YUROK TRIBE

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February 9, 2010

Catherine Kuhlman
Executive Officer
North Coast Regional Water Quality Control Board
c/o Katharine Carter
5550 Skylane Blvd, Suite A
Santa Rosa, CA 95403

Ms. Kuhlman,

These comments are provided by the Yurok Tribe in regards to the North Coast Regional Water Quality Board and the EPA soliciting comments on the revised text and substantive changes related to the Draft Klamath River TMDL. Technical comments follow this cover page and are specific to concerns that the Yurok Tribe has.

Below is specific language we request be inserted into the North Coast Basin Plan.

The following language should be inserted into the first introduction paragraph prior to the Problem Statement or in the opening paragraph in the Thermal Refugia Protection Policy of the Action Plan:
In order to ensure the Native American Cultural (CUL) and Subsistence Fishing (FISH) Beneficial Uses in the Klamath River are met all life cycles of cold water fishes and up-river habitats, in particular cold water refugia, will be protected.

The following language should replace sentence 2 of paragraph 2 in the Thermal Refugia Protection Policy section of the Action Plan:
The restriction applies year round to account for annual and seasonal temporal variability when thermal refugia is functioning in the mainstem Klamath River and its tributaries and to incorporate a margin of safety to protect beneficial uses associated with cold water.

The following language should be inserted into Section VIII. Reassessment and Adaptive Management.
Within one year Regional Board staff shall evaluate the inventory of cold water refugia AND the effectiveness of thermal refugia protection regulations and make recommended revisions to the Regional Board as necessary to adequately protect cold water refugia.

Within one year Regional Board staff shall make an appraisal to determine if the Scott and Shasta Rivers are improving water quality in the Klamath River and make recommended revisions to the Scott and Shasta TMDLS as necessary to meet water quality targets in the Klamath River.

The Yurok Tribe looks forward to continuing to work with you and your staff on this important issue. The point of contact at the Yurok Tribe regarding these matters is Ken Fetcho. Please contact him at (707) 954-1523 or at kfetcho@yuroktribe.nsn.us if you have any questions or concerns.

Sincerely,

Kathleen Sloan PhD.
Director
Yurok Tribe Environmental Program

Overall the technical analysis presented in the Klamath TMDL is scientifically rigorous and provides a solid foundation for remediation of the river's pollution problems. The technical analysis has been further refined in recent *Revised Public Draft TMDL*. We commend Regional Board Staff for their effort on the TMDL conceptual framework and technical analysis.

In our August 2009 comments on the *Public Draft TMDL*, we noted the need for overall strengthening and acceleration of the Implementation Plan and Basin Plan amendment language, the most important parts of the TMDL from a practical perspective.

Unfortunately, it appears as though exactly the opposite has occurred. In a troubling development, the Implementation Plan appears to have been weakened in response to pressure from agricultural interests in the Klamath Basin. While we strongly support the adoption and implementation of the Klamath TMDL in general, we are alarmed by Regional Water Board staff's back-sliding on important issues, such as dropping the interim requirements to develop farm and ranch water quality management plans and the removal of the conditional sediment prohibition that included requirements to control sediment discharges.

The failure to follow the farm and ranch plan model provided by the Garcia River TMDL (Regional Water Board 1998), that which was confirmed as lawful, practical and prudent for addressing agricultural non-point water pollution load reduction by the courts (Prosolino vs. Nastri) is unacceptable.

We also find provisions with respect to timber harvest and roads left too vague, and the lack of targets and time-lines for reducing cumulative effects risks are likely to confound the plan's refugia protection policy. The lack of clear Klamath TMDL tributary monitoring requirements will make adaptive management impossible.

These shortcomings of the Klamath TMDL, in aggregate, render it, in our view, non-compliant with the California Environmental Quality Act.

Our comments below are organized into two parts. Given the importance of the Implementation Plan and Basin Plan amendment language, we address those sections and other policy issues in Part One of the comments below. Part Two presents comments on the other chapters and on technical issues.

PART 1:
COMMENTS ON IMPLEMENTATION PLAN AND BASIN PLAN AMENDMENT LANGUAGE

Thermal Refugia Protection Policy

We strongly support the concept of the Thermal Refugia Protection Policy outlined in the Basin Plan amendment language and section 6.5.4 of the staff report (Page 6-33). We would, however, propose two improvements. Additionally, the shortcomings with regard to cumulative effects from timber harvest and roads (Higgins 2010) are likely to confound attainment of the proposed thermal refugia protection, as is the lack of farm and ranch plans in tributaries like Bogus and Horse Creeks (Kier Associates 1991, 1999).

