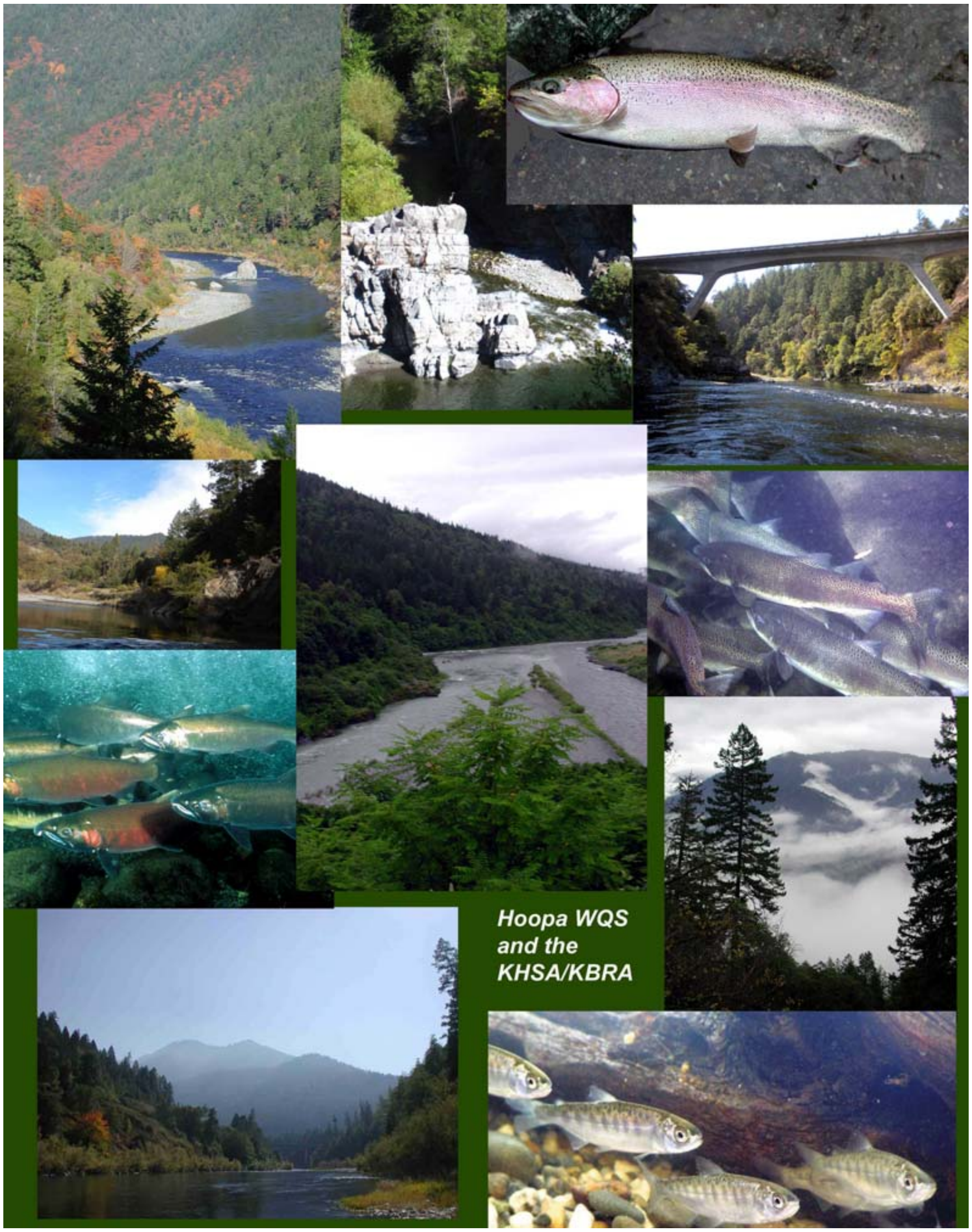
KHSA and KBRA Likelihood of Meeting Hoopa Valley Tribe Klamath River Water Quality Standards



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Prepared for**:**
Hoopa Tribal Environmental Quality Agency

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Foreword

The purpose of this report is to provide the following information for the Hoopa Tribal Environmental Protection Agency (TEPA) in response to their request:

- Provide a clear over view of whether water quality management under the Klamath Hydropower Settlement Agreement (KHSA) and Klamath Basin Restoration Agreement (KBRA will attain Hoopa Valley Tribe (2008) Klamath River Water Quality Standards (WQS),

- Provide recommendations for exercising the Hoopa Valley Tribe's WQS authority under the KHSA/KBRA water quality management process,

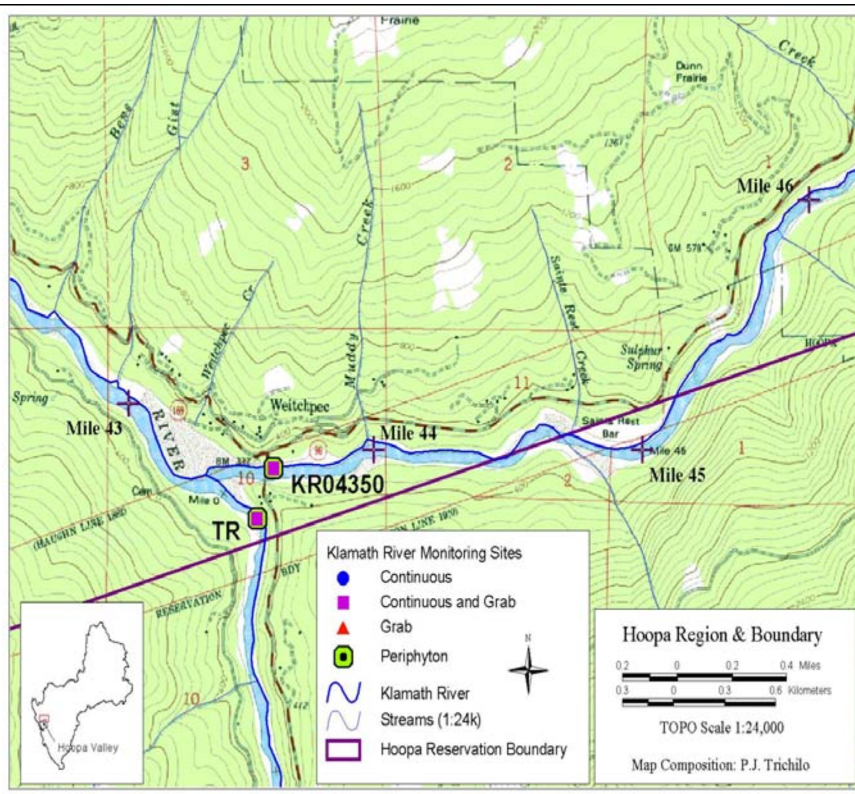
- Identify options other than the KHSA/KBRA for the Hoopa Valley Tribe that achieve dam removal, and

- Provide recommendations for coordinating efforts with local tribes and other entities regarding pursuing an alternative approach for dam removal.

These are section headers in the report below, but sections on the origin of the KHSA/KBRA and using ecological restoration to attain Hoopa WQS are also included.

The Hoopa Indian Reservation includes a segment of the mainstem Klamath River just upstream of its confluence with the Trinity River (Figure 1 at right).

Hoopa Valley Tribe water quality authority that allows them to create water quality standards (WQS) for the Klamath River is based on U.S. EPA (2002) approval.



Origin of the KHSA and KBRA

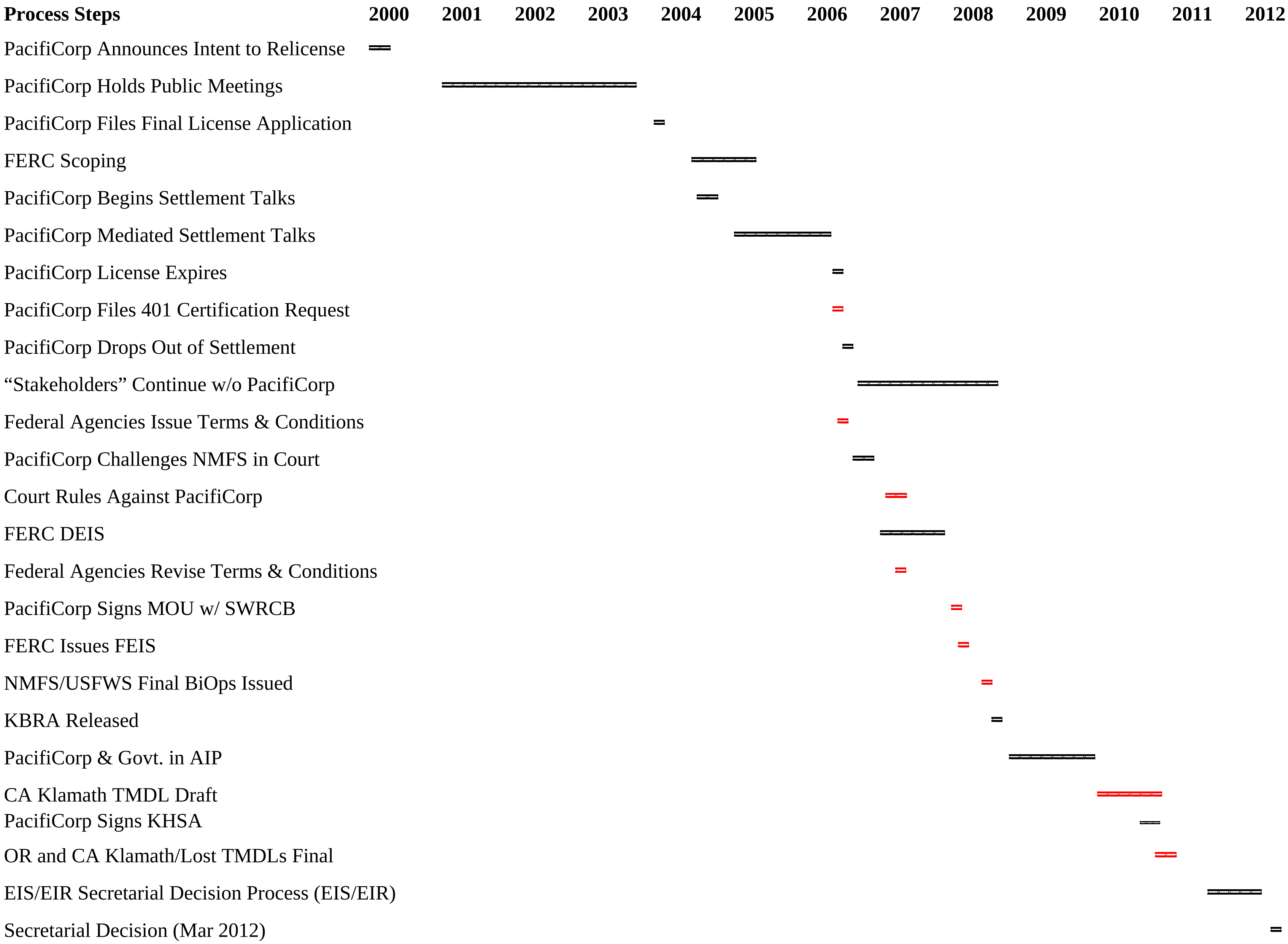
The KHSA is a negotiated settlement in lieu of following the Federal Energy Regulatory Commission (FERC, 2007) relicensing process for the Klamath Hydroelectric Project (KHP) (FERC #P-2082). The KHP is owned and operated by PacifiCorp and the company has pursued settlement because the outlook of their relicensing process did not look favorable (Brockbank 2010). The deposition of PacifiCorp Executive Vice President Dean Brockbank (2010) supplies much of the information in this section about the chronology of settlement talks (see also Alternatives for KHP Dam Removal).

PacifiCorp first announced its intention to relicense the KHP in December 2000 and held a series of public meetings before filing its Final License Application in February 2004. Table 1 provides a time line that chronicles steps in relicensing, other processes that have bearing on relicensing (i.e., 401 certification) and KHSA and KBRA development. Red highlights in the table indicate unfavorable components of relicensing of the KHP from PacifiCorp's perspective. In particular, PacifiCorp was apprehensive about obtaining necessary State water quality certification (SWRCB 2007) and the cost of fish passage facilities for Pacific salmon species mandated by the National Marine Fisheries Service (NMFS 2006).

