" (Dunne *et al*. 2011, pp 18-19).

The Expert Panel noted the likely continuation of poor coho conditions under the no action alternative and a modest to moderate response of coho under the action alternatives (the moderate response being contingent on successful KBRA implementation):

> "Although Current Conditions will likely continue to be detrimental to coho, the difference between the Proposed Action and Current Conditions is expected to be small, especially in the short term (0-10 years after dam removal). Larger (moderate) responses are possible under the Proposed Action if the KBRA is fully and effectively implemented and mortality

caused by the pathogen *C. shasta* is reduced. The more likely small response will result from modest increases in habitat area usable by coho with dam removal, small changes in conditions in the mainstem, positive but unquantified changes in tributary habitats where most coho spawn and rear, and the potential risk for disease and low ocean survival to offset gains in production in the new habitat. Very low present population levels and low demographic rates indicate that large improvements are needed to result in moderate responses. The high uncertainty in each of the many individual steps involved for improved survival of coho over their life cycle under the Proposed Action results in a low likelihood of moderate or larger responses….Nevertheless, colonization of the Project Reach between Keno and Iron Gate Dams by coho would likely lead to a small increase in abundance and spatial distribution of the ESU, which are key factors used by NMFS to assess viability of the ESU" (Dunne *et al*. 2011, p ii).

The Biological Subgroup also notes the benefits of the action alternatives on coho viability:

"Reestablishing access to historically available habitat above IGD will benefit recovery of coho salmon by providing opportunities for the local population and the ESU to meet the various measures used to assess viability (e.g., abundance, productivity, diversity, and spatial structure (Williams et al., 2006). Thus there would be less risk of extinction when more habitat is available across the ESU" (Biological Subgroup 2011, p 92).

The action alternatives are expected to improve the viability of coho populations in the Klamath Basin and advance the recovery of the SONCC coho ESU. However, since the action alternatives do not include coho restoration actions outside the Klamath Basin, they alone will not bring about the conditions that would warrant de-listing of the SONCC coho ESU throughout the species range.

A.2. Klamath River Spring and Fall Chinook

Biological effects of the no action and action alternatives on Klamath River Chinook are evaluated on the basis of two models – the Evaluation of Dam Removal and Restoration of Anadromy Model (Hendrix 2011) and a habitat-based model (Lindley and Davis 2011) – and conclusions of the Biological Subgroup (Hamilton *et al*. 2011) and an Expert Panel convened in January 2011 to evaluate the effects of the alternatives on Klamath River Chinook (Goodman *et al*. 2011).

A.2.a. Evaluation of Dam Removal and Restoration of Anadromy (EDRRA) Model

The Evaluation of Dam Removal and Restoration of Anadromy (EDRRA) model (Hendrix 2011) is a simulation model that provides 50-year projections of Klamath Chinook escapement, as well as separate harvest projections for the ocean troll, ocean recreational, inriver recreational and tribal fisheries under the no action alternative and dam removal alternatives (denoted as NAA and DRA respectively by Hendrix). Projections from the EDRRA model begin in 2012 (the year of the Secretarial Determination) and span the period 2012-61. The harvest projections for the DRA reflect the following assumptions: (i) active introduction of Chinook fry to the Upper

Basin beginning in 2011, (ii) short-term effects on Chinook of sedimentation associated with dam removal, (iii) gains in the quantity and quality of salmonid habitat associated with dam removal and KBRA beginning in 2020, and (iv) loss of Iron Gate as a production hatchery in 2028.

The 50-year escapement and harvest projections provided by the model were each iterated 1000 times to capture the influence of uncertainties in model inputs on model outputs. The harvest projections pertain to Klamath/Trinity River Chinook and do not distinguish between spring and fall runs. Klamath/Trinity Chinook harvest (all fisheries combined) is estimated for each simulated year on the basis of the KRFC harvest control rule recommended by the PFMC to NMFS in June 2011 as part of a pending amendment to the Pacific Salmon Fishery Management Plan (Figure A-1). As an added constraint, the model also caps the forecast harvest rate for age-4 KRFC in the ocean fishery at 16 percent to address the consultation standard for California Coastal Chinook (listed as 'threatened' in 1999).