Expand geographic coverage

The list of refugia in section "6.5.4.1 Identification of Thermal Refugia in the Klamath River Basin in California" and the "Thermal Refugia Protection Policy" of Basin Plan amendment language have not been updated to include the additional thermal refugia locations in the Scott River submitted by QVIR (2009). Of most importance, the entire five-mile reach of the Scott River from Boulder Creek to Townsend Gulch serves as a thermal refuge. The identification of many seeps, springs and creek which serve as thermal refugia are not yet included in the TMDL refugia list.

Year-round prohibition of waste discharge

It appears that between the release of the initial June 2009 public draft and the release of the revised December 2009 public draft, the prohibition of discharging wastes within the designated instream buffers has been reduced from a year-round prohibition to one which now would apply only to the June 15 – September 15 period (see Page 6-37 section "6.5.4.4 Discharge Restriction In Designated Instream Buffer Areas" of the staff report and Page 9 "Discharge Restriction In and Around Thermal Refugia" in Action Plan).

Clearly the June 15 – September 15 period during which these areas provide thermal refugia is the most important time to provide them from protection. However, suction dredging during other times of year may alter the physical morphology of these areas, potentially diminishing their capacity to serve as thermal refugia. Limiting the duration of prohibition to the June 15 – September 15, therefore, does not adequately protect these areas from damage caused by suction dredging. Higher winter and spring flows could reduce the dredging effects by mobilizing sediment and re-shaping stream/river channels, but physical alterations created by dredging in late spring (after the annual peak-flows have occurred), or dredging at any time of year during periods of drought in which no sediment-mobilizing flows occur, could persist for many months including the critical summer period.

Agriculture (Grazing and Irrigated Agriculture)

The merging of grazing and irrigated agriculture into a single section (6.5.6) of the Staff Report document makes sense; however we are concerned that the interim requirements to develop farm and ranch water quality management plans that were included in the June public draft is no longer contained in the December public draft. This appears to be yet another example (e.g. as occurred in the development of the Shasta and Scott TMDL implementation plans) of staff yielding to pressure from agricultural interested to delay and dilute implementation measures. Regional Board staff should not allow political pressure to influence the regulatory process in the Klamath Basin. The information gained in the technical analysis and lessons learned in other basins should be the basis in which implementation approaches are developed and adaptively managed over time.

The revised public draft staff report calls for a "public process" to develop the proposed waiver, but provides no description of that process – of who will participate in the development, other than "The Regional Water Board will initiate the stakeholder process after adoption of the TMDL" (page 6-46). A clear timeline needs to be developed for this waiver and proper staffing needs to be allocated to ensure its success.

This is a critically important process in which the Tribes must participate fully and expect the

Regional Board staff to engage our technical staff in the development of this waiver.

Staff may regard this back-sliding as a means of winning landowners cooperation, but it is viewed by the Yurok Tribe as a stalling tactic or worse. This is the same pattern of deference to landowners concerning flow, groundwater and water quality issues related to the Scott and Shasta TMDL that has proven to be ineffective (QVIC 2009a).

The most troubling aspect of this apparent between-drafts back-sliding is that the Regional Water Board and State Water Resources Control Board appear to be moving in the same policy direction the California Department of Fish and Game has taken in the Scott and Shasta river basins with regard to permitting the incidental take of Endangered Species Act-listed coho salmon (QVIC 2009a, 2009b, QVIR 2006, 2006a, 2008, 2008a, 2009). If the Regional Water Board chooses this path of least resistance it could face a legal challenge similar to that brought by conservation and fishing groups in 2009 against CDFG.

There are many well-documented Middle Klamath water quality problems related to agriculture that persist (Kier Associates 1991, 1999), including water diversion and thermal pollution in Bogus Creek. Agricultural operators in Bogus Creek need to be held accountable. The plan should incorporate "salmon safe" practices in farm and ranch plans as soon as possible.

Bogus Creek is one of the last Pacific salmon refugia in the upper Middle Klamath River reach and the metapopulation function (Rieman et al. 1993) of wild salmonids that do not have access to the Upper Klamath rely on this refugia. Increased stream diversions between 1991 and 1999 (Kier Associates 1999) in Bogus Creek increased water temperatures above optimal for salmonids, while aquatic insect diversity decreased. Similarly, chronic problems with stream diversions and other agricultural operations on lower Horse Creek are known to limit potential coho salmon refugia there. Many mainstem Klamath River reaches have unfenced riparian areas where animal waste enters the river directly and there are no vegetative buffers to filter nutrients and pesticides (Kier Assoc. 1999).

