State of California
North Coast Regional Water Quality Control Board

PUBLIC COMMENTS & RESPONSES

for the

Action Plan and Staff Report for the Shasta River Temperature and Dissolved Oxygen Total Maximum Daily Loads

May 26~~3~~, 2006

Appendix J

State Water Resources Control Board
North Coast Region
5550 Skylane Boulevard, Suite A
Santa Rosa, California 95403
707-576-2220

TABLE OF CONTENTS

RESPONSE TO PUBLIC COMMENTS

Shasta River Watershed
Temperature and Dissolved Oxygen
Total Maximum Daily Loads

Prepared by:
Staff of the
North Coast Regional Water Quality Control Board
May 3, 2006

The Response to Public Comments document for the Shasta River watershed TMDLs is divided into two response sections; comments categorized by general topic, where appropriate, and responses and individual comments and responses.

Section 1 – Categorized Comments and Responses

Regional Water Board staff reviewed all of the written comments submitted during the comment period and all comments presented orally at the three public workshops. These comments were then partitioned into categories based on comment topic. Comments are arranged within each category and include the commenters name or affiliation. Responses are provided for each comment; however, several comments may be addressed under one response if the comments were similar enough in scope. For oral comments presented at the workshops, the workshop name will appear and then the commenters name will be given before their comment. The categories are listed below with their page number.

Comment Categories

Section 2 – Individual Comments and Responses

Comments submitted from certain agencies or individuals were addressed separately from the categorized comments above. For these, the comments from each letter or oral presentation were extracted and given an individual response. The entire submitted text was not included. Again, there may be one response for multiple comments if staff found this to be more appropriate. The individual commenters are listed below with their page number.

Section 1 – Categorized Comments and Responses

1. Beneficial Uses

Yreka Public Workshop comment:
Jack Cowley: The only thing that concerns me is that there is minimum emphasis on agriculture and we want to make sure that is a beneficial use.

California Cattlemen's Association comment:
It is important to remember as you progress with the Shasta TMDL that Agriculture is identified as a beneficial use for the Shasta River.

Response: The Basin Plan designates "agricultural supply" as a beneficial use of waters. Agricultural supply is defined in the Basin Plan (page 2-1.00) as "Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing". The beneficial use relates to the quality of water for use, not the quantity available for use or the presence of the agricultural activity itself.

Yreka Public Workshop comment:
John Giorgi: Why did you have some beneficial uses at the top when they are all supposed to be equal?

Response: The organization of the beneficial uses as presented at the workshop was for information purposes only. All beneficial uses are important.

John Spencer comment:
The TMDL must identify the applicable non-degradation provision of the Basin Plan and the Implementation Plan must lay out a clear path to compliance, i.e. a clear path to eliminating discharge of polluted agricultural wastewater whether or not this discharge is downstream irrigation water.

Response: The Staff Report (Chapter 11) contains an antidegradation analysis. The Action Plan, Table 4, has been revised to more clearly describe the path to bring tailwater return flows (e.g. polluted agricultural wastewater) into compliance with the Basin Plan water quality standards, the TMDL, and the Nonpoint Source (NPS) Policy.

Shasta River Coordinated Resources Management and Planning committee (CRMP) comment:
Hydropower generation is an existing use in the Shasta River, not a potential use as stated in Chapter 2, page 2.

Response: Thank you for your comment. Table 2-1 in the Basin Plan indicates that the hydropower generation is a potential beneficial use. The existing use of water for hydropower generation will be noted and forwarded to the appropriate Regional Water Board staff to be addressed as part of the Basin Plan triennial review.

Klamath River Keeper comment:
The TMDL fails to identify past beneficial uses, which must be restored in order to comply with the Porter-Cologne Act. That Act clearly calls for such consideration. In the past the Shasta River produced annual runs of up to 500,000 salmon. Furthermore, the Shasta was a stronghold of Spring Chinook salmon, which are currently on the brink of extinction in the Klamath River Basin. Porter-Cologne requires that you develop an Action Plan, which aims at restoring the historic conditions that supported those beneficial uses.