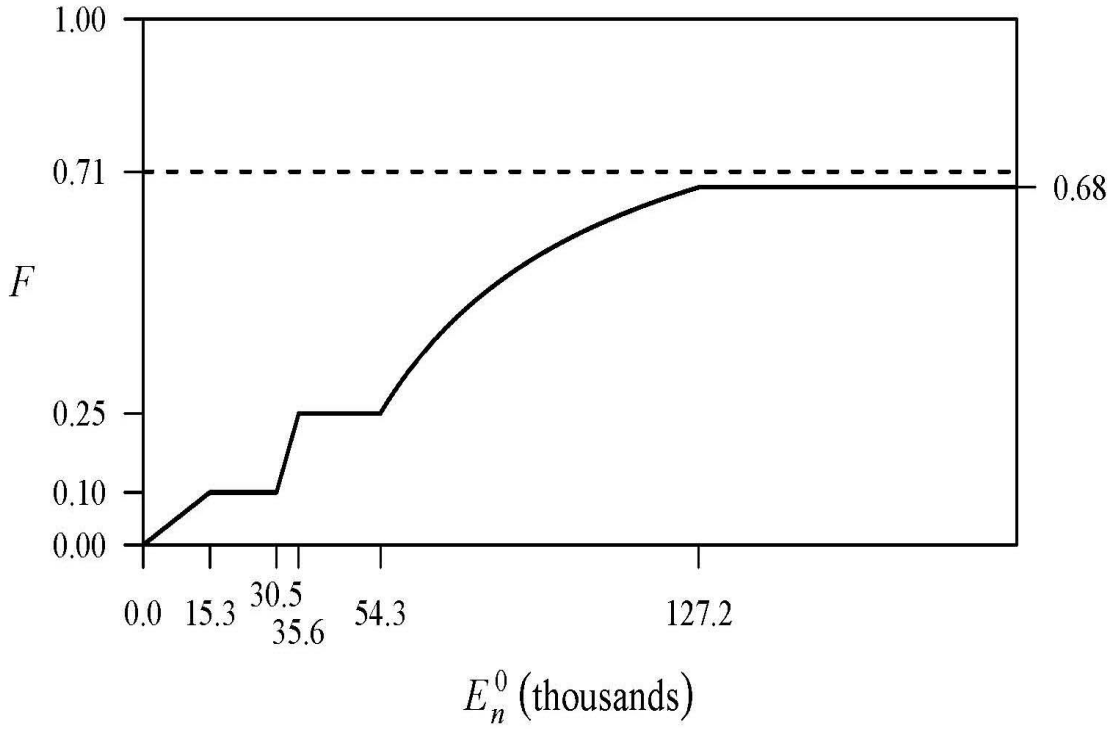

Figure A-1. Harvest control rule used in the EDRRA model (E_n^0 = annual escapement to natural areas prior to ocean or inriver harvest, F = harvest rate) (graphic by Michael Mohr, NMFS).

Consistent with PFMC practice, the model distributes the allowable harvest among fisheries as follows: 34.0 percent to the ocean commercial fishery, 8.5 percent to the ocean recreational fishery, 7.5 percent to the inriver recreational fishery (up to a maximum of 25,000 fish – with any surplus above 25,000 allocated to escapement), and 50.0 percent to tribal fisheries. The 50 percent tribal share is a 'hard' allocation specified by the Department of the Interior (USDOI 1993) on behalf of the Yurok and Hoopa Valley tribes. The distribution of the remaining 50.0 percent among the three non-tribal fisheries represents customary practice rather than mandatory conditions.