The Klamath TMDL should clearly recommend that agriculture reduce pesticides and herbicides that are problematic for water quality restoration and push for integrated pest management (Dieckhoner and Galvin 1999).

The National Marine Fisheries Service (2008) recently held in a Biological Opinion to the U.S. EPA that products containing chlorpyrifos, diazinon, and malathion have significant adverse effects on endangered species. The Yurok Tribe has pointed out previously that the use of these products is prevalent in Siskiyou County.

Of even greater concern are subsequent findings regarding mixtures of commonly used chemicals that are widespread in the environment (Laetz et al. 2009): "Pacific salmon exposed to mixtures containing some of the most intensively used insecticides in the western United States showed either concentration-additive or synergistic neurotoxicity as well as unpredicted mortality. This implies that single-chemical assessments will systematically underestimate actual risks to ESA-listed species in salmon-supporting watersheds where mixtures of OP and CB pesticides occur."

The United States Geological Survey (2009 as cited in Laetz et al. 2009) found low ambient levels of pesticides in Pacific Northwest rivers that, taken individually are not toxic to salmonids, but when salmonids are exposed to the same mixtures in laboratories they become stressed or die (Laetz et al. 2009). Given the extremely low flows in the Shasta and Scott River basins there is the clear potential for the concentration of pesticides to levels that could cumulatively effect salmonids. The Regional Water Board should err, if at all, on the side of caution given this newly-available scientific information.

Prohibition on the Discharge of Excess Sediment
As noted in Section 6.5 "Nonpoint Source Control and the Watershed-Wide Allocations" of the *Revised Public Draft TMDL*, the "Prohibition on the Discharge of Excess Sediment" section of the *Public Draft TMDL* was dropped and replaced with a voluntary "Guidance for the Control of Excess Sediment".

This is another disappointing example of the weakening of the Implementation Plan. We recommend the original language be restored. Given that sediment is a well-known contributor to stream warming and that the Klamath TMDL has prohibitions on inputs to Middle Klamath tributaries to protects refugia, this new, lax language is inconsistent with the temperature refugia policy and will confound attainment of that objective.

Waste Discharge Requirements or Waivers for Private Timber Unlikely to be Sufficient
The need for the Klamath TMDL pollution abatement program is driven in significant part by non-point source pollution from timber harvest and associated road networks. Despite years of requests from the Yurok Tribe, the Regional Water Board still has not required private timberland operators to adhere to prudent risk thresholds for timber harvest (Reeves et al. 1993, Reeves et al. 1995), road densities (NMFS 1995, 1996) or road stream crossings (Armentrout et al. 1999).

Consequently, recurring excessive storm damage similar to January 1997 (de la Fuente and Elder 1998) is likely. The Fruit Growers Supply (FGS) habitat conservation plan (HCP)(CH2M Hill 2009) portends poorly for water quality and Pacific salmon recovery. We are not sure if the Regional Water Board is aware of the FGS HCP or is commenting on it, but some examples of problems likely to arise with refugia protection are discussed below.

While CDFG and the National Marine Fisheries Service (NMFS 2009) will require that some riparian areas on FGS land be protected and taken out of timber harvest rotation, the HCP states clearly that this will lead to more rapid harvest and rotating clear cuts on the remaining ownership. This is problematic for stream protection given that many of Middle Klamath tributaries, where FGS has ownership like that in Horse and Beaver Creeks, are already well over cumulative effects thresholds (Kier Assoc. 1999, KNF 2000). The accelerated clear- cutting will exacerbate problems and confound refugia protection.

FGS ownership patterns where clear-cutting will take place tend to be at higher elevations which will experience an increased risk of rain-on-snow events (Van Kirk and Naman 2008). Clear cuts could add to increased peak discharge which can alter channel conditions profoundly (Montgomery and Buffington 1993) to the detriment of salmonids.

Clear cuts in headwater areas and on unstable inner gorges may not only increase sediment yield catastrophically, but can also cause a major decline in the large wood recruitment (May and Greswell 2003) essential for fish habitat. This strongly suggests the need for specific language in the Klamath TMDL regarding riparian and headwater area protection (FEMAT 1993).