Response: The TMDL staff report identifies the Beneficial Uses of the Shasta River Basin, which include a suite of beneficial uses associated with coldwater fish, including salmonid species. Fish population information is summarized in Section 1.4.10, and includes a discussion of spring Chinook. Porter-Cologne requires the Action Plan to restore water temperature and dissolved oxygen in the Shasta River Basin to levels that are fully protective of the Beneficial Uses. The most sensitive existing Beneficial Uses in the Shasta River Basin include those associated with the support of salmonid populations and the TMDLs are established at levels to restore them.

California Cattlemen's Association comment:
CCA and local members would like to be engaged in further development of the TMDL, and subsequent policies, specifically the Wetland and Riparian Protection Policy.

Response: The Regional Water Board staff support CCA participation in this TMDL and any future Basin Plan amendments.

2. Water Temperature Objectives

EPA comment:
On page 6-17 of the Staff Report, EPA recommends that the final Shasta TMDL state explicitly that meeting the narrative objective of no alteration of natural receiving water temperature will also meet the 5˚F objective in the basin plan.

Response: The narrative temperature objective in the Basin Plan calls for natural receiving water temperatures unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration does not adversely affect beneficial uses. The water quality compliance scenario results in a temperature condition that staff believes does not adversely affect the most sensitive beneficial uses, specifically those associated with cold water fish. Since the TMDLs address all of the significant sources of

temperature impairment in the Shasta River watershed, i.e., streamside shade, tailwater return flows, minor impoundments, and flows, we believe that the Shasta temperature TMDL, when achieved, will meet the 5 F objective in the Basin Plan.

State Water Resources Control Board (SWRCB) comment:
In the Basin Plan language, Page 1, Part I, first paragraph: "Water temperature conditions are regularly too high…" Because the temperature objectives in the Basin Plan are narrative and the TMDL is interpreting the narrative in order to protect beneficial uses, staff recommend you say …"because they exceed temperature protective of salmonids…" or just leave out "too high" and say, "Water temperature conditions regularly exceed temperature thresholds protective of salmonids." Would be much more clear and concise.

Response: The Action Plan language has been revised.

3. DO Objectives

EPA comment:
On page 2-3 and Chapter 7 of the Staff Report, EPA recommends that the Regional Board revise the paragraph on the dissolved oxygen 50% lower limit. Figure 2.7 implies that the 9.0 mg/l monthly mean standard is likely met given a limited review of the data in the months of September - April. Improving summer conditions by meeting the 7.0 mg/l (based on the TMDL analysis) will then more conclusively attain the 9.0 mg/l. If the Regional Board agrees, then a statement regarding how attainment of the 7.0 mg/l standard meets the 9.0 mg/l objective is needed in chapter 7. EPA recommends that the Regional Board work with EPA to assure all the basin plan standards for dissolved oxygen are addressed in the final TMDL.

Response: The text has been revised in sections 2.2.2, 2.4.2, and 7.4.1 of the Staff Report to address this comment.

4. Biostimulatory Objectives

EPA comment:
Table 2-2 identifies the biostimulatory substances narrative objective as "applicable to the TMDL." EPA recommends that the final staff report clarify what is meant by "applicable." The document should clearly explain how the TMDLs address the biostimulatory objective.

Response: Modifications have been made to Sections 2.2.2 and 7.4.1 of the Staff Report.

5. Water Temperature Modeling

Eureka Public Workshop comment:
Michael Hentz: Groundwater levels – has there been any measurements as to the height of the water table? Has it been decreasing? How does groundwater affect temperature and how has it been depleted over time?

Response: Groundwater measurements were not made as part of the TMDL analysis.

Eureka Public Workshop comment:
Felice Pace: The modeling that you presented, you only presented one set of manipulations, you could have done other things, but you had a specific suggestion. But are we talking about the different allocation to get us to compliance, and it doesn't by the way, because at the bottom, it doesn't reach compliance.

Response: The water quality model was used to evaluate the components identified in the temperature and dissolved oxygen source and linkage analysis chapters. These components were evaluated discretely in order to better understand their effects, and were then combined to form the basis for the water quality compliance scenario, as described in sections 6.2 and 7.3. The narrative temperature objective in the Basin Plan calls for natural receiving water temperatures unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration does not adversely affect beneficial uses. The water quality compliance scenario results in a temperature condition that staff believe does not adversely affect the most sensitive beneficial uses, specifically those associated with cold water fish.