Table A-1 summarizes model results for the entire 50-year projection period (2012-61) and for the following subperiods: (i) 2012-20 (pre-dam removal, hatchery influence); (ii) 2021-32 (post-dam removal, continued hatchery influence), and (iii) 2033-61 (post-dam removal, no hatchery influence).[2]

The EDRRA model assumes that ocean abundance is known without error and that the harvest control rule exactly achieves the escapement objective (Hendrix 2011). Given that the absolute harvest projections provided by the model are an idealized version of real world conditions, model results are best considered in terms of relative rather than absolute differences between alternatives. The average percent difference between EDRRA's 50th percentile harvest projections for the NAA and DRA is +50 percent for the tribal fishery. The annual increase varies by subperiod, with harvest increasing by +8 percent prior to dam removal (2012-2020), peaking at +68 percent during the 12 years after dam removal when the fishery is still influenced by hatchery production (2021-32), then diminishing somewhat to +55 percent during 2033-61 after hatchery influence dissipates in 2032. The average harvest increases during the latter two subperiods (+68 percent during 2021-32, +55 percent during 2033-61) are higher than the average +50 percent increase experienced over the entire period (Table A-1).

Table A-1. EDRRA model results for the tribal fishery under the no action alternative (NAA) and dam removal alternative (DRA)

Model Results	*Time Period*			
	2012-61	*2012-20*	*2021-32*	*2033-61*
50th percentile harvest: % diff between NAA and DRA	+50%	+8%	+68%	+55%
5th percentile harvest: % diff between NAA and DRA	-60%	-81%	-50%	-58%
95th percentile harvest: % diff between NAA and DRA	+886%	+512%	+1000%	+955%
Average # years when DRA harvest > NAA harvest: % diff between NAA and DRA	70%	54%	78%	72%
Average # years when pre-harvest adult natural spawning escapement ≤ 30,500: % diff between NAA and DRA	-66%	-4%	-79%	-80%

Source: EDRRA model outputs provided by Hendrix (2011).
2012-61: 50-year projection period
2012-20: pre-dam removal
2021-32: post-dam removal, hatchery influence
2033-61: post-dam removal, no hatchery influence

EDRRA model results indicate that the 5th percentile harvest value for the DRA is 60 percent lower than the 5th percentile value for the NAA and that the 95th percentile harvest value is 886 percent higher; that is, the DRA harvest distribution is positively skewed and exhibits a high degree of overlap with the NAA harvest distribution. The EDRRA model also provides information regarding the percent of simulated years in which DRA harvest exceeds NAA harvest (50 percent indicating no difference between the two alternatives). These paired comparisons were made possible by applying the parameter draws associated with each iteration

[2] The model assumes that Iron Gate would cease to operate as a production hatchery in 2028. Hatchery influence on the fishery would continue for another 3-4 years (the length of the life cycle of the last year class released from the hatchery).

of the simulation to both the NAA and DRA. The results in Table A-1 indicate virtually no difference between the alternatives during 2012-20 (54 percent) but higher harvests under DRA in the two subsequent subperiods (2021-32 and 2033-61) in a notable majority of years (78 percent and 72 percent respectively).

The harvest control rule incorporated into the EDRRA model (Figure A-1) limits the harvest rate to 10 percent or less when pre-harvest escapements fall below 30,500 adult natural spawners. Escapements this low would likely be accompanied by major regulatory restrictions and adverse economic conditions for the fishery. Such conditions occur in 66 percent fewer years under the DRA than the NAA – with the greatest declines (-79 percent during 2021-32, -80 percent during 2033-61) occurring in the post-dam removal years (Table A-1).