The road provisions of the FGS HCP give further cause for concern. Values on FGS holdings range as high as 7.2 miles of road per square mile of watershed (mi./mi.^{2}). The overall average in FGS watersheds is 5.4 mi./mi.^{2}. This is far above recognized thresholds for judging cumulative effects risk (NMFS 1995, 1996, USFS 1996) and is likely contributing to increased peak flows (Jones and Grant 1996). FGS timberland ownership on steep holdings tend to exhibit road construction with many stream crossings in short spans of headwater streams, also known as 'stacked culverts'. The presence of many such crossings in headwater areas can lead to multiple crossing failures (Armentrout et al. 1999), a phenomenon that contributed hugely to stream sedimentation in January 1997 (de la Fuente and Elder 1998).

There will be no reduction in road densities under the FGS HCP, which acknowledges that road systems will be maintained only when there is an active timber harvest plan in the vicinity. Leaving roads in an unmaintained state will lead to culvert plugging, road failure and even 'stream capture'. It should not be allowed - the Klamath TMDL needs to call for decommissioning roads and reducing road networks to levels were they can be maintained.

The FGS HCP allows timber harvest on steep slopes with high risk of landslide failure. Road construction in these areas is not prohibited, and would be allowed after geologic review. This shows that despite numerous studies (Ligon et al. 1999, Dunne et al. 2001, Collison et al. 2003) demonstrating the notorious deficiencies of the California Forest Practice Rules (CFPR), the deficiencies have yet to be addressed.

The Klamath TMDL should require analysis with available landslide risk tools like SHALSTAB (Dietrich et al. 1998) and should prohibit activities on steep slopes with high or extreme landslide risk, especially those in the inner gorge where sediment may be delivered directly to streams (de la Fuente and Elder 1998). The FGS HCP lacks specific prescriptions or restrictions on activity on unstable soils like decomposed granite that are known to cause major water pollution in Beaver Creek (Kier Associates 1999).

The Klamath TMDL presents insufficient protections for these issues and improvements must be made before the TMDL is finalized prior to the adoption hearing scheduled in March 2010.

Pollution Control on Federal Lands

The Yurok Tribe recently submitted written comments to the State Water Resources Control Board (SWRCB) regarding the proposed transfer of authority for oversight of federal land management from the Regional Water Board to the SWRCB. We are concerned about problems that have arisen from the mismanagement of National Forest lands that have contributed significantly to stream pollution and decreased chances for the recovery of Pacific salmon species.

While the recognition of the need for action provided in the Klamath TMDL gives the Yurok Tribe

hope, the prospect of the proposed transfer of authority is chilling.

The Yurok Tribe remains disappointed that there is no specific requirement to reduce road densities on USFS lands despite the fact that watershed analyses and road management plans on both Six Rivers and Klamath National Forest set such targets (SRNF 2000, 2003, KNF 2000). By simply adding their own targets to the TMDL the Forest Service would likely accelerate federal funding for bringing their lands into compliance. Absent such language the KNF will likely continue to delay such improvements indefinitely. Proactive National Forests like the Six Rivers could use the TMDL to leverage significant funds or road decommissioning projects.

There is a profound need for more trend monitoring and compliance enforcement. Even when aquatic indicators are trending negatively, required corrective action, using adaptive management, has not been taken. The Regional Water Board has failed to press for data and assessments from the Klamath National Forest. There has been a pattern of incompetence that has been tacitly allowed.

Adaptive Management and Monitoring Deficiencies Indicate CEQA Non-Compliance

The Revised Draft Klamath TMDL falls short of any scientific standard for the use of adaptive management (Walters, 1997). It instead falls into the pattern of 'deferred action' described by the NRC (2004):

> "In the deferred-action approach, management methods are not changed until ecosystems are fully understood (Walters and Hillborn 1978, Walters and Holling 1990, Wilhere 2002). This approach is cautious but has two notable drawbacks: deferral of management changes may magnify losses, and knowledge acquired by deferred action may reveal little about the response of ecosystems to changes in management. Stakeholder groups or agencies that are opposed to changes in management often are strong proponents of deferred action."

The implementation actions called for in the TMDL are not yet defined and are to be worked out through subsequent negotiations with the USFS, private farm and ranch interests, or large private timberland holders. The Klamath TMDL must be clearer in defining how it will enforce water quality standards, the monitoring that will be used for compliance assessment, and a timeline for abating water pollution under CEQA. Otherwise, how does the Regional Board expect to see timely improvements? The deferred approach is facilitating the status quo and will result in an increased work load for Regional Board staff in the future.

Despite more than five years of recommendations from the Yurok Tribe to the Regional Board staff, the Klamath TMDL still lacks a tributary monitoring program based on trusted scientific methods (Knopp 1993, Kier Associates and NMFS 2008) with a timeline for attainment of targets. Consequently, adaptive management will remain elusive (NRC 2004) as will compliance with CEQA.