PacifiCorp began informal settlement talks in October 2004 that became a "mediated" settlement in January 2005. The settlement process took over five years to complete and ironically PacifiCorp dropped out of talks in mid-2006 as other "stakeholders" crafted the KBRA. The Energy Policy Act of 2005 (Public Law 109-58) allowed entry into settlement at any time within the licensing process for PacifiCorp. This new law also allowed PacifiCorp to challenge NMFS' authority to require KHP fish passage but their challenge was rejected by an administrative law judge (McKenna, 2006). PacifiCorp's KHP license expired on March 1, 2006 and FERC has been issuing 1 year extensions since. The company reengaged with state and federal agencies regarding potential decommissioning through an Agreement in Principal (AIP) in July 2008 (CA, OR, USDOI and PacifiCorp 2008) that was superseded by their signing the KHSA in February 2010. PacifiCorp is not a signatory to the KBRA, but all Parties signing the KBRA also signed the KHSA.

The creation of the KBRA involved dozens of meetings spanning several years, all behind closed doors with participants bound by a confidentiality agreement. Although the process involved several counties, Tribes, environmental organizations and government agencies, key participants were excluded from participation, including Del Norte County and the federally recognized Resighini Rancheria and the Quartz Valley Indian Reservation. The Hoopa Valley Tribe participated in the Settlement, but declined to sign the final KBRA or KHSA because they would require giving up water rights and the ability to take legal action to abate water quality problems to protect fisheries (KBRA 15.3.9). The KBRA and KHSA are arcane documents written by lawyers with tedious cross references and a myriad of contradictions. Ultimately important decisions regarding public trust and Indian Treaty Rights and Trust responsibilities are embodied in these documents that were made out of public view and excluded legitimate stakeholders.

Table 1. Time Line for Klamath Settlement Process



In April 2007 during the Settlement that preceded the KBRA, Klamath Project irrigators made an ultimatum with regard to their continuing participation; any Settlement would have to include farming in the Lease Lands of Tule Lake and Lower Klamath National Wildlife Refuges. Oregon Water Watch (OWW 2010) and Oregon Wild (OW) were expelled from Settlement talks because they would not agree to this condition. Talks continued without OWW and OW, but this requirement restricted subsequent consideration of viable ecological restoration options under the KBRA.

Although the KBRA is separate from the KHSA and deals with issues largely unrelated to KHP relicensing, the agreements are intertwined due to KBRA (7.2.1 C) and KHSA (8.1) "severability" clauses that state that neither can be implemented separately. Therefore, both the KHSA and KBRA are discussed below with regard prospects of meeting Hoopa TEPA (2008) WQS. The *Klamath River and Lost River Total Maximum Daily Load (TMDL)* (NCRWQCB 2010) and *Upper Klamath and Lost River TMDL and Water Quality Management Plan* (ODEQ 2010) are integral to improving water quality, so their potential to improve conditions is also considered.

KHSA and KBRA Actions Insufficient to Meet Hoopa TEPA WQS

The KHSA has to do with dam decommissioning and pollution associated with KHP operation while the KBRA would deal with fishery restoration and potential remediation of water quality problems. Both the KHSA and KBRA will require federal authorizing legislation, including $1 billion or more in funding. Legislation has not been passed. Pollution associated with KHP dam operation will continue under the KHSA until 2020, but there is also a question as to whether measures taken under the KBRA after dam removal will be sufficient to abate nutrient pollution and meet Hoopa TEPA (2008) WQS. Interim Measures to abate water quality problems under the KHSA are pertinent to the Klamath River TMDLs and are discussed in that section below. Table 2 lists beneficial uses recognized by the NCRWQCB (2007) *Basin Plan* and Hoopa TEPA (2008) and their likelihood of being met under the KBRA/KHSA before and after 2020.

Table 2. Likelihood of meeting Klamath River beneficial uses under the North Coast Basin Plan (NCRWQCB 2007) or Hoopa TEPA (2008) WQS before and after 2020 under the KBRA/KHSA. Green indicates beneficial uses are restored and red indicates that they are not.

Beneficial Use	Key	Before 2020	After 2020
COLD	Cold freshwater habitat		
SPAWN	Fish spawning		
MIGRATION	Fish migration		
RARE	ESA and CESA Fish		
COMM	Commercial & Sport Fishing		
FISH	Subsistence Fishing		
CUL	Cultural Use		
REC-1	Recreational Contact		
REC-2	Recreational Boating		

KHSA

The KHSA does not directly call for KHP dam removal but rather sets up a March 2012 Secretary of Interior Decision as to whether decommissioning is in the public interest and will benefit the environment, including Klamath River native fish species. A major effect of the KHSA is to delay the 401 processes of California (PacifiCorp 2008, SWRCB 2008) and Oregon that had the potential to force expeditious dam decommissioning (Brockbank 2010), if either State withheld certification. The serious nuisances caused by KHP reservoirs is justification for swift dam removal (SWRCB 2007), but instead under the KHSA the project will operate until 2020 on a year to year extension of its 1956 FERC license (Brockbank 2010). Numerous problems have been identified with regard to KHP operation that lead to major negative impacts on salmonids and other beneficial uses (Hoopa TEPA 2008), and to some extent these cannot be mitigated without dam removal (SWRCB 2007, FERC 2007).

Fish Passage: Fish passage for anadromous species is considered as part of the COLD beneficial use according to the SWRCB (2007), and migration for Pacific salmon species (MIGR) will continue to be blocked until at least 2020 under the KHSA and KBRA (see Alternatives for Dam Removal). Coho salmon that are affected by the KHP are listed as Threatened under the federal Endangered Species Act (ESA); therefore, the RARE beneficial use is also compromised. The impediment to migration also continues to compromise the commercial and sport fishing beneficial use (COMM) and tribal subsistence fisheries (FISH).

Thermal Problems Created by Iron Gate Reservoir: The mass of water within Iron Gate Reservoir creates thermal problems that delay Chinook salmon spawning (SPAWN) in fall and impair juvenile rearing conditions (COLD) in spring. This will continue until drawdown of the reservoir or Iron Gate Dam removal. Klamath River fall temperatures remain above suitable for spawning three weeks later than if the river were free flowing (Figure 4). The KBRA Chinook Expert Panel (Goodman et al. 2011) noted high “pre-spawning mortality documented in the mainstem river may be related to high water temperature and moderately low dissolved oxygen”, which are both side effects of reservoir operation. Increased fall water temperatures and associated stress are also likely to reduce fecundity. Fry from eggs laid later in the season emerge later in spring and their growth is then suppressed by artificially depressed Klamath River. Smaller fry migrate more slowly as the Klamath River water temperature rises and water quality becomes adverse. With their resistance compromised by water quality related stress, these fish also face much greater exposure to the disease organisms (see below). The thermal lag at Iron Gate appears to have shifted spawn timing of fall Chinook later and the losses of juveniles are sometimes in the hundreds of thousands (USFW 2001, Nicholas and Foott 2005). While temperature effects of Iron Gate Reservoir do not extend downstream to the Hoopa Reservation, maintaining Iron Gate Dam through 2020 leads to unacceptably high risk to the Klamath River fall Chinook population. Continued depressed Chinook populations blocks attainment of commercial and sport fishing (COMM) and tribal subsistence fishing (FISH) beneficial uses.

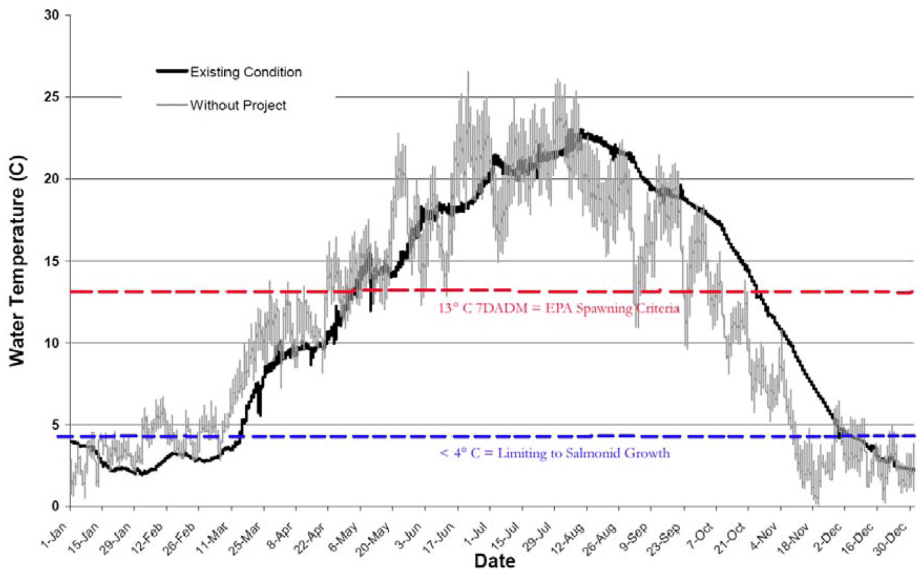


Figure 2. Temperatures below Iron Gate Dam (bold) versus without dam scenario (grey). Warmer fall temperatures create a three week lag for suitability of spawn timing and rearing temperatures remain below optimal for a month. Reference thresholds from U.S. EPA (2003).

Fish Disease Cycles: One of the main impediments to restoring COLD, COMM, RARE and FISH beneficial uses of Pacific salmon in the Klamath River, particularly Chinook salmon and coho salmon, is the extremely high prevalence of disease organisms below Iron Gate Dam (Foott et al. 2003, Stocking and Bartholomew 2004, Nichols and Foott 2005, Nichols and True 2007, Nichols et al. 2008, Bartholomew 2008, Stocking et al 2006, Stone et al. 2007). Two myxozoan disease organisms, *Ceratomyxa shasta and Parvicapsula minibicornis*, are endemic to the Klamath River and the Pacific salmon species have co-evolved with them and have developed substantial resistance. However, nutrient enrichment from the Upper Klamath Basin and from within Iron Gate Reservoir sets up conditions that cause extraordinarily high production of disease organisms that can overwhelm otherwise healthy fish (Nichols and Foott 2005).

The green algae species *Cladophora* is recognized as an indicator of nutrient pollution and there are areas below Iron Gate Dame where this species is dominant (Stocking et al. 2006). A polychaete worm, *Manayunkia speciosa*, which thrives in Cladophora beds also serves as an intermediate host for the deadly diseases. Fall Chinook spawning is concentrated below Iron Gate Dam and adults carry myxospores that cause a vicious cycle as *M. speciosa* captures them and then releases actinospores when Chinook juveniles are migrating downstream (Stocking et al. 2006, Bartholomew 2008). Stocking et al. (2006) concluded that actinospores remain viable during the 5 days required for water to pass from Iron Gate Dam to the Klamath estuary. Therefore, it is likely that disease problems will continue for fish migrating through the Hoopa Reservation portions of the Klamath River until at least 2020. Disease effects can extend downstream of the Trinity River and there indications of major impacts to juvenile Chinook from that river (Figure 3); therefore, Hoopa Valley Tribe Trinity River fish harvest is also directly impacted.