A.2.b. Biological Subgroup

According to the Biological Subgroup, the action alternatives are expected to provide habitat favorable to spring Chinook:

> "If dams were removed it is reasonable to expect reestablished spring-run Chinook salmon to synchronize their upstream migration with more natural flows and temperatures. The removal of Project reservoirs would also contribute important coldwater tributaries (e.g., Fall Creek, Shovel Creek) and springs, such as the coldwater inflow to the J.C. Boyle Bypassed Reach, to directly enter and flow unobstructed down the mainstem Klamath River, thereby providing thermal diversity in the river in the form of intermittently spaced patches of thermal refugia. These refugia would be useful to migrating adult spring-run Chinook salmon by extending opportunities to migrate later in the season. The thermal diversity would also benefit juvenile salmon" (Hamilton *et al*. 2011, p 87).

A.2.c. Lindley/Davis Habitat Model

The Lindley/Davis habitat model focuses on potential Chinook escapement to the Upper Basin above Iron Gate Dam (IGD). The analytical approach involved compilation of escapement and watershed attribute data for 77 fall and spring Chinook populations in various watersheds in Washington, Oregon, Idaho and Northern California, and comparison of those attribute sets with the attributes of Upper Basin watersheds. Based on their analysis, the authors concluded that Upper Basin attributes fall well within the range of spring bearing watersheds.

According to Lindley and Davis:

> "Our model predicts a fairly modest increase in escapement of Chinook salmon to the Klamath basin if the dams are removed. The addition of several populations of spring-run Chinook salmon with greater than 800 spawners per year to the upper Klamath would significantly benefit Klamath Chinook salmon from a conservation perspective, in addition to the fishery benefits….The last status review of the UKTR [Upper Klamath and Trinity Rivers] ESU expressed significant concern about the very poor status of the spring-run component of the ESU (Myers *et al*. 1998). Viable populations of spring-run Chinook salmon in the upper Klamath would increase the diversity and improve the spatial structure

of the ESU, enhancing its viability (McElhaney *et al*., 2000) and improving the sustainability of the ESU into the uncertain future" (Lindley and Davis 2011, p 13).

A.2.d. Chinook Expert Panel

With regard to short term impacts of dam removal, the Chinook Expert Panel indicated that "Dam removal does not have a substantial multi-year adverse impact on mainstem Chinook salmon" (Goodman *et al.* 2011, p ii).

With regard to longer term effects, the Panel concluded that "The Proposed Action offers greater potential for increased harvest and escapement of Klamath Chinook salmon than the Current Conditions" (Goodman *et al*. 2011, p 16). More specifically, the Panel noted that

> "…a substantial increase[3] in Chinook salmon is possible in the reach between Iron Gate Dam and Keno Dam. A modest or substantial increase in Chinook upstream of Keno Dam is less certain. Within the range of pertinent uncertainties, it is possible that the increase in Chinook salmon upstream of Keno Dam could be large, but the nature of the uncertainties precludes attaching a probability to the prediction by the methods and information available to the Panel. The principal uncertainties fall into four classes: the wide range of variability in salmon runs in near-pristine systems, lack of detail and specificity about KBRA, uncertainty about an institutional framework for implementing KBRA in an adaptive fashion, and outstanding ecological uncertainties in the Klamath system that appear not to have been resolved by the available studies to date" (Goodman *et al*. 2011, p 7).

With regard to spring Chinook, the Panel noted:

> "The prospects for the Proposed Action to provide a substantial positive effect for spring Chinook salmon is much more remote than for fall Chinook. The present abundance of spring Chinook salmon is exceptionally low and spawning occurs in only a few tributaries in the basin. Under the Proposed Action, the low abundance and productivity (return per spawner) of spring Chinook salmon will still limit recolonization of habitats upstream of IGD. Intervention would be needed to establish populations in the new habitats, at least initially. Harvests of spring Chinook salmon could occur only if spring Chinook salmon in new and old habitats survive at higher rates than at present. Therefore, habitat quality would need to be higher than at present, and KBRA actions would need to greatly improve survival of existing populations of spring Chinook salmon. Factors specifically affecting the survival of spring Chinook salmon have not been quantified" (Goodman *et al*. 2011, p 25).