Concluding comments on TMDL implementation

The Regional Water Board is shirking its duty and abrogating its authority by not requiring farm and ranch plans similar to those required by the Garcia River TMDL (Regional Water Board 1998). The strategy has worked well in the Garcia basin where voluntary strategies in other basins have largely

failed. The legality of the Garcia farm and ranch plans was affirmed by the State's courts in Prosolino vs. Nastri. The Regional Water Board has a duty to adhere to proven, practical and legal measures to abate non-point water pollution.

The Regional Water Board has apparently succumbed to pressure brought by the Klamath basin landowner community. We recognize that while compromise may be regarded as an inherent dimension of environmental regulation, we would point out that whatever is ultimately adopted here must be not only based upon the law but it must be capable of achieving its aims, as well. The preponderance of comments on the *Public Draft TMDL* came from those objecting to regulation. It appears their objectives are being met by the regional board staff choosing to favor the weighted response method in which the team with the most comments wins. This is clearly a non-scientific approach and will create stiff resistance amongst those who have traditionally supported the Klamath River TMDL.

We are aware that the some have used fear-based tactics and that some commenters at Klamath TMDL hearings have resorted to threats and personal intimidation of Regional Water Board staff. Nonetheless, there is a duty under the law to restore the water quality to the Klamath River from which the Regional Water Board cannot shrink.

Despite the numerous requests and recommendations made by the Yurok Tribe over the past several years, the Klamath TMDL still does not acknowledge the urgent need to commence the restoration of the Klamath River basin's freshwater habitat immediately, given the imminent ocean and climate cycles (Hare 1998, Hare et al. 1999, Collision et al. 2003). The consequences are very real and will affect Tribal Lifeways that rely on all anadramous fish stocks being restored to healthy sustainable populations.

To let these fish populations continue to decline to the point of extinction, the Regional Water Board would violate the Clean Water Act and would deliver a perpetual loss to the Klamath Basin Tribes. Given the existing water quality and fish health crisis and the onset of global warming (Van Kirk and Naman 2008), the bureaucratic backsliding represented by the devolution of the Klamath TMDL is inappropriate, unacceptable and clearly legally challengable.

PART 2:
COMMENTS ON OTHER CHAPTERS AND ISSUES

Chapter 1: Introduction

Page 1-27:
The following text seems to be describing the old figure (now removed from the text), not the new one, and is thus obsolete and should be deleted or revised:

> "The estimated unimpaired flows represented in Figure 1.111.12 illustrate the magnitude and pattern of flows that would be expected with natural flows in the Scott and Shasta Rivers and without diversions upstream of Keno, Oregon. These data, however, should be viewed with caution because the estimated unimpaired flows are based on the estimated median monthly unimpaired flows at Keno, as reported by the United States Bureau of Reclamation [USBR] (2005), whereas the

estimated natural Scott and Shasta River flows are reported by the U.S. Geological Survey (USGS (2006) as monthly means. Although the two types of data sets use different metrics, the data are useful for general comparison purposes."

Chapter 2: Problem Statement

Page 2-36
Richard Stocking has done excellent research on the Klamath River, but it is our understanding that he has an MS, not Ph.D., and thus the title "Dr. Richard Stocking" is incorrect.

Page 2-39
"*Microcystis aeruginosa, Anabaena flos-aquae, Anabaena flos-aquae, and Gleotricia echinulata.*" should read, instead, "*Microcystis aeruginosa, Aphanizomenon flos-aquae, Anabaena flos-aquae, and Gleotricia echinulata.*"

Page 2-59.
Table 2.10: "Summary of fall temperature effects resulting from human alteration" is an informative table; however, the river location is nowhere mentioned. We assume it is the site of Iron Gate Dam, but this should be stated explicitly.

Page 2-102
Incorrect citation in the references:
"E. J. Kann, and W. Walker, 2009. Multi-year Nutrient Budget Dynamics for Iron Gate and Copco Reservoirs, California. Final Technical Report to the Karuk Tribe Department of Natural Resources, Orleans, CA. 55pp + appendices.". The names should read "Asarian, E, J. Kann, and W. Walker"

Chapter 3: Analytical Approach

The changes made to the water quality model to address comments by the U.S. Geological Survey appear to be minor improvements. While we still have some concerns regarding the model, expressed in many rounds of previous comments, it is our opinion that on the whole, the model is robust enough to serve its intended purposes in the TMDL (i.e. setting load allocations). It is abundantly clear that the current nutrient concentrations in the river are far higher than natural background and that substantial reductions are necessary to restore water quality.