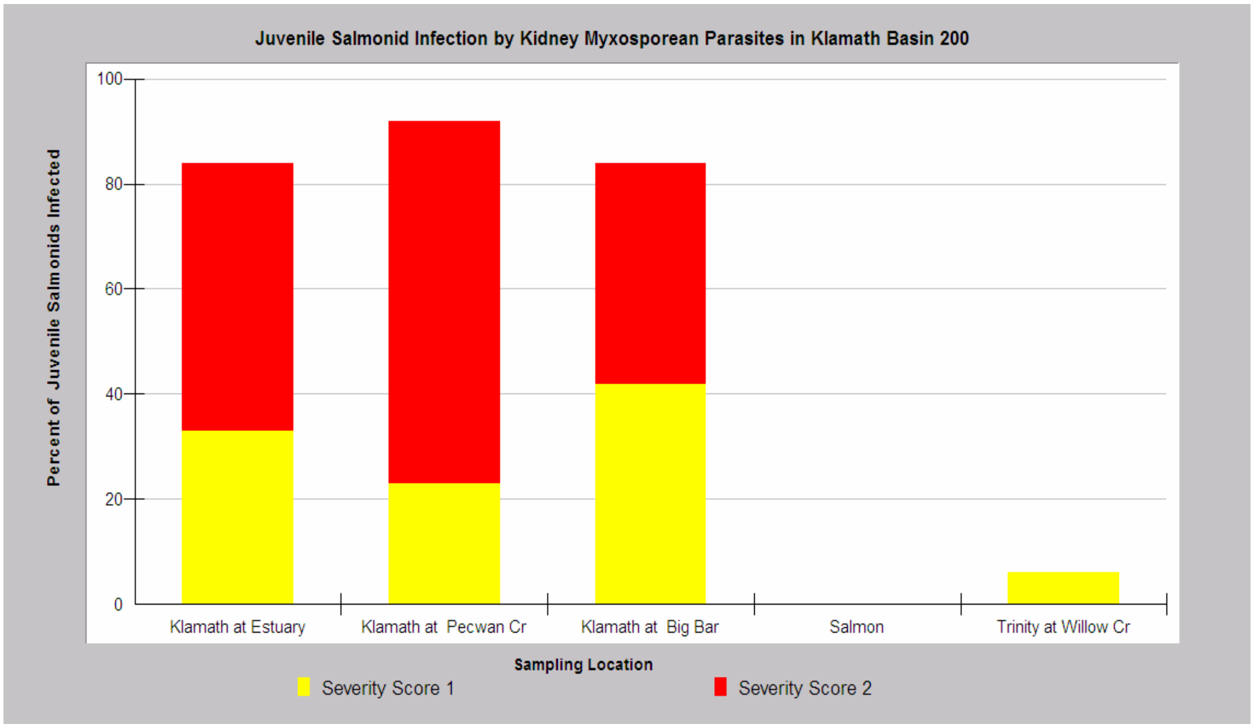


Figure 3. Chart shows the percentage of juvenile salmonids infected by kidney myxosporean parasites. High severity (2) score indicates likely mortality. While Trinity River infection is low, Pecwan and estuary high disease incidence suggests Trinity fish are becoming infected. Most of the juvenile salmonids sampled were Chinook salmon. Data from Foott et al. (2003).

Water Quality Stress: Fish susceptibility to disease is a function of cumulative stress caused by multiple water quality factors (Hoopa TEPA 2008). In addition to temperature, impairment below Iron Gate Dam can include elevated pH, algal toxins and dissolved ammonia as well as depressed dissolved oxygen (D.O.), all of which are linked to KHP dam operation (SWRCB 2007, FERC 2007). These conditions will continue to cause impairment until at least 2020 as a result of KHP operation and lack of attainment of the COLD, FISH, COMM, and RARE beneficial uses. The manifestation of nutrient pollution and associated problems for fish health may remain after dam removal, but that prospect is more fully explored under the KBRA section below.

Toxic Algae: Kann (2006) found the toxic algae species *Microcystis aeruginosa* to be prevalent within Copco and Iron Gate reservoirs but in low abundance or absent from the outlet of Upper Klamath Lake to below J.C. Boyle Reservoir within the Klamath Project. The SWRCB (2007) points out that there is little chance for remediation of toxic algae in the lower two KHP reservoirs before 2020; therefore, NCRWQCB (2011) staff do not recommend PacifiCorp carry out Interim Measures within the reservoirs aimed at treating algae problems (see TMDL discussion).

Kann and Corum (2009) found evidence of *Microcystis* downstream at Orleans and samples from the Yurok Reservation indicate it is present downstream to the estuary (Yurok 2009). Kann (2008) also reported bioaccumulation of microcystin toxin in Iron Gate Hatchery Chinook salmon juveniles. Yellow perch from Copco and Iron Gate

Reservoirs and mussels downstream of the KHP had such high levels due to bioaccumulation that they would pose a human health risk, if consumed. Emerging epidemiological evidence suggests that the substance BMAA (beta-methylamino-L-alanine) that is prevalent in toxic blue-green algae species may be linked to neurological disorders, such as Amyotrophic Lateral Sclerosis (ALS) (Lou Gehrig's disease), Parkinson's disease and Alzheimer's disease (Caller et al. 2009). Impairment of Hoopa Reservation waters on the Klamath River from toxic algae will continue through at least 2020 with the recreational (REC-1) beneficial use compromised and ceremonial use (CUL) in certain seasons inadvisable.

Keno Reservoir Operation: The KHSA (7.5.4, 7.5.5) stipulates that the U.S. Bureau of Reclamation (BOR) will assume ownership of the Keno Reservoir and will continue to operate it in the same way that PacifiCorp has since 1968. Keno Reservoir has major problems with seasonal anoxia (Deas and Vaughn 2006, Sullivan et al. 2009, 2010) and riparian marsh restoration needed to combat this problem will, therefore, be prevented. Historically a lava bedrock sill at the location of Keno Dam caused the Klamath River to back up and form a vast connected wetland with Lower Klamath Lake. Diking off of wetlands and farming up to the margin of the reservoir has disrupted river processes that could otherwise assist with nutrient processing and reduction, similar to the findings of Bernot and Dodds (2005). Dredging of the reservoir to increase water storage capacity circa 1968 likely contributed to a decreased ability for ecological function and an increased propensity for anoxia.

Goodman et al. (2011) call attention to persistent problems of prolonged anoxia in Keno Reservoir (Figure 4) that they believe will not be alleviated under the KBRA. Figure 5 shows a map from PacifiCorp (2004) of riparian vegetation of the Keno Reservoir just above Keno Dam and Figure 6 is an aerial photo of the same area showing the pattern of land use. Continuing this land use and pattern of operation of Keno Reservoir under the KHSA will prevent improved ecosystem function by riparian marshes that could otherwise assist with clean up of nutrient pollution (Lytle 2000, Mayer 2005).

The ODEQ (2010) TMDL found that the suspended load from Upper Klamath Lake is a major driver of anoxia in Keno Reservoir; however, they also found the waste load from the Straits Drain to be a major source of pollution. ODEQ (2010) provided a schematic of flow diversions from the Klamath River and flow contributions to Keno Reservoir (Figure 7). Waste water from the Klamath Straits Drain in August 2002 constituted 48% of flows to the reservoir, which is similar to NRC (2004) findings. The Lost River and Tule Lake were originally a sink and did not discharge into the Klamath River; therefore, the high level of nutrients contributed by them today help push the river past the tipping point where ecosystem processes are insufficient for the river to clean itself. This results not only in anoxia within the Keno Reservoir but also in very adverse water quality impacts in the lower Klamath River.

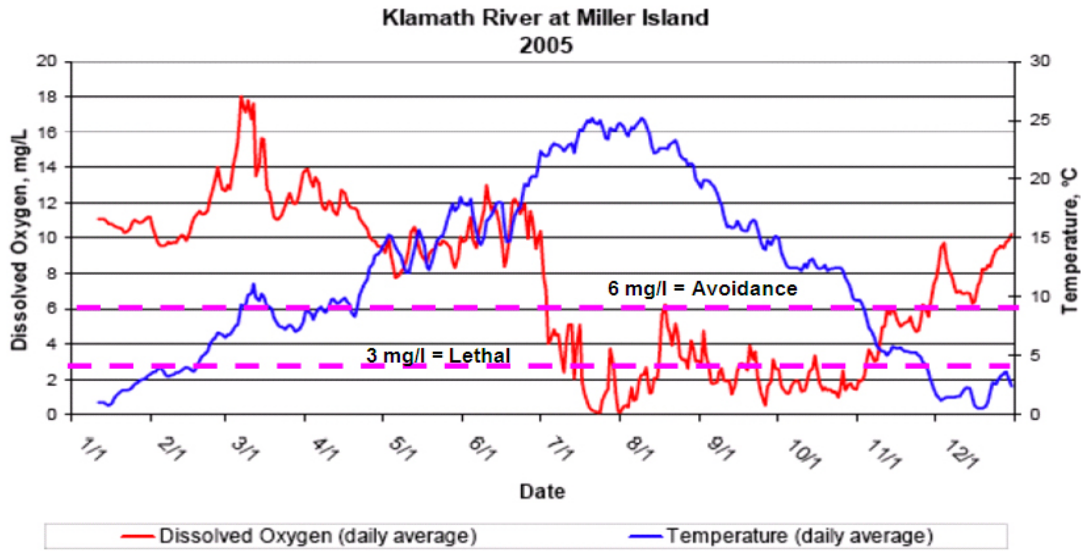


Figure 4. This chart shows fluctuations of water temperature and dissolved oxygen in Keno Reservoir in 2005 with lethal levels extending from July through October. Taken from Goode et al. 2011 where it appears as Figure 4. Threshold reference annotations added based on WDOE (2002).

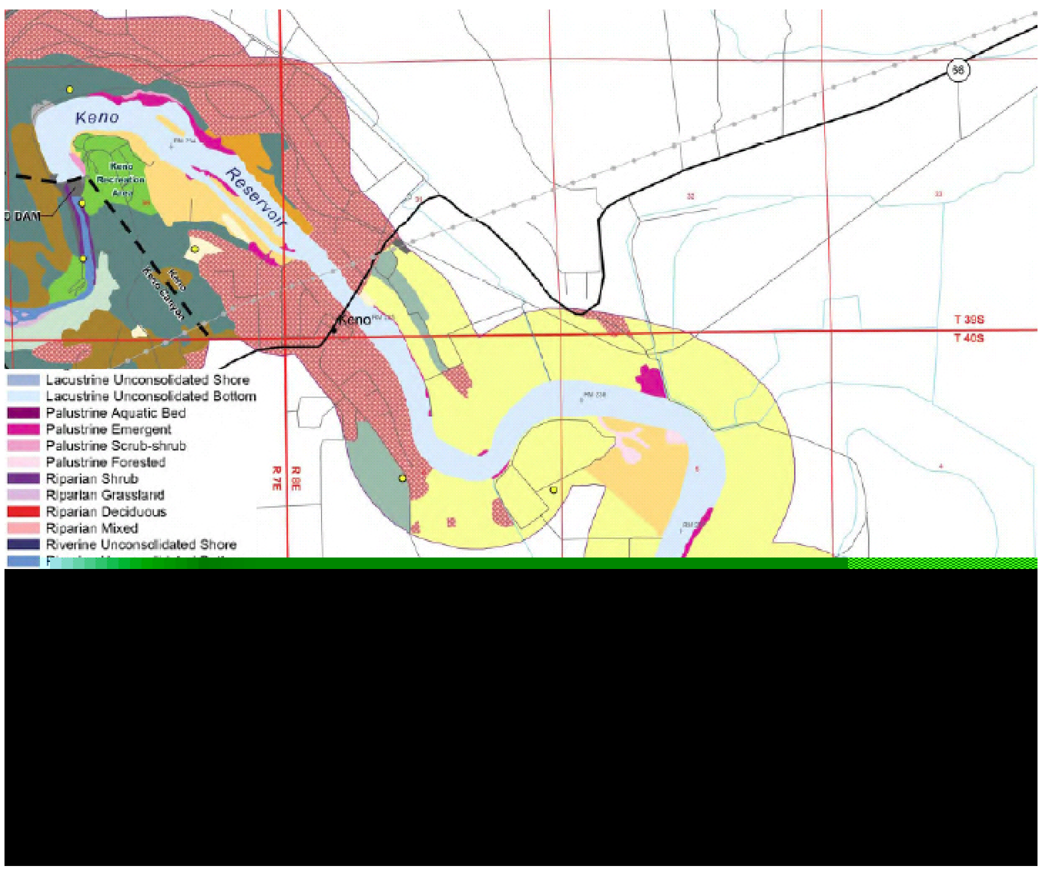


Figure 5. Keno Reservoir riparian vegetation map from PacifiCorp (2004) showing irrigated hayfields right up to the margin with no marsh buffer to help absorb nutrients and to provide other ecosystem services.