Yreka Public Workshop comment:
Dave Webb: Is the model run going to become the official baseline for comparison into the future or is there another baseline?

Response: TMDLs must result in attainment of water quality standards throughout the year, including under critical conditions [40 CFR 130.7(c)]. For the Shasta River, temperature and dissolved oxygen objectives are not being met during the summer months. The temperature and dissolved oxygen load allocations were developed based on the water quality compliance scenario, which was run for the period August 29 – September 4, 2002.

Yreka Public Workshop comment:
Steve Orloff: When modeling the effect of return flow how did you estimate the volume of that return flow?

Response: Please see the responses to Dr. Daniel Drake in the Individual Comments and Responses section of this document.

Yreka Public Workshop comment:
Siskiyou County Supervisor Jim Cook: The coldwater flows that you based the models on: I want to make sure you capture the comments of Mr. Louie about the temperature. This is not anecdotal – there is actual data. I'm sure he will get the data for us – and there is data there. I'd like that to be capture on your board.

Response: We look forward to receiving the data from Mr. Louie. See also responses to Dr. Drake and to responses to Comment Category 7 – Water Temperature, Flow and Allocations.

Yreka Public Workshop comment:
Jim De Pree: It's still unclear to me that in the technical TMDL that you may have done other modeling scenarios. How many of those other scenarios were looked at. I feel like the 50% increase is the only way to achieve the targets. How did that increased flow move down the system?

Response: Various water quality modeling scenarios were applied in evaluating the components identified in the temperature and dissolved oxygen source and linkage analysis chapters. The water quality compliance scenario represent the synthesis of these discrete model scenario applications. In regards to the 50% flow increase, please see response to Comment Category 7 – Water Temperature, Flow and Allocations.

Yreka Public Workshop comment:
Jim De Pree: You have a lot of documentation on the models but it's not in plain language. If we're going to look at different ways to meet those objectives, we don't want to get boxed into the idea that flow is the only way to meet those objectives. If you're allowing for diversion below Big Springs Creek for ag purposes but not out of the Big Springs complex – how does that mesh with the priority of water rights? You have an inequitable situation there.

Response: We agree that the modeling analysis is complex and highly technical. Please see the response to Comment Category 7 – Water Temperature, Flow and Allocations. We recognize that the issue of flow increases is complex with respect to water rights. Regional Water Board staff are engaging State Water Resources Control Board Division of Water Rights staff and attorneys in order to better understand the constraints and opportunities that our TMDL analysis has identified.

Yreka Public Workshop comment:
Jim De Pree: Some people may have been diverting and some might not be diverting. So using a model run on these particular conditions when there is associated error, should they even be used in the TMDL for devising implementation? Shouldn't those more be hypotheses to be tested as the TMDL in implemented?

Response: Please see the response to Comment Category 7 – Water Temperature, Flow and Allocations. In addition, the TMDL identifies the need for more monitoring of system hydrodynamics, and this information will be used in assessing the adequacy of the TMDL.

Yreka Public Workshop comment:
Jim De Pree: You need to make that more clear in the Action Plan. I don't understand potential shade. Is that required amount at every point? Is there an allowance for windstorms etc.?

Response: Please see section 6.5.2.1. The potential solar radiation transmittance values for the Shasta River were estimated by staff, and do account for natural disturbance. Adjusted potential effective riparian shade equal to 90% of site potential shade is applied to Shasta River tributaries, and accounts for natural riparian disturbance.

Yreka Public Workshop comment:
Jim De Pree: In the mainstem – are you going to require the potential in the tributaries and the mainstem?

Response: Yes; see previous response.

Yreka Public Workshop comment:
Jim De Pree: But in a reach you have several different property owners and who has to be below – how is it divided? I assume that the temperatures at the river miles is what you are ultimately trying to reach. In the model – when you use the accretions, you look at subsurface flow or groundwater or tailwater. Do you have to allocate what you think might be the percentage from each of those sources to account for any increase in flow from those sources. And if you found that 90% of that water that you're gaining is from subsurface flow, would that make a difference in model results?

Response: Please see responses to Dr. Drake's letter as well as response to Comment Category 7 – Water Temperature, Flow and Allocations.

Siskiyou County Supervisor Marcia Armstrong