Chapter 4: Pollutant Source Analysis:

Page 4-29
Erroneous dates in "Table 4.3 Hydraulic Parameters for Klamath Reservoirs (May 2004 – May 2005)" if information is based on Kann and Asarian (2007), as that report examined the period May 2005-May2006. This was noted in previous comments, please fix.

Page 4-32
"For the purposes of this report the term retention is meant as net retention, which is the difference between influent and effluent loads. The net retention includes both permanent losses to the atmosphere and deep burial along with temporary storage and exchanges with the active sediment

and gains from the atmosphere due to nitrogen fixation."
We suggest the following revision to make this more explicit and accurate:
"For the purposes of this report the term retention is meant as net retention, which is the difference between influent and effluent loads. The net retention includes permanent losses (denitrification to atmosphere and deep burial), temporary storage and exchanges (within reservoir water column and active sediment), and gains from the atmosphere due to nitrogen fixation. This definition of net retention is slightly different from that used by Asarian et al. (2009) because that report excluded (subtracted) changes in reservoir storage in calculating retention."

Page 4-34
"Table 4.5 Estimated Nutrient Retention and Export for Copco and Iron Gate Reservoirs"
All instances of 2004-2005 in this table should in fact be 2005-2006. Also the values from Kann and Asarian (2009) should not include decimal places, as the values in that report are rounded to the nearest integer. Additionally, we suggest adding notes to clarify the sources of the literature-based empirical models. These include changing "Range of 5 methods cited by Kann and Asarian (2007)" to "Range of 5 literature-based empirical models applied by Kann and Asarian (2007)". Additionally, a note should be added to indicate that the Vollenweider (1976) and Nürnberg (1984) values were derived by Tech (one was to do this would be to say change "Vollenweider (1976)" to "Vollenweider (1976) empirical model applied by TetraTech (2008)", etc. Also, the "PacifiCorp (2006)" nitrogen estimate is derived from Kann and Asarian (2005) and should be noted as such suggested revision: "PacifiCorp (2006), based on Kann and Asarian (2005).

Chapter 5: Klamath River TMDLs – Allocations and Numeric Targets

Page 5-3
This comment was previously submitted, but has not been resolved and is thus re-stated here. Table 5.1 in the Public Draft TMDL is generally an excellent table, nicely summarizing all of the numeric targets and allocations; however, it contains something that does not make any sense: "Microcystis aeruginosa cell density < 50% of the blue-green algae biomass, or < 20,000 cells/L (which ever is lower)" (p 5-3). We agree that the Microcystis aeruginosa cell density < 20,000 cells/L is an excellent target, but the Microcystis aeruginosa cell density <50% of the blue-green algae biomass it is unnecessary and not supported. For example, if the total blue-green algae biomass is very low, then it should not matter if Microcystis aeruginosa is 50% of the total -- because the total amount of Microcystis aeruginosa would still be very low. Public health risks are driven by the concentration of Microcystis aeruginosa cells and microcystin toxin, not the relative percent of the blue-green algae biomass that is Microcystis aeruginosa. We suggest a revised target of simply "Microcystis aeruginosa cell density < 20,000 cells/L". This is the only place in the entire TMDL that we can find any mention of a 50% target, so we suspect that its inclusion in Table 5.1 may have been unintended.

Appendix 1: Staff Report for the Proposed Site-Specific Dissolved Oxygen Objectives for the Klamath River in California

This appendix of the *Revised Public Draft TMDL* contains Regional Water Board staff's analysis of the existing site-specific objectives for dissolved oxygen in the Klamath River.

Comments on the proposed values

We agree with staff that Alternative 3, using a percent saturation based on natural receiving water temperatures, is the most appropriate method to use for setting the criteria; however, we disagree with the values proposed in Table 7.5:

Table 7.5 Alternative 3 Summary

Location	Percent DO Saturation based on natural receiving water temperatures	Time period
Stateline to Hoopa	90%	October 1 through March 31
	85%	April 1 through September 30
Hoopa to Turwar	85%	All year
Upper and Middle Estuary	80%	August 1 through August 31
	85%	September 1 through July 31
Lower Estuary	For the protection of estuarine habitat (EST), the dissolved oxygen content of the Lower Klamath Estuary shall not be depressed to levels adversely affecting beneficial uses as a result of controllable water quality factors.	