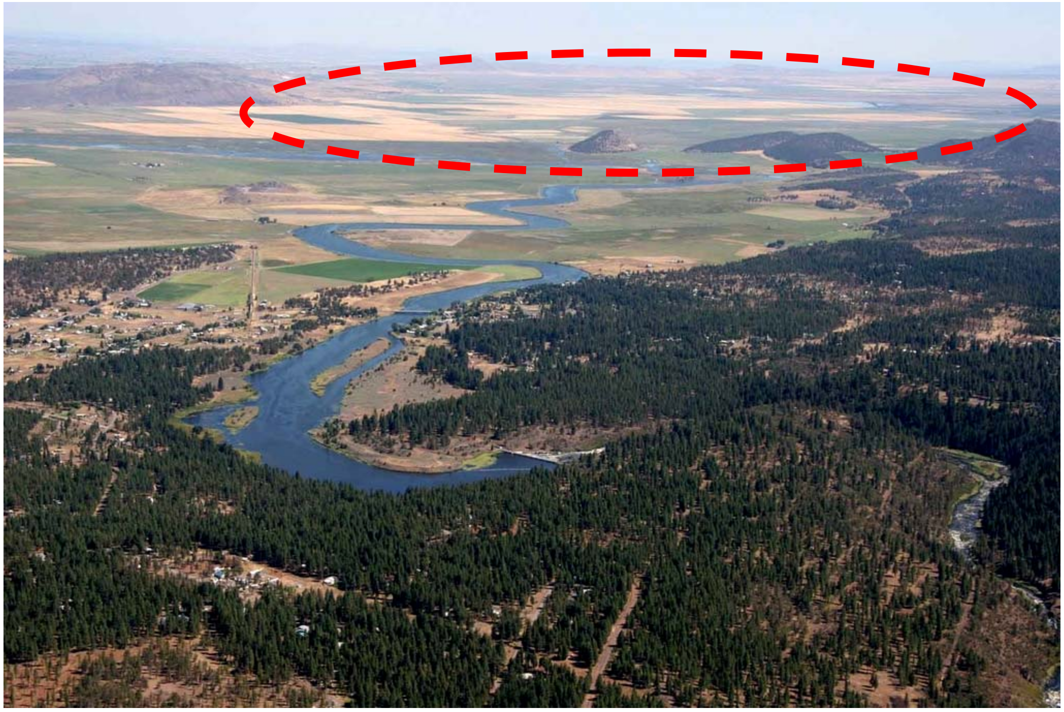


Figure 6. Aerial photograph of Keno Reservoir with Keno Dam below center and the old Lower Klamath Lake bed in the distance (red oval).

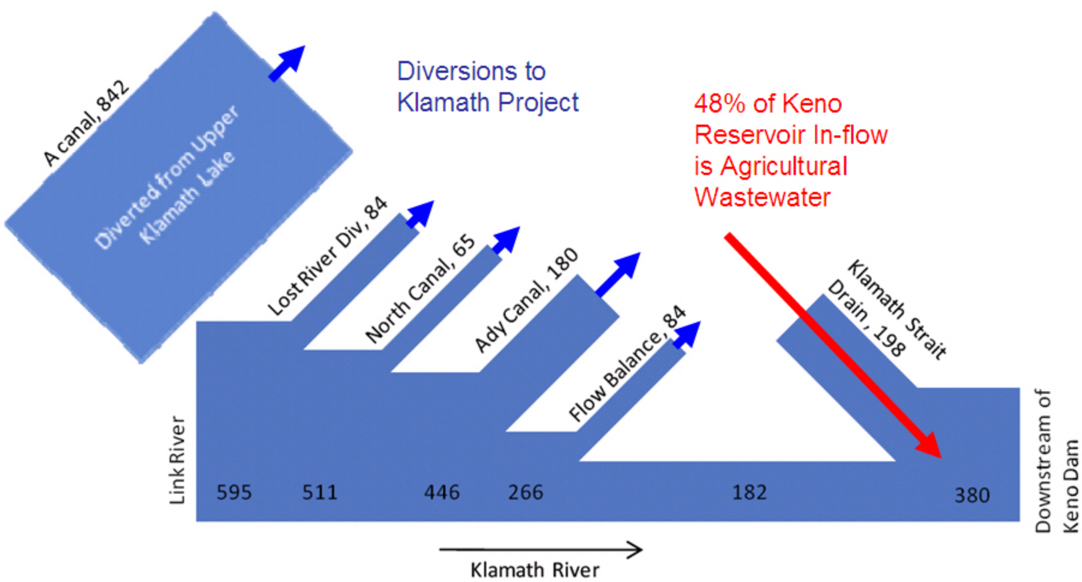


Figure 7. Average daily flow in August 2002 into the Klamath Project and Keno Reservoir. From ODEQ (2010) where it appears as Figure 2-21.

Agricultural discharges from the Lost River through the Lost River Diversion (LRD) canal are known to occur in winter (Deas and Vaughn 2006); however, ODEQ (2010) also found substantial nutrient contributions from that source in summer and fall of 2000 and 2008. ODEQ (2010) model runs of D.O. depletion in Keno Reservoir (Figure 9) show that the contributions from the LRD in September and October 2008 had substantial impacts in addition to discharges from the Klamath Project through the Straits Drain.

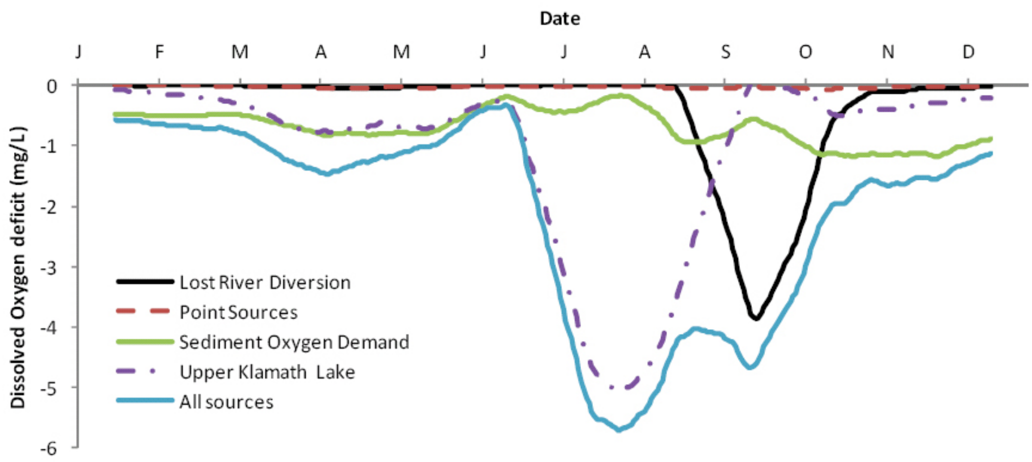


Figure 8. This chart is taken from ODEQ (2010) and shows model results of the D.O. deficits in Keno Reservoir by month in 2008 with a substantial contribution from the LRD Canal in fall, which likely extended conditions lethal to salmonids for two months.

<u>KBRA</u>

The KBRA does not have a water quality plan and has a very broad and ill defined strategy for clean up of nutrient pollution in the Upper Klamath Basin (Dunne et al. 2011, Goodman et al. 2011). Flows under the KBRA (Appendix E-5) will drop further from historic norms (Dunne et al. 2011), which will cause water pollution and fish health problems to persist or even worsen (Goodman et al. 2011). Lost River surface flows are likely to also be reduced under the KBRA resulting in direct impacts to ESA listed suckers and increased nutrient concentrations in waste discharges sent to the Keno Reservoir. The greatest KBRA effect on water quality, however, is that it guarantees continued agricultural land use over vast areas, including sites critically needed for ecological restoration. Major subsidy for maintaining low cost power for Upper Basin water users is also part of the KBRA, when the footprint of agriculture might otherwise shrink due lack of profitability (Jaeger 2004) helping to lower water demand and nutrient pollution.

<u>Klamath River KBRA Flows</u> <u>to Increase Water Quality Problems</u>: The KBRA convened Expert Panels (Dunne et al. 2011, Goodman et al. 2011) to judge the sufficiency of action in restoring conditions favorable for different fish species in the Klamath Basin. The Coho Salmon and Steelhead Expert Panel (Dunne et al. 2011) expressed concern that there would be no consideration under the KBRA of trying to restore historic flows in the Klamath River. Before the Klamath Project was created, Lower Klamath Lake (LKL) would fill in winter and then augment Klamath River flows from May through July (Weddell 2000). Dunne et al. (2011) charted flows before and after Klamath Project construction to show the departure from historical patterns (Figure 9). A return to historic flows would reduce water temperature and nutrient concentrations, which in turn would reduce algae blooms and fish diseases. Figure 9 is annotated to show where departures from the natural flow regime of the Klamath River since the construction of the Klamath Project increase water temperatures and water quality problems as well as

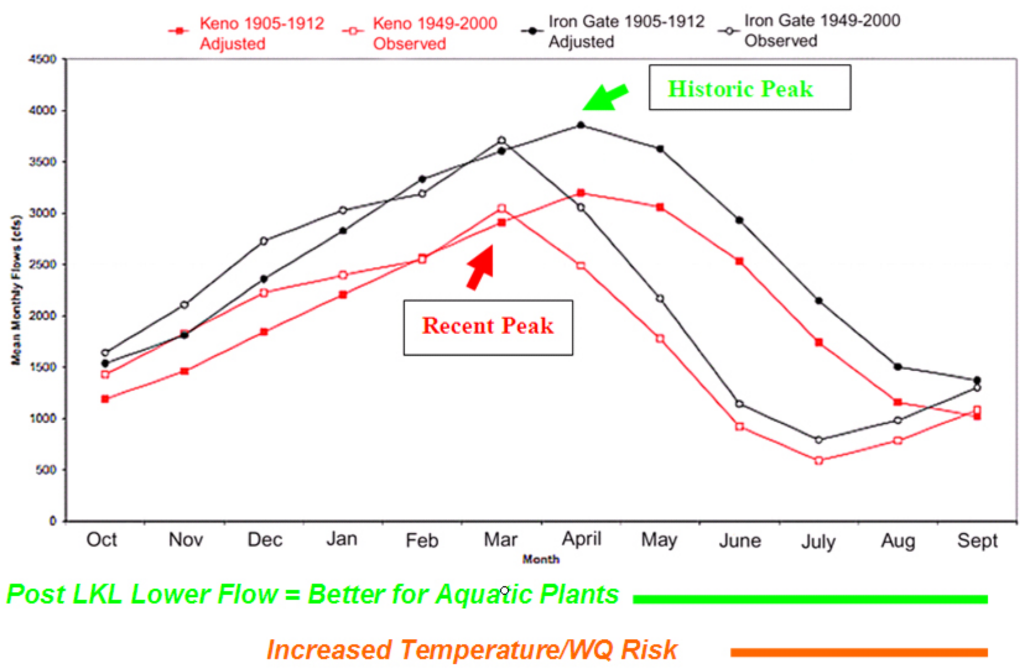


Figure 9. Chart of historic seasonal flows versus those after the construction of the Klamath Project and the disconnection of Lower Klamath Lake. Annotations include historic and recent peaks as well as periods likely to increase algal growth, temperature and nutrient pollution (WQ) added. Taken from Dunne et al. (2011) where it occurs as Figure 3.

promoting conditions that favor growth of algae beds. Continued agricultural activity in the Lower Klamath National Wildlife Refuge (LKNWR) under the KBRA forecloses the option of refilling the lake and increasing spring and early summer flows; instead KBRA flows will depart even further from historic norms.

Flows under the KBRA will be less than those called for under the Klamath Project operations NMFS (2010) Biological Opinion (B.O.) for coho salmon and Hardy et al. (2006). Figure 10 shows Klamath River flows at Iron Gate Dam for the 90% exceedance (very dry) water year with the KBRA WRMS R32 model run, the NMFS (2010) Biological Opinion (B.O.) flows and minimums recommended in the Hardy et al. (2006) Phase II study (Hoopa Tribe Fisheries Department 2011). Annotations once again show periods when very low flow conditions will foster increased algae growth and trigger more adverse water quality. Algae build up has the potential to be most injurious during prolonged droughts when there is insufficient water for flushing flow releases in spring.