[3] The Panel defined the term 'substantial increase' to mean 'a number of fish that contributes more than a trivial amount to the population' and cited 10 percent of the average number of natural spawners or 10,000 fish as a rough approximation to what they mean by 'substantial'. As indicated in their report, "The Panel does not suggest that this figure is a likely increase or a minimum increase that is expected. It is only used as a benchmark for our discussions and to provide a basis for interpreting our response to the question" (Goodman *et al*. 2011, p 7, footnote 3).

A.3. Steelhead

Biological effects of the alternatives on Klamath River steelhead are evaluated on the basis of results of an Expert Panel convened in December 2010 to evaluate the effects of the alternatives on steelhead and coho (Dunne *et al*. 2011) and conclusions of the Biological Subgroup (Hamilton *et al*. 2011) regarding steelhead.

A.3.a. Coho/Steelhead Expert Panel

The Coho/Steelhead Expert Panel did not expect current conditions to be conducive to expansion of the steelhead fishery:

> "Current Conditions will not, in the short to medium term, result in an expansion of the fishery. Projecting harvest under the Current Conditions depends on the fate of the hatcheries and specifics of harvest policies into the future, which are insufficiently defined at this time" (Dunne *et al*. 2011, p 58).

Dam removal activities are expected to be injurious to steelhead; however, these effects are expected to be short-term.

> "The short-term effects of the sediment release will be sediment concentrations in the range of 1,000 to more than 10,000 milligrams per liter (mg/L), which will be injurious to upstream migrants of both species [coho and steelhead], and especially to any adult steelhead or 'half pounders' that hold or spawn in the mainstem. However, these high sediment concentrations are expected to occur for periods of a few months in the first two years after the beginning of reservoir lowering and sediment flushing. For a few years after that period, suspended sediment concentrations are expected to be higher than normal, especially in high flow conditions, but not injurious to fish" (Dunne *et al*. 2011, pp 18-19).

The Panel anticipates a long-term increase in abundance and distribution of steelhead under the action alternatives, provided certain conditions are met.

> "If the Proposed Action is implemented effectively, and the other related actions occur [e.g., Total Maximum Daily Load (TMDL)], then the response of steelhead may be broader spatial distribution and increased numbers of individuals within the Klamath system. This assessment is based on the likelihood of steelhead being given access to substantial new habitat, steelhead being more tolerant than coho to warmer water, the fact that other similar species (resident redband/rainbow trout) are doing well in the upstream habitat, and that steelhead are currently at lower abundances than historical values but not yet rare" (Dunne *et al*. 2011, p ii-iii).

The Panel notes, however, that long-term positive effects are subject to a number of uncertainties:

> "The Panel identified six principal obstacles to drawing convincing conclusions between the two alternatives: (1) insufficient specificity of the KBRA; uncertainties about (2) fish passage through Keno Reservoir and Upper Klamath Lake, (3) hatchery effects, (4) disease, and (5) water demand responses to KBRA; and (6) limited understanding about coho and

steelhead abundances, migration patterns, and factors affecting survival at each life stage" (Dunne *et al.* 2011, p iii).

A.3.b. Biological Subgroup

The Biological Subgroup concluded that the action alternatives would likely lead to expansion of the steelhead fishery above the current dam sites.

> "…it is likely that access under the without dams and with the KBRA management scenario would create a sport fishery for anadromous species, in particular steelhead, above IGD [Iron Gate Dam]" (Hamilton *et al*. 2011, p 68).

The Subgroup expects the action alternatives to be more beneficial to steelhead than to other anadromous species due to steelhead's habitat adaptability and disease resistance.

- "Because of their ability to navigate steeper gradient channels and spawn in smaller and intermittent streams (Platts and Partridge 1978), steelhead would realize the extent of anadromous habitat gain to a greater degree than other species" (Hamilton *et al*. 2011, p 51).