For reasons described below, it is our opinion that the values the Regional Water Board proposes in Table 7.5 are erroneous, based on artifacts of the TMDL water quality model, and should be revised. We suggest a value of 90% year-round for Stateline to above Turwar, and 85% for Turwar.

Regarding the values proposed for the various portions of the Estuary, at this time we cannot endorse setting site-specific dissolved oxygen objectives based on the TMDL water quality model for the Estuary, given: 1) the complex dynamics of the Estuary are not well understood, in part due to the lack of data, 2) the inherent difficulty of modeling a system as complex as the Estuary, 3) due to reasons 1 and 2 we regard the Estuary as the most uncertain geographic area of the TMDL water quality model, and 4) we have not closely examined model outputs for the Estuary. Furthermore, Table 6.7: "Minimum Percent DO Saturation at Locations throughout the Klamath River Mainstem under Natural Conditions (T1BSR Model Run)" does not included modeled percent saturation values for the Estuary (only displays as far downstream as Turwar).

It is our understanding that given that the Estuary is located on the Yurok Reservation, the Regional Water Board does not have authority to set a criterion anyway, as is alluded to in the text of page 7-3 "To the extent that the State lacks jurisdiction, the proposed SSO is extended as a recommendation to the applicable regulatory authority". Given the substantial uncertainty regarding the model predictions for the Estuary (even under current conditions, aside from the issue of natural conditions), and the lack of a need for the Regional Water Board to recommend a criteria due to lack of jurisdiction, we recommend that the Upper and Middle Estuary and Lower Estuary be removed from Table 7.5, and that area be left as a gap in the site-specific D.O. criteria.

Issue regarding elevation, atmospheric pressure, and dissolved oxygen saturation in the TMDL water quality model

Barometric pressure and water temperature are key determinants of dissolved oxygen saturation, and barometric pressure is dependent on elevation (higher elevation means lower barometric pressure

and hence lower dissolved oxygen). The information included in the "Table 6.6: Barometric Pressure Assignments, corrected for elevation at key locations" indicates that while representations of barometric pressure in the TMDL water quality model have been improved since previous versions of the model, the situation is still less than desirable, particularly for the portion of the Klamath River that lies within the Hoopa Valley Reservation.

For example, there is an approximately 900 foot elevation drop between Seiad Valley and the Saints Rest Bar on the Hoopa Valley Reservation; however, the model uses a single atmospheric pressure for that entire reach. It appears (based on Table 6.6) that the model's atmospheric pressure changes from 964.70 millibars (mb) to 1006.30mb right at Hoopa. We did some calculations to explore how this would affect the model results at a water temperature of 20 degrees C:

- 100% saturation is 8.66 mg/L at 964.70 mb and is 9.03 mg/L at 1006.30 mb, a difference of 0.37 mg/L D.O concentration. This represents the approximate magnitude of the model artifact affecting Hoopa.
- If water above Hoopa was at 90% saturation (7.79 mg/L)[100% saturation would be 8.66 mg/L), then once that water enters Hoopa and the modeled atmospheric pressure changes (and hence 100% saturation changes from 8.66 mg/L to 9.03 mg/L), then the 7.79 mg/L is equivalent to only 86.2% saturation (7.79/9.03*100).

Thus, it is highly likely that the jump up in exceedance of the 90% saturation threshold from 0% at D/S Salmon to 35.89% at Hoopa (see Table 7.3 embedded below) in August (and similar for July and September) is probably caused almost solely by this issue of the location of the atmospheric pressure breakpoint, and is thus an artifact of the model, not any real characteristics of that river reach.

The Yurok Tribe, Hoopa Tribe and the USFS operate continuous weather stations along the Klamath and Trinity Rivers and their data can be used to cross check assumptions made in the model to determine the effects of barometric pressure on dissolved oxygen saturation levels.

There is also a jump of 27 mb from above US Iron Gate Dam (909.83 mb) to DS Iron Gate Dam (936.40), and this also probably accounts for the jump in the exceedance of the 90% saturation threshold from 0% at 23.92% between these two stations (see Table 7.3 embedded below).