Table 3 captures KBRA model (Appendix E-5) projections for Klamath River flows at the location of Iron Gate Dam Flows during extreme drought years similar to 1992 and 1994. Flows could fall as low as 442 cubic feet per second (cfs) (Figure 11) while the adult salmon kill of September 2002 was triggered by flows of 758 cfs (Guillen 2003, CDFG 2003). Reduced flow decreases the volume of water which in turn increases water temperature and nutrient concentration. Although the KBRA states that the Drought Plan would define higher flows for fish needs, the draft Drought Plan circulated in May 2011 does not have alternative levels to those in Appendix E-5 (Resighini Rancheria 2011a).

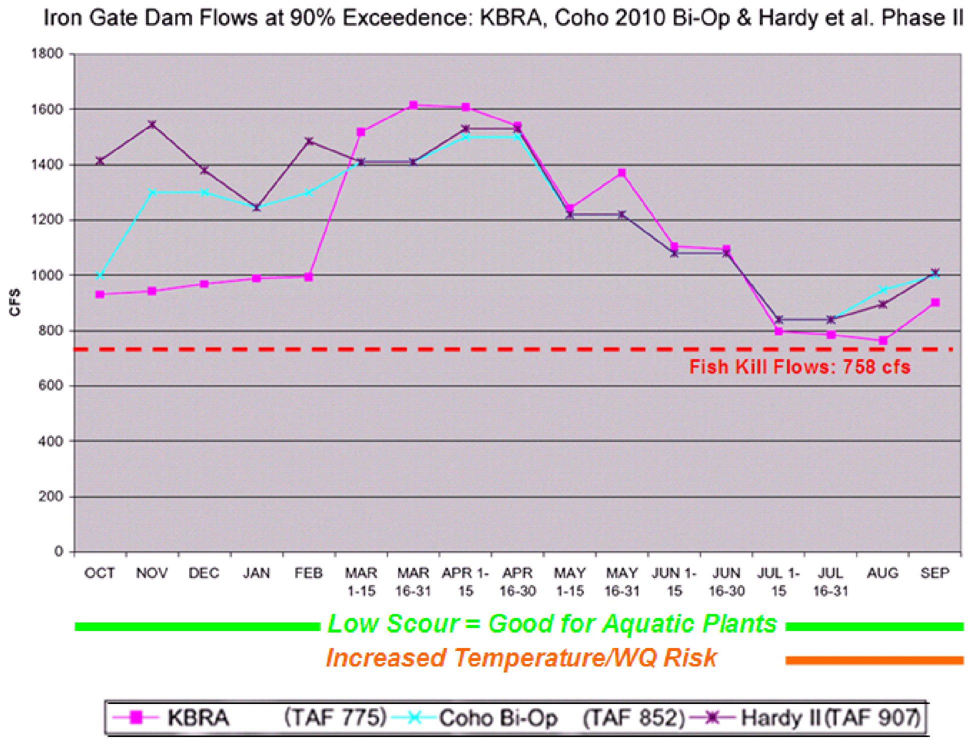


Figure 10. Flows at Iron Gate Dam in a 90% exceedance flow year comparing the KBRA WMRS R32 model flows, NMFS (2010) BO flow levels and Hardy et al. (2006) Phase II. Data from the Hoopa Fisheries Department. Reference is USGS Iron Gate September 2002 fish kill flow release.

Table 3. KBRA WRMS model flow simulations at Iron Gate Dam for years similar to 1992 and 1994 under KBRA flow allocations. R32 = primary run. R33 = with additional storage. R34 = with additional storage and climate change. Yellow indicates lower than September 2002 fish kill flows (758 cfs).

Period	R32_1992	R32_1994	R33_1992	R33_1995	R34_1992	R34_1994
Jan	854	959	819	1106	846	1106
Feb	809	928	800	1025	809	1025
Mar_1_15	1022	1239	800	996	800	996
Mar16_31	1021	1151	800	860	826	924
Apr_1_15	1063	1184	800	824	786	847
Apr_16_31	1022	1125	800	821	767	813
May_1_15	807	924	800	813	701	798
May_16_31	843	1069	800	812	668	823
Jun_1_15	698	913	800	811	581	773
Jun16_30	646	873	800	809	610	753
Jul_1_15	509	629	700	706	515	607
July15_30	524	574	700	705	537	561
August	442	485	800	804	533	548
Sept	512	577	800	808	519	552
Oct	549	582	800	811	800	811
Nov	647	690	829	800	829	800
Dec	774	762	914	800	914	800

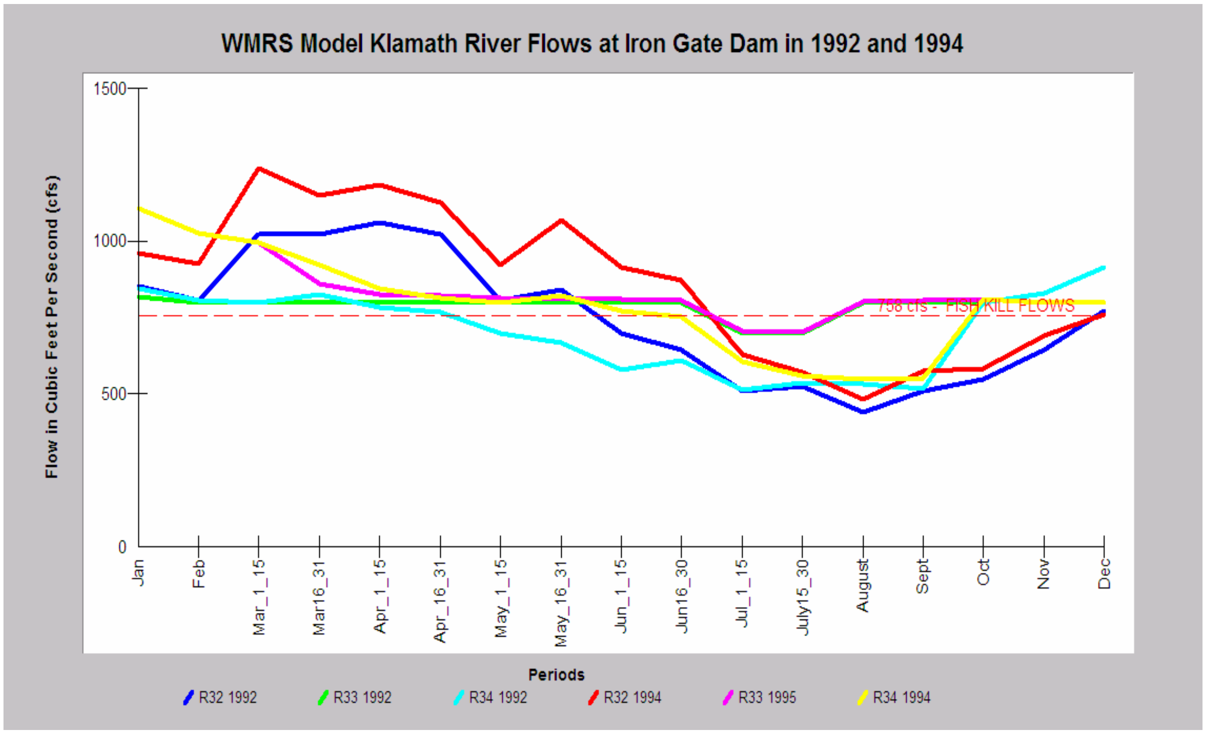


Figure 11. KBRA WRMS model run for flows at the location of Iron Gate Dam in years of Extreme Drought, with similar Upper Klamath Lake in-flow to 1992 and 1994. Data from KBRA (E-5, Tables 2, 4, 6).

Moving flows further away from their historic range of variability poses greater risk due to processes described in the FERC (2007) Final Environmental Impact Statement (FEIS) for the KHP relicensing:

> "Over time, the overall limitations on water availability and dynamic hydrographs contribute to conditions that result in a channel that becomes stable and prone to other undesirable consequences to water quality and aquatic resources."

Although nutrient concentrations are reduced by greater water volume (Asarian et al. 2010), the KBRA (Section 25.1.4) states that increasing flows will be the last option for improving water quality:

> "The Parties shall support all reasonably available alternative or additional water quality measures before considering any action for the purpose of water quality compliance that would reduce water supplies beyond the limitations provided in this Agreement."

Restricted Klamath River flows under the KBRA in and of themselves substantially lower chances of attaining Hoopa TEPA (2008) WQS, especially during drought or extreme drought years even after dams are removed.

Lost River Flow Reduction Impacts Under KBRA: The KBRA will likely reduce surface flows in the Lost River, which will have a direct impact on Lost River suckers but will also increase nutrient concentrations in Straits Drain and LRD waste water sent to Keno Reservoir. The KBRA provides substantial resources that allow irrigation districts to bind together and create an On-Project Plan for water and power. This publicly funded document may not undergo public review and yet it will govern Lost River flows for the life of the KBRA. Lost River surface and groundwater have been used to make up for Klamath River shortfalls since 2001 through the U.S. Bureau of Reclamation (BOR) water bank. According to USGS (2005) "Water bank activities have resulted in an approximately eight-fold increase in ground-water pumping in the vicinity of the Klamath Valley and Tule Lake sub-basins." Gannett et al. (2007) measured water table drops from 2001-2004 of greater than 15 feet in the lower Lost River in California and stated that this was likely reducing surface flows. California State agencies and Siskiyou County do not actively manage groundwater and are not likely to prevent future adverse Lost River drought impacts. Increased nutrient concentrations in tail waters sent to Keno reservoir will promote continuing acute water pollution there with radiating negative impacts downstream.

KBRA Nutrient Reduction Insufficient: The U.S. EPA (2000) notes that "restoration should reestablish in so far as possible the ecological integrity of degraded aquatic ecosystems." A restored system would meet the following criteria: "Its key ecosystem processes, such as nutrient cycles, succession, water levels and flow patterns, and the dynamics of sediment erosion and deposition, are functioning properly within the natural range of variability" (U.S. EPA 2000). As noted above, the KBRA will cause flows to depart further from their historic range of variability and the amount of functioning marsh and area of shallow lakes that formerly helped improve water quality will remain at just a fraction of their historic extent.

Dunne et al. (2011) pointed out that the KBRA has no assured strategy for reducing nutrient pollution (emphasis added):

> "Experience from other locations where eutrophication is a major problem suggests that, at a minimum, drastic reductions in loading from the watershed must accompany local amelioration. These reductions must account for the apparently high natural nutrient inputs from the local watersheds, and the unavoidable leakage occurring in watersheds heavily altered for urban and agricultural use. *Thus, it would be premature to conclude that any problems caused by these blooms, including low dissolved oxygen, will be substantially reduced by KBRA*" (p. 39).

Goodman et al. (2011) urge consideration of more extensive wetland and lake restoration to recover the Klamath River's limnological balance:

> "Evaluate reductions in irrigated agriculture for lands draining to UKL and the Lost River for their feasibility to reduce summer and fall nutrient additions from those waters. Consider managing the refuges to further emphasize their benefits

for fish and wildlife, which can be in contrast to their agricultural objectives." (Page 12, Section 2.1)

Goodman et al. (2011) also express doubt that problems with extremely low D.O. in Keno Reservoir will be resolved by KHSA and KBRA measures and as result that "a fully self-sustaining run of Chinook salmon to the upper basin is unlikely" even with KHP dam removal.

Asarian et al. (2010) point out that available nitrogen at the location of Iron Gate Dam after removal of KHP reservoirs will increase in the months of July through September by 45-58%. Asarian et al. (2010) note that nutrient assimilation of periphyton and macrophytes will increase in the Klamath River below the location of Iron Gate Dam in response to increased nitrogen availability and states that "These increased retention rates downstream would then partially offset the effects of increased Iron Gate load on nitrogen concentrations in reaches farther downstream." The problem is that the process of photosynthesis associated with assimilating a 50% increase in nitrogen will continue to cause water quality perturbations that create stressful conditions for salmonids and disease rates similar to those experienced in the recent past (Halstead 1997, USFWS 2001, Nichols and Foott 2005).