- "For steelhead, habitat above IGD [Iron Gate Dam] has the potential to increase returns by 6,800 to 20,000 spawners (Table 1). Disease problems in the Klamath River are far less likely to interfere with steelhead returns than with salmon returns, as Klamath steelhead trout are resistant to *C. Shasta* (Administrative Law Judge 2006)" (Hamilton *et al*. 2011, p 112).

A.4. Pacific Lamprey

Biological effects of the alternatives on Pacific lamprey are evaluated on the basis of results of an Expert Panel convened in July 2010 to evaluate the effects of the alternatives on that species (Close *et al*. 2010). The Panel distinguished between short and long term effects and effects downstream and upstream of Keno Dam.

The Panel expects the short-term adverse effects of sedimentation associated with dam removal to be minimal:

> "Pacific lamprey larvae utilize soft fine substrate for approximately 4-6 years in freshwater streams. Because they live burrowed in the soft sediments, there will likely be minimal increases in larval mortality rates of existing Pacific lamprey larvae in the mainstem Klamath River after dam removal. The larvae will likely relocate or adjust their burrow tubes to maximize feeding and respiration" (Close *et al*. 2010, p 33).

The Panel also considered long term effects, distinguishing between areas downstream and upstream of Keno Dam. While noting a potential 14 percent increase in Pacific lamprey habitat downstream of Keno, the Panel indicated that harvest potential would be somewhat less:

> "However, larval habitat quality in the reach between Iron Gate Dam and Keno Dam will be less desirable than in downstream reaches currently available to anadromous lamprey,

making the increase in lamprey production as the result of dam removal and KBRA in this reach alone less than 14 percent. When also considering that Conditions without Dams and with the KBRA might lead to an increase in productivity below Iron Gate Dam also (due to a potential increase in spawning habitat upstream of Iron Gate Dam and reestablishment of natural sediment dynamics downstream of Iron Gate Dam), the Panel then roughly estimated that there might be a total increase of production of outmigrant lamprey (and hence harvest potential) in the range of 1 to 10 percent relative to Conditions with Dams. Within the range of 1 to 10 percent, the production of lamprey in this extended range downstream of Keno Dam will depend on the survival of adults in the ocean and the success of the KBRA (Close *et al*. 2010, pp 45-46).

The Panel also noted the potential for Pacific lamprey to colonize the area above Keno Dam:

> "This area [upstream of Keno] was historically accessible to anadromous fishes, but the historical occurrence of Pacific lamprey is unresolved and investigations have only confirmed Pacific lamprey up to at least Spencer Creek. Nevertheless, improvements to fish passage scheduled for Keno Dam may open the upper Klamath River Basin to Pacific lamprey irrespective of their historical occurrence[4]….but the Panel does not know to what extent or over what time frame such increases could translate into increased harvest potential" (Close *et al*. 2010, p 46).

[4] Larval pheromones that guide lamprey to a given river are not species-specific. Thus Pacific lamprey could potentially colonize an area not previously occupied based on pheromones emitted by other lamprey populations that inhabit that area (Close *et al*. 2010, p 32).

Appendix B. Yurok Fishery Management

The Yurok Tribe has an extensive program of fishery management, monitoring and enforcement. The description of the program contained in this appendix is based on information provided in Yurok Tribe (2010) and Williams (2010).

Under the Yurok Tribe's Harvest Management Plan (HMP), commercial fishing is disallowed for all species except fall Chinook and is allowed only in years where fall Chinook abundance is sufficient to support commercial as well as subsistence harvest (Williams 2010, Yurok Tribe 2010). The Tribe sets aside a modest reserve quota from its overall fall Chinook quota that can be taken anywhere on the Reservation, and allocates the remaining quota among three management areas: (1) Estuary – Klamath River mouth to the Highway 101 bridge, (2) Middle Klamath – Highway 101 bridge to Surpur Creek, and (3) Upper Klamath – Surper Creek to the upstream boundary of the Yurok Reservation. Fish harvested under the three area subquotas can be used for subsistence or smoked for commercial sale. Once a subquota is exhausted in a management area, dip net fishing and angling are allowed in that area until the reserve quota is exhausted.