Table 7.3- Percentage of time in which a Percent Saturation Criterion of 90% DO Saturation is met under Natural Conditions (T1BSR)

90% Saturation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Stateline	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.27%	0.13%	0.00%	0.00%	0.00%	0.00%
DS_COPCO DAM	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DS_IGDAM	0.00%	0.00%	0.00%	10.28%	1.88%	8.75%	23.92%	27.69%	8.47%	0.00%	0.00%	0.00%
US_SHASTA	0.00%	0.00%	0.00%	4.58%	0.54%	7.08%	5.78%	1.08%	0.00%	0.00%	0.00%	0.00%
DS_SHASTA	0.00%	0.00%	0.00%	0.42%	0.00%	2.08%	0.54%	0.13%	0.00%	0.00%	0.00%	0.00%
US_SCOTT	0.00%	0.00%	0.00%	0.00%	0.00%	0.28%	1.21%	1.08%	0.00%	0.00%	0.00%	0.00%
DS_SCOTT	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SEIAD	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.54%	0.00%	0.00%	0.00%	0.00%	0.00%
US_INDIAN	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DS_INDIAN	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
US_SALMON	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DS_SALMON	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
HOOPA	1.08%	0.00%	0.00%	0.00%	0.00%	1.53%	28.90%	35.89%	21.11%	1.75%	0.00%	0.00%
US_TRINITY	1.21%	0.00%	0.00%	0.00%	0.00%	2.08%	28.63%	35.08%	18.89%	1.34%	0.00%	0.00%
DS_TRINITY	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.34%	9.14%	0.28%	0.00%	0.00%	0.00%
YOUNGSBAR	0.54%	0.00%	0.00%	0.00%	0.00%	0.00%	0.27%	8.33%	0.00%	0.00%	0.00%	0.00%
TURWAR	1.48%	0.00%	0.00%	0.00%	0.00%	1.53%	25.00%	23.39%	1.94%	0.00%	0.00%	0.00%
Upper Estuary	2.02%	0.00%	0.00%	0.00%	0.00%	4.58%	20.97%	34.27%	30.42%	8.06%	0.00%	0.00%
Middle Estuary - Top	2.02%	0.00%	0.00%	0.00%	0.00%	2.92%	14.52%	34.27%	34.17%	18.15%	0.00%	0.00%
Middle Estuary - Bottom	2.02%	0.00%	0.00%	0.00%	0.00%	2.92%	14.52%	34.68%	34.58%	18.95%	0.00%	0.00%
Lower Estuary - Top	20.65%	0.00%	0.00%	0.42%	1.21%	16.67%	28.63%	50.81%	57.08%	89.52%	99.58%	91.29%
Lower Estuary - Bottom	40.08%	28.45%	21.77%	49.17%	62.90%	70.42%	65.32%	66.13%	84.17%	100.00%	100.00%	97.51%

Lightly shaded cells are months and locations at which a 90% saturation criterion is always met under natural conditions. Dark shaded cells are months and locations at which a 90% saturation criterion is violated no more than 1% of the time. Unshaded cells are months and locations at which a 90% saturation criterion is violated under natural conditions.

Following a recent conference call to discuss the compatibility of the Regional Water Board's proposed site-specific D.O. objectives and the Hoopa Valley Tribe's water quality standards, Kier Associates notified Regional Water Board staff to the issues/calculations above, and staff responded that they would attempt to resolve the issue by having the TMDL modeling team add more break-points for barometric pressure between Seiad and Hoopa and re-run the model. This seems like a sensible approach and we look forward to seeing the results of the proposed model runs. We expect this will show that the TMDL model is compatible with the Hoopa Valley Tribe's natural conditions clause that specifies that:

> "If dissolved oxygen standards are not achievable due to natural conditions, then the COLD and SPAWN standard shall instead be dissolved oxygen concentrations equivalent to 90% saturation under natural receiving water temperatures." (Hoopa Tribe 2008).

It is our understanding that the jump in atmospheric pressure at Iron Gate Dam could not be fixed, because it was part of an upstream model segment that would have required more work that there is time for at this stage in the TMDL adoption schedule.

<u>D.O. criteria and climate change</u>

We object to staff's proposal of a standard that automatically weakens with climate change:

> "Further, using an estimate of natural temperatures as the basis for calculation DO concentration allows for consideration of the effects of climate change. If convincing data is developed which confirms a rise in natural temperatures due to the effects of climate change, then consideration can be given to adjusting the estimate of natural

> temperatures upon which the percent saturation criteria are based. If the percent saturation criteria were applied based on existing temperatures, no specific consideration would be given to climate change and all increase in natuarl [sic] temperature would automatically adjust the DO objective without executive or public review." (Page 7-15)

The text does not explicitly state whether climate change is natural or human-caused, an important distinction that should be made. It is our opinion that the majority of climate change that has occurred in the past few decades (and will continue to occur) is human-caused. Thus, climate changes are not "natural" and should not be included in "natural receiving water temperatures."

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