Goodman et al. (2011) acknowledged the potential significance of the increased nutrient load in the Lower Klamath River:

> "Releasing these excessive amounts of nutrients to the Klamath River in the absence of the four lower dams means that the river, versus the reservoirs, will process the nutrients, perhaps in the form of excessive *Cladophora* biomass or increased periphyton production down river. These changes could elevate pH, lower night time dissolved oxygen, and cause gas supersaturation during afternoons in local areas."

The FERC (2007) FEIS also poses the same hypothesis as Goodman et al. (2011) with regard to nutrient surpluses and fish disease risk:

> "Continued high nutrient levels in the Klamath River that create ideal colonization conditions for *Cladophora*, at sites with favored flow and substrate conditions, would enable the host polychaete to become reestablished, and *C. shasta* and *P. minibicornis* would likely continue to pose a serious threat to downstream salmon for the foreseeable future."

As pointed out in the Fish Disease Cycles section above, no matter where the new fish disease node is below Keno Reservoir after dam removal, actinospores will be viable and increase exposure to *C. shasta* and *P. minibicornis* downstream to the estuary even after dam removal. Thus, Hoopa TEPA (2008) WQS beneficial uses will not likely be met and the Hoopa Valley Tribe will also likely continue to suffer fisheries losses both at Klamath River and Trinity River fishing sites.

Pulse Flow Mitigation Measures: The NMFS 2010 Biological Opinion for the Klamath Project envisions using strategic pulse flows to prevent algae build up. One of the few accomplishments of the biological opinion was a pulse flow release for one day of 5000 cfs in February 2011, which was an attempt to scour algae beds. However, no data on bedload movement was conducted so the effectiveness of this particular pulse flow is unknown. Since 2011 is very wet, it is very likely that algae and disease problems would be delayed by natural conditions and associated juvenile salmonid mortality likely to be modest. As pointed out above, the most severe water quality problems will arise during drought or extreme drought, particularly when there are several dry years in a row (e.g., 1986-1992), when excess water for flushing flows will not be available. There are no hard requirements within the KBRA or its associated Drought Plan for such flow releases.

Potential Effectiveness of Klamath and Lost River TMDLs

Unfortunately both the California (NCRWQCB 2010) and Oregon (ODEQ 2010) TMDLs have very little chance of success in abating nutrient pollution in the course of the 50 year KBRA and KHSA. A fundamental flaw in both is their lack of recognition of the need to restore of ecosystem function of the lakes and marshes of the Upper Klamath in order to help the Klamath River clean itself. Both TMDLs assume that incremental reduction of non-point source pollution from each farm field will eventually solve the problem, but their models do not account for the fact that nitrogen fixing blue-green algae can make up for any reduction unless ecosystem services suppress its growth. Both over-rely on voluntary measures for implementation and neither has expected compliance dates for meeting water quality standards. As noted above, the KBRA provisions that continue Lease Land farming on Tule Lake NWR and Lower Klamath NWR and support continued full use of the 200,000 acre Klamath Project through power subsidy essentially block TMDL implementation because they do not allow reduction of nutrient contributions and water demand. They also block strategic restoration of marshes and lakes needed for water storage and filtration.

TMDLs Ignores Need for Marsh and Lake Ecosystem Function

Conversion of marsh land around Upper Klamath Lake has augmented phosphorous for aquatic plant growth and caused nitrogen to become potentially more limiting. However, the nitrogen fixing blue-green algae *Aphanizomenon flos aquae* colonized Upper Klamath Lake (UKL) and can transform nitrogen gas from the air into a form usable by plants. Research indicates that mild acids from decaying material within marshes causes the cells of blue-green algae, including *A. flos-aquae*, to break down when exposed to sunlight (ASR/WRC 2005, WRC 2009). Blue-green algae species were not present in UKL before the 20th Century (Bradbury et al. 2004, Eilers et al. 2001) likely because marsh ecosystem function suppressed them. PacifiCorp (2004) estimates that nitrogen exiting UKL is on the order of 2.5 times higher than water entering. In other words, UKL has been transformed from an ecosystem that helps clean up water to one that is a major engine for nutrient pollution. ODEQ (2010) TMDL does not recognize the need to reverse these processes and does not address restoring riparian function in the Keno

Reservoir reach to help improve water quality, the importance of which is discussed above.

Agricultural water supply from Upper Klamath Lake through the A Canal continually inoculates the Lost River and Tule Lake with *A. flos-aquae* and marsh complexes there need to be re-expanded to stifle its growth. Neither the U.S. EPA (2008) Lost River TMDL or the NCRWQCB (2010) Klamath and Lost River TMDL implementation recognize the need for these restored ecosystem functions and processes. The KBRA guarantees water delivery and continued agricultural use of the Lease Lands within the TLNWR (15.1.2 B i) and LKNWR (15.1.2 B i), which constitutes 21,000 acres (Figure 12) and is the only such arrangement on any wildlife refuge in the nation. Tule Lake was originally 110,000 acres whereas Tule Sump occupies between 10,000-14,000 acres and Lower Klamath Lake was 95,000 acres and is now only 4,000 to 7,000 acres depending on the water year (Figures 13-14). This essentially blocks ecological recovery of both areas; therefore, confounds successful abatement of pollution.

Dam removal will help ecosystem function of the Klamath River in the restored KHP reach, including elimination of toxic algae. However, the huge excess of nutrients from Keno Reservoir will continue to overwhelm the river's capacity for assimilation causing major algae blooms downstream. As noted above, this has consequences for fish diseases as well as exceedance of water quality standards. Lower Klamath River recovery also requires that flows and ecosystem function of the Shasta and Scott rivers also be restored, but conditions there have not improved since adoption of those TMDLs (Higgins 2011).

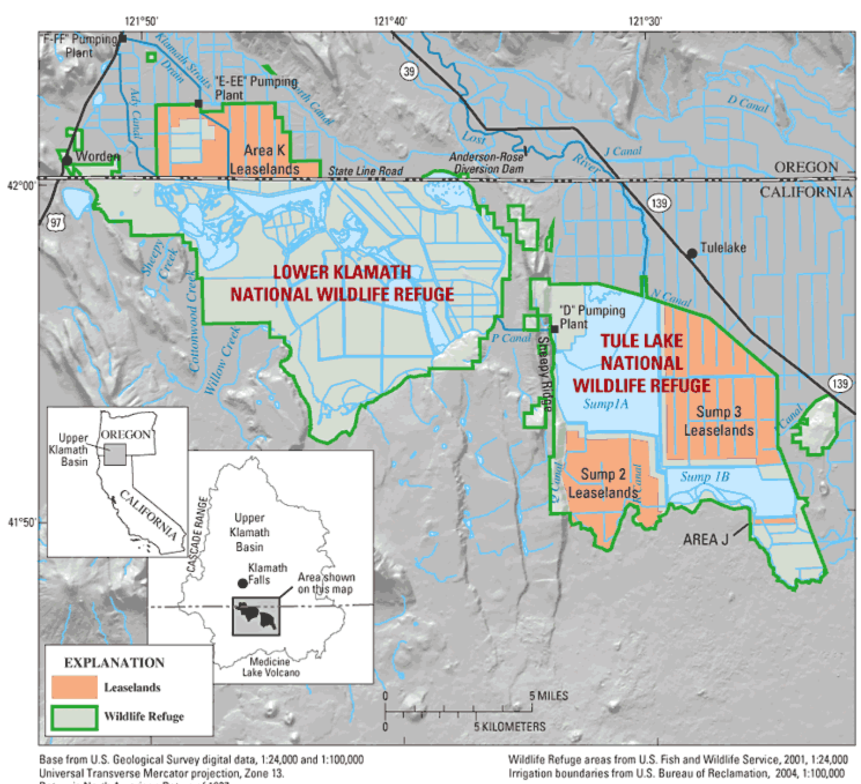


Figure 13. USFWS and BOR map of TLNWR and LKLNWR Lease Lands occupy 21,000 acres.

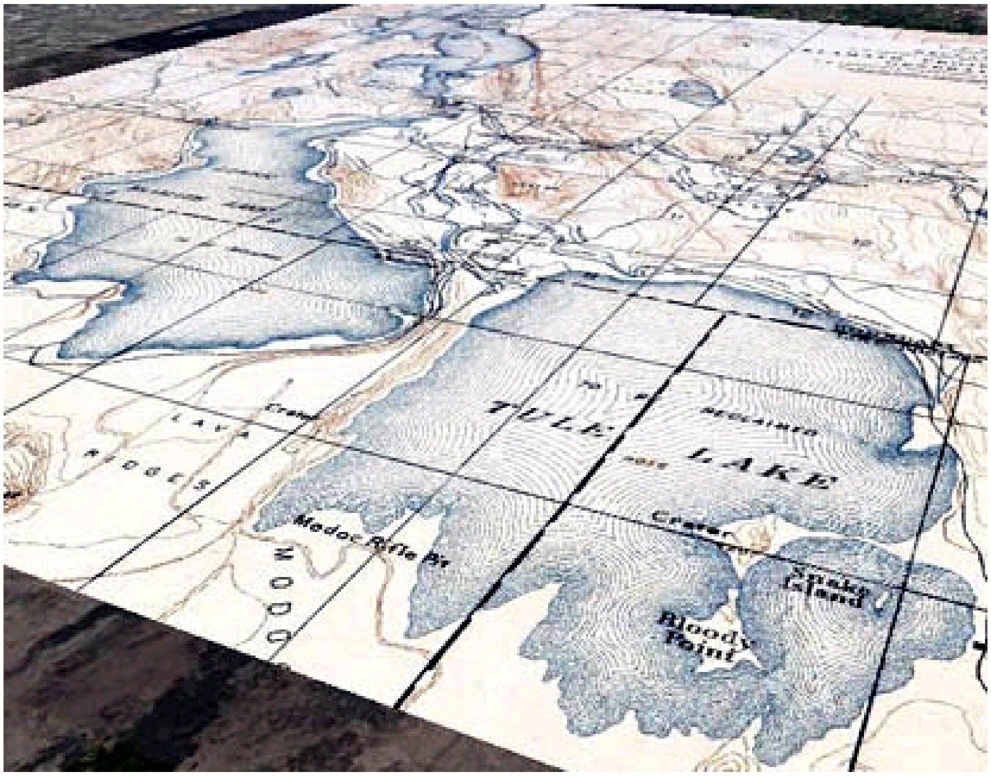


Figure 13. Historic map of Tule Lake and Lower Klamath Lake from Oregon Wild website at www.oregonwild.org/waters/klamath/klamath-photos-and-maps/interactive_maps

Figure 14. Aerial photo of Tule Lake and Lower Klamath Lake from Oregon Wild website.

The Tule Lake basin also has the highest use of pesticides in Siskiyou County (Figure 15) with up to 7,500 pounds per acre in use within the TLNWR on the Lease Lands.