In years where the overall quota is sufficiently large, the Tribe may establish a commercial subquota for area (1) (the Estuary) in addition to the customary subsistence subquota. While sale of smoked fish is allowed in all areas, sale of fresh fish is allowed only in the Estuary. If the subsistence subquota in any area is exhausted before the commercial subquota, fish may be transferred in-season to that area's subquota from the commercial subquota.

Fresh fish commercially harvested in the Estuary may be sold on or off the Reservation. Fishers are charged a per-fish use fee to sell their catch to tribally authorized buyers at Requa. The authorized buyers are responsible for issuing receipts to sellers and for paying the use fee to the Yurok Tribal Fisheries Department. Fishers who sell fresh fish to anyone else on or off the Reservation must have a Temporary Commercial Permit issued by the Tribe. These fishers are personally responsible for providing triplicate receipts of each transaction (for themselves, the buyer, and the Fisheries Department). Buyers and sellers must have a receipt in hand while in possession of Chinook on the reservation.

Fishers wishing to sell their fish commercially –whether directly to the public, to a commercial buyer or to another Tribal member – must be certified. Certification involves completion of training on Commercial Fish Quality Control Regulations (CFQCR) and signing copies of the CFQCR, the HMP, and a summary of offenses and associated penalties. Individuals who sell fish harvested by other Tribal members must be similarly certified and can only sell fish harvested by certified fishers.

While used for commercial fishing in the Estuary, nets must display a commercial buoy marked with the fisher's ID and must be attended at all times while on the water. All commercially harvested fish must have an intact dorsal fin. When the commercial season is open, all subsistence fish must have their dorsal fin clipped within five minutes of first handling the fish, to allow subsistence fish to be distinguished from commercial fish. Gutting and filleting of fish is allowed only at designated cleaning stations.

The Yurok Tribe also manages a tribal guide fishery. Tribal members wishing to be guides must be certified. Non-tribal anglers wishing to harvest Yurok fall Chinook must receive a Tribal permit, fish with a Tribal guide, and adhere to California Department of Fish and Game regulations regarding gear restrictions and bag limits. Fall Chinook harvested in the tribal guide fishery are taken from the reserve quota.

Fishery regulations are enforced by Yurok Public Safety officials. Depending on the nature and frequency of the infraction, penalties can range from monetary fines to forfeiture of fish to temporary or permanent forfeiture of gear, vessel, fishing rights and/or certification.

Fishing in management areas (2) and (3) consists of fishers setting their nets at traditional family fishing sites during the evening and returning to check their nets the following morning. Monitoring crews conduct a total net count by boat after dark over the entire management area, then contact fishers the next morning to quantify and sample their catch. Daily net counts are multipled by catch per net to estimate daily harvest, which is summed over all days to derive total season harvest. Biological data are also collected, including lengths, weights, sex, tags, fin clips, and snouts from adipose fin clipped fish. Fish are also inspected for seal or otter bite marks.

While traditional fishing sites are also located in management area (1), most fishing in that area occurs from boats with gillnets that are continually attended. During the fall fishery, effort in area (1) varies with the tides. Effort counts are made every two hours to estimate total net hours. Catch per unit effort (CPUE), calculated as fish per net-hour, is also estimated. Effort and CPUE are stratified by gear type to allow derivation of separate harvest estimates for set nets, drift nets, dip nets and angling. Biological data are also collected, as in areas (2) and (3).

To minimize impacts of the subsistence fishery on ESA-listed SONCC coho, the subsistence fishery is closed 48 hours each week during period when coho migrate through the Reservation (September 25-November 30). In years when a commercial fishery is allowed in area (1), the commercial season is closed after September 25.