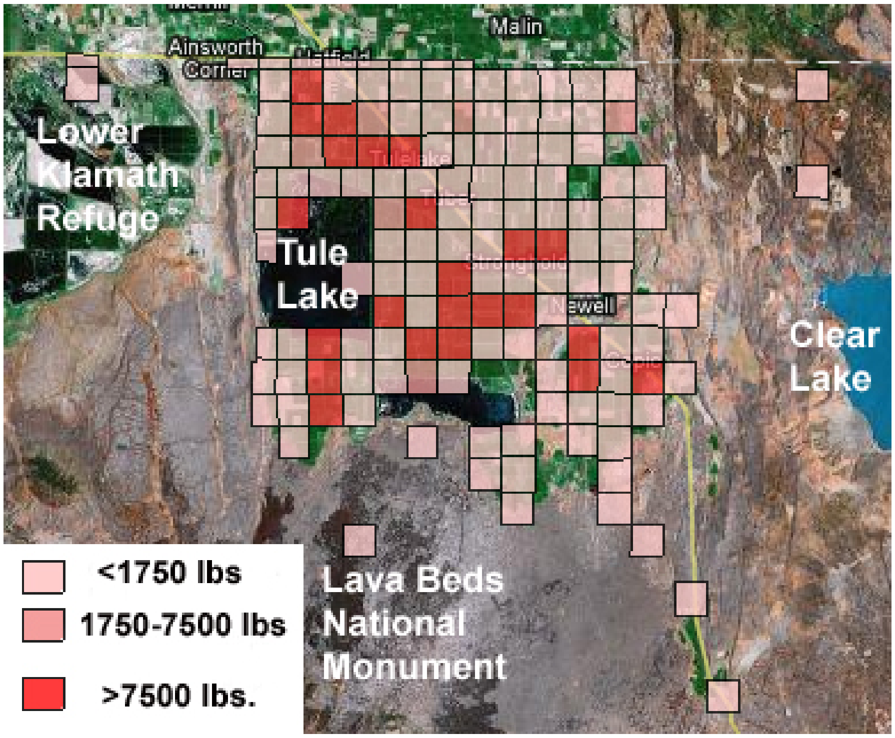


Figure 15. Tule Lake pesticides in pounds per year, including within the TLNWR Lease Lands adjacent to Tule Lake. Data from CA Department of Pesticide Regulation (DPR).

Recent studies have shown that even low levels of some chemicals can be injurious to coho salmon when acting together (Laetz et al. 2009). The KHSA and KBRA do not even mention the topic of pesticides but high contributions to the Keno Reservoir reach could be another factor that could impede Upper Basin salmon recovery. Laetz et al. (2009) found combinations of diazinon, malathion, chlorpyrifos, carbaryl and carbofuran in many Pacific Northwest rivers and exposing coho salmon juveniles to equivalent levels in a lab induced mortality. All of these chemicals are used in Siskiyou County where in 2007 an estimated 1,287,800 pounds of pesticides were applied to 187,595 acres, most of them within the Klamath Basin (CDPR 2008). Conversion to organic farming techniques needs to be pursued as part of any final settlement, especially on Lease Lands if farming there continues.

<u>Technical Fix of Water Quality Problems is Experimental and Unlikely to Succeed</u>

The NCRWQCB (2010) frames the strategy for nutrient pollution as follows:

> "Explore engineered treatment options such as treatment wetlands, algae harvesting, and package wastewater treatment systems to reduce nutrient loads to the Klamath River and encourage implementation of these options where feasible."

These technical approaches to nutrient pollution all require intensive capital investments for implementation and also have substantial on-going costs for electricity for water pumping or purification. It is very unlikely with the current budget crisis that funds will be available for construction and availability of capital for operation and maintenance in the future casts doubt on the ability of this approach to succeed. Furthermore, harvest of algae at the outlet of Upper Klamath Lake in perpetuity makes far less sense economically than abating algae blooms through ecological restoration. Similarly, operating a waste water treatment plant at the Keno Reservoir is not cost-competitive with reducing nutrient loads by eliminating farming on the TLNWR and LKNWR and expanding marshes to clean the water.

Meyer (2005) found that water passed through the LKNWR marsh complex had a 55-77% reduction in total nitrogen (N) and 19-51% reduction in total phosphorous with permanent wetlands having a much greater retention rate than seasonal wetlands. Lytle (2000) assessed the potential for use of a treatment wetland to reduce nutrient loads from the Klamath Straits Drain:

> "With an estimated wetland treatment area ranging between 1,633 and 3,114 acres, according to the Kadlec and Knight Model, the wetland could achieve a 61% reduction in total P concentration (0.41 to 0.16 mg/L) and a 90% reduction in total nitrogen including NH3-N."

The problem with operation of such a treatment wetland is that it requires a flow rate of 70-130 cubic feet per second, which would require additional water storage. Thus, even operation of a treatment wetland at the Straits Drain would require expansion of Lower Klamath Lake or Tule Lake, both of which are blocked by the KBRA. The report from Lytle (2000) remains in draft and there has been no action with regard to its implementation.

TMDLs Rely on Voluntary Cooperation and Have No Timelines for Compliance

Both the California (NCRWQCB 2010) and the Oregon (ODEQ 2010) TMDLs are overly reliant on voluntary measures for compliance. TMDLs from both States lack any projections for when water quality compliance will occur or when beneficial uses will be fully restored. The Final KHP EIS (FERC 2007) expressed the following concern with regard to potential for success of TMDLs in the Upper Klamath to remediate pollution:

> "The TMDL program relies on voluntary involvement for loads identified from non-point sources; therefore, nutrient load reductions to the allocated size may not be fully realized as farmers and ranchers choose between converting portions of their land to best management practices or maximizing their property's agricultural potential." (3.3.2.3)

ODEQ (2010) states the TMDL "does not attempt a timeline addressing the many ongoing and voluntary efforts."

The prospect of enforcement in Oregon is more remote than in California because ODEQ (2010) must delegate authority for implementation to designated management agencies (DMAs). The lead DMA is the Oregon Department of Agriculture (ODA), which is charged with both promoting agriculture and regulation of agricultural activities that affect water quality. Other DMAs include the U.S. BOR and irrigation districts. A program that relies on polluters to oversee abatement of pollution has a very low likelihood of success.

Interim Measures for KHP Will Not Improve Reservoir or Lower Klamath River Water Quality Conditions

PacifiCorp has complied with Section 6.3.2 of the KHSA and submitted a TMDL implementation plan to the NCRWQCB. Appendix C and D of the KHSA lay out the 21 Interim Measures and they are reflected in PacifiCorp's (2011) *Plan for Implementing Management Strategies and Water Quality-Related Measures*. The NCRWQCB (2010b) response to the proposed measures states that in-reservoir actions will not abate nutrient pollution or toxic algae problems there. The PacifiCorp (2011) actions pursuant to TMDL implementation relevant to this report are as follows.

Interim Measure 2 requires that PacifiCorp provide $500,000 per year for coho salmon habitat restoration or acquisition, but these measures will have small water quality benefits and will target projects below the KHP. The improvement of cold water refugia at the mouths of Klamath River tributaries is very laudable and worthwhile, but it does not fully mitigate impacts of the operation of KHP dams as PacifiCorp (2011) claims: "The thermal refugia actions to be implemented under the Coho Enhancement Fund will mitigate the continuing effect of the reservoirs on water temperature during the interim period." This measure will help coho salmon, but the major impact to fall Chinook of reservoir operation described above will remain huge as long as Iron Gate Dam remains. Also, increased flows in the Shasta and Scott rivers is needed to restore coho salmon habitat there, which has much greater potential to increase carrying capacity for these fish (Higgins 2011)

Interim Measure 3 calls for turbine venting at Iron Gate Dam to improve dissolved oxygen (D.O.) levels that may improve lower Klamath River conditions within a short distance of the dam. Even if such measures were implemented, excess nutrients from the reservoir will continue to be released that stimulate profuse algae growth leading to D.O. sags stressful for salmonids downstream, when algae respires nocturnally.

Interim Measure 5 calls on PacifiCorp to consult with agencies and tribes and to carry out experiments with different flow levels in fall and early winter to benefit salmonids. In February 2011 5,000 cfs was released for one day under the theory that such a peak would increase scour and potentially reduce algae beds. These short term events are aimed at offsetting potential problems from low fall and winter flows planned under the KBRA as described above. No experimental design is in place, so whether this isolated action had any benefit is unknown.

Interim Measure 10 requires that PacifiCorp provide $100,000 to hold a conference "that focuses on the design and implementation of nutrient and organic matter reduction projects. The conference should assess the appropriateness and feasibility of various centralized pollutant removal technologies, including wetland treatment systems, wastewater treatment systems with energy recovery capabilities, aquatic plant harvesting, as well as agricultural best management practices" (NCRWQCB 2010).

Interim Measure 11 is entitled Interim Water Quality Improvements, but there will be no significant improvements to Lower Klamath River that result. PacifiCorp is to spend $250,000 a year on one or more of the following: 1) developing a water quality accounting framework, 2) constructing pilot treatment wetlands for evaluation, 3) assessing in-reservoir water quality control techniques, and 4) improving J.C. Boyle D.O.

The NCRWQCB (2011) is asking that PacifiCorp increase resources to fully develop the water quality accounting framework that will help evaluate TMDL implementation, which is good. In lieu of reservoir projects, the NCRWQCB staff recommends pilot projects for nutrient reduction that could be expanded and implemented under the KBRA. While treatment wetlands have the potential to reduce nutrient contributions (Lytle 2000), they are unlikely to be able to offset continuing high contributions of nutrients (see Ecological Restoration).

The KHSA would set up an Interim Measures Implementation Committee (IMIC) to work with PacifiCorp comprised only of signatories or "Parties" to the settlements. The committee would also appoint and oversee a Fisheries Technical Working Group and a Water Quality Technical Working Group. These processes would prevent involvement of the Hoopa Tribe and other legitimate stakeholders who did not sign onto the KHSA and KBRA. The Hoopa Tribe has used government-to-government consultations and Freedom of Information Act requests to try to keep abreast of activities within the IMIC. This will lead to a strong bias against any solutions to water quality problems that require more land retirement or higher flows than agreed to in the KBRA.

Sucker "Beneficial Use" Recovery Required by TMDLs Unlikely Under KBRA

Both the Lost River and shortnose suckers are endemic to the lower Lost River, Tule Lake and Lower Klamath Lake and they are, thus, both considered beneficial uses under the Clean Water Act and the Lost River TMDL (U.S. EPA 2008). Both species have been extirpated in Lower Klamath Lake (LKL)(USFWS 2001b). The NRC (2004) recommended consideration of refilling LKL to re-establish sucker populations to reduce regional extinction risk and to improve ecological function of the Klamath River. As noted above, this option is precluded by KBRA provisions that guarantee farming in the lake bed and the LKNWR Lease Lands. Therefore, this aspect of TMDL implementation is not likely to occur within the 50 year life of the program.

Shortnose suckers are no longer present in the lower Lost River (Delineas et al. 1996). Although there is an adult population of Lost River suckers in Tule Lake, there is no viable spawning habitat for them in the lower Lost River (Delineas et al. 1996, Shively et al. 2000). The source population for Tule Lake is thought to be Upper Klamath Lake larvae entrained in the A Canal (Scoppettone et al. 1995), but colonists will likely decrease as fish screens are improved. Consequently, with no ability to reproduce and a diminishing source of colonists, the Tule Lake Lost River sucker population is also likely to be lost over time. Marsh and lake restoration in the lower Lost River, Tule Lake and LKL basins would not only allow re-establishment of sucker populations to lessen species extinction risk, it would help attain nutrient reduction that will likely prove elusive otherwise.

Ecological Restoration Approach to Restoring the Klamath River

An ecosystem based approach to resolving Klamath River water quality impairment is in keeping with current best-science principles: "Management of the freshwater habitat of Pacific salmon should focus on natural processes and variability rather than attempt to maintain or engineer a desired set of conditions through time" (Bisson et al. 2009). Major Upper Klamath Basin anthropogenic alteration and reengineering have overwhelmed ecosystem function and caused the Klamath River to develop acute water pollution. Ecosystem services that stifle algae blooms, absorb nutrients and provide water storage need to be regained, which will then allow Pacific salmon and sucker species recovery. The U.S. EPA (2000) gives similar guidance with regard to restoration:

> "Restoration strives for the greatest progress toward ecological integrity achievable within the current limits of the watershed, by using designs that favor the natural processes and communities that have sustained native ecosystems through time.
>
> Restoring the original site morphology and other physical attributes is essential to the success of other aspects of the project, such as improving water quality and bringing back native biota."

Despite naturally high phosphorous levels because of volcanic activity in its headwaters, the Klamath River was known as the "river of renewal" because of its ability to clean itself (NCRWQCB 2010). Marshes filtered run off, trapped nutrients and suppressed blue-green algae as described above. Lower Klamath Lake acted as the water storage system capturing winter flows and releasing them in late spring. The river bed itself, in a free-flowing condition, helped capture nitrogen from the water and release it back into the atmosphere similar to processes described by Sjodin et al. (1997). None of these ecological functions can be substituted for through technical fixes.

The Klamath River has passed its tipping point in terms of nutrient balance due to several changes:

- Changes within Upper Klamath Lake leading to A. flos-aquae domination,
- Blocking the connection to Lower Klamath Lake and drying it up,
- Pollution of the Lost River and Tule Lake and artificial connection to the Klamath River in the Keno Reservoir, and

- Keno Reservoir reach alteration that stopped denitrification and added to eutrophication.

The goal of ecological restoration as applied to the Klamath River is not to return the watershed to pristine conditions but rather to take strategic actions to restore the natural balance so that beneficial uses as defined by the Clean Water Act can be attained. If the natural system is restored to a level where its ecosystem processes clean the water, then it will be largely powered by gravity and far less expensive than technological fixes.

Studies are needed that go beyond those of Lytle (2000) and Mayer (2005) to determine quantitatively how strategic, large scale marsh and lake restoration would reduce water demand, increase water storage and resolve nutrient pollution as a result of improved ecosystem function. The current state of knowledge would suggest priorities include re-establishment of a marsh perimeter around Upper Klamath Lake, restoring the riparian marsh in the Keno Reservoir and in the lower Lost River, and expansion of Tule Lake and Lower Klamath Lake. The KBRA has hundreds of millions of dollars earmarked for restoration, which could be used for acquisition of wetlands for restoration. However, the obvious solution is to restore wetland and lake functions in TLNWR and LKNWR since there are 21,000 acres of wetlands there in public ownership. Costs of easements and acquisitions for areas in addition to the Lease Lands would be one time investments that lead to ecosystem function that has modest or no need for on-going maintenance.

Hoopa Valley Tribe Options to Uphold WQS Under the KHSA/KBRA

A key to upholding Hoopa WQS will be developing a consistent testing and reporting program examining any WQS exceedances seen. Under the KBRA, participation in committees and work groups will be restricted to Tribes and entities that signed the KBRA and KHSA; therefore, the Hoopa Valley Tribe and other non-party Tribes will not be able to participate in fisheries or water quality management unless the Tribe can successfully assert its authority through government-to-government consultations with federal agencies. In the event that the KHSA and KBRA are enacted through legislation and are subsequently implemented, the Hoopa Valley Tribe would likely need to launch a legal challenge under applicable federal statutes. The Hoopa Valley Tribe should fully participate in the review of KHSA/KBRA federal and State environmental documents and provide comments that promote ecological restoration as an alternative approach. Submitting evidence into the record will likely provide substantial causes for action against the federal and State governments in the event that the program alternatives are not scientifically defensible or are otherwise out of compliance with the law.

Hoopa Valley Tribe Alternatives to KHSA/KBRA for Dam Removal

The two most promising avenues for promoting KHP dam removal are to return to the FERC relicensing process and by pressing for a speedy decision by the California SWRCB regarding 401 certification.

The Hoopa Valley Tribe challenged continuing operation of the KHP on a year to year basis without implementation of mitigation measures (HVT vs. FERC 2010). While the challenge was rejected (U.S. Court of Appeals District of Columbia 2010), trying to re-initiate the FERC licensing process should provide benefits with regard to promoting decommissioning. PacifiCorp felt imminent KHP decommissioning and loss of their power generating facility was a possibility under the relicensing process (Brockbank 2010):

> "Throughout these negotiations, the federal government and the states of Oregon and California have expressed a strong policy preference that PacifiCorp's dams on the Klamath River be removed."

If the KHP relicensing process re-opens, NMFS' (2006) fish passage requirements at dams will be part of terms and conditions. Administrative Law Judge Parlen McKenna (2006) upheld NMFS authority and PacifiCorp (2008) estimates that fish passage at all KHP dams would cost $267 million, which is far more than project revenue justifies. This will likely throw the project into the "uneconomic" category. Brockbank (2010) explains PacifiCorp's options: "The applicant may accept the uneconomic license, decommission and remove the facility, or pursue litigation and challenge the mandatory conditions."

The California SWRCB (2008) suspended the 401 certification process after entering into an Agreement in Principal with PacifiCorp and subsequently signing the KHSA. The Hoopa Valley Tribe (2011a) pointed out that the most recent SWRCB Resolution (2010-0024), which held the KHP 401 process in abeyance, required federal KBRA/KHSA legislation be enacted by May 17, 2011, which it was not. Therefore, the SWRCB should re-start its 401 certification process. Oregon and northern California environmental groups (Cascadia Wildlands et al. 2011) and the Resighini Rancheria (2011d) also made similar requests to the SWRCB, which is likely to consider the matter at its August 2011 meeting.

If the relicensing and 401 process restart, the SWRCB will likely prevent FERC from issuing a new KHP license by withholding 401certification because water pollution problems associated KHP reservoirs cannot be remedied (SWRCB 2006). The inability of PacifiCorp to acquire a new license would also force abandonment and decommissioning.

Hoopa TEPA (2008) WQS for the Klamath River must be considered by the SWRCB in the 401 certification process. When the 401 process is reopened, the Hoopa Valley Tribe should continue to provide the SWRCB with evidence that shows the need for immediate removal of KHP dams due to toxic algae problems and alarming continuing impacts to salmon resources, particularly in drier years.

Building an Alliance that Supports an Alternative Approach to Dam Removal and Klamath Restoration

The Hoopa Valley Tribe has been a leading voice in opposition to the KHSA/KBRA but additional avenues are recommended below for building alliances, public education, organizing and political action to prevent their implementation and to supplant them with a more sound, just and equitable solution for Klamath River restoration.

Failure of Authorization and Funding Could Cause KHSA/KBRA Termination: The political reality is that there is substantial opposition to Klamath River dam removal from California Congressman Tom McClintock, Chairman of the House Water and Power Sub-Committee (Siskiyou Daily News 2011). Siskiyou County Congressional Representative Wally Herger also opposes the KHSA/KBRA after a 79% of Siskiyou County residents voted against dam removal in a November 2010 initiative (Redding Searchlight 2011). Consequently, enabling legislation passage seems remote and allocation of the needed $1 billion even more so. Furthermore, a California $250 million bond initiative for helping to fund decommissioning was withdrawn from the November 2010 ballot for lack of support. Given California's pre-occupation with its own current budget crisis, such legislation or initiative action also seems unlikely.

The KBRA (8.11.1) spells out several factors that could lead to termination of the Settlement that help provide focus for action. Failure to pass federal authorizing legislation with necessary funding (KBRA Appendix E) is the first criteria listed and lack of passage or prospect there of is grounds to ask all Parties to the KHSA/KBRA to reconsider their commitment. The Hoopa Valley Tribe should make a request of Humboldt County to reconsider its commitment to the Settlement and also open negotiations with the Yurok and Karuk Tribes.

Concurrence of both Oregon and California is also requirements of the KBRA and withdrawal of either would cause termination. Although there is engagement with the SWRCB on the 401, the Hoopa Valley Tribe should consider additional political action to sway the State of California to withdraw from both the KHSA and KBRA.

Alliances and Outreach**:** The Hoopa Valley Tribe has been part of the Klamath Conservation Coalition partners, which includes Oregon Water Watch, Oregon Wild and the Resighini Rancheria. This group has tracked legislation, provided timely comments in various processes and has done some effective outreach to better inform the public of problems with the KBRA. The Hoopa Valley Tribe and the Coalition partners needs to expand the number of allies who support ecological restoration of the Klamath River and influence legislation that enables it. In order to have political clout, there needs to be widespread recognition of problems with the KBRA/KHSA and knowledge of why an ecological alternative is more economical and truly sustainable. Targets for education and outreach might include:

- Del Norte County,
- Coastal tribes,
- Coastal municipalities and
- Environmental groups

Work is also necessary to educate Congressman Mike Thompson and local State representatives Assemblyman Wesley Chesbro and Senator Noreen Evans. In addition to correspondence, direct contact with legislators or their representatives from Native American in the Klamath Basin who are not in agreement with the KHSA/KBRA is necessary because they have been succumbing to pressure from the Karuk and Yurok Tribes and their rationalization is that the KBRA/KHSA are supported by the majority of Indians. Contact in Eureka can be easily accomplished, but travel to Sacramento to meet with other California legislators and key administration officials is also highly desirable.

Seminars or workshops that discuss ecological restoration within the Klamath-Trinity Basin could provide outreach to all Indian people, including members of Tribes currently backing KHSA/KBRA. These workshops would ask participants to give consideration to alternatives more likely to achieve true sustainability.

Other methods of outreach for organizing political support for ecological restoration include:

- Presentations to local governments, civic groups and environmental organizations,
- Press releases and guest articles or editorials,
- Public Radio: KIDE, KMUD, KHSU, Jefferson Public Radio,
- Co-sponsored debate with the League of Women Voters, and
- Development (or expansion) of a Website to share findings.

The public review process of the NEPA and CEQA documents pertaining to the KHSA/KBRA will be in September and October of this year and the process offers an excellent opportunity to raise public awareness.

<u>Craft Alternative Legislation that Includes Ecological Restoration Approach</u>: In order to react in a timely fashion, the Hoopa Valley Tribe should likely move forward cooperatively and help craft Klamath River Basin restoration legislation that stresses an ecological approach to fixing water quality problems. The strategy would call for reduction of water demand and nutrient pollution through acquisition or easements in strategic locations likely to help restore ecosystem services and processes, including life cycle costs. Similar California legislation is also needed. It is extremely important that the Klamath Tribes of Oregon needs be considered in any such legislation and that funds be provided for acquisition of the Mazama Forest as an extension to their Reservation as called for in the KBRA.

<u>Decouple Dam Removal from Other Restoration Activities</u>: Dam removal will result from completion of the FERC licensing process because the license FERC will issue will force PacifiCorp to choose between dam removal and other more expensive alternatives.

No legislation is required to complete the FERC licensing. Legislation, or at least appropriations, will be necessary for other restoration activities.

Conclusion

There is substantial concern that the lack of nutrient reduction at the source in the Upper Klamath Basin under the KBRA will cause a failure to remediate water quality problems even after dam removal (Dunne et al. 2011, Goodman et al. 2011). The chances that Hoopa WQS standards will be met appear low and all fisheries-related beneficial uses will continue to be compromised under the KBRA even after dams are removed. As noted above, a rigorous testing and reporting program to measure compliance with Hoopa WQS will be essential.

There is urgent need for action in promoting an ecologically sound restoration alternative. Current conditions have lead to a fish kill of 33,000-70,000 adult Chinook salmon (CDFG 2004) and the level of mortality of juvenile Chinook salmon in some recent years has had an equivalent impact (Nichols and Foott 2005). High levels of fish disease threaten the existence of remnant runs of spring Chinook and coho salmon and these problems are not likely to be remedied either before dam removal or afterward. Continuing operation of the KHP without mitigation poses high risk to these at-risk fish populations and insufficient actions under the KBRA to abate nutrient pollution virtually assure the extirpation of these species before 2062.

A critical consideration is the urgent need for action given short term climate regime known as the Pacific decadal oscillation cycle (Hare et al. 1999, Collison et al. 2003) that affects Pacific salmon species:

> "If current patterns prevail, with shifts in the PDO occurring every 20 to 30 years (Hare et al. 1999), the next negative shift in the PDO for California is likely to occur in the 2015 to 2020 timeframe …... If fresh water habitats have not recovered by that time, the fish will simultaneously face both degraded freshwater habitats and an unproductive ocean. The result could shift the stocks to endangered status or result in extinctions" (Collison et al. 2003).

This suggests that dam removal needs to be in advance of 2020 for the highest potential of success. Toxic algae from reservoirs will also continue to pose unacceptably high health risk for recreational or ceremonial use of the Klamath River until at least 2020, and this condition in and of itself should be sufficient cause for speedy KHP dam decommissioning.

"We must restore impaired ecosystems if we are ever to regain the natural capital necessary to prevent continued economic and social decay and to approach economic and ecological health and sustainability" (Society for Ecological Restoration 2004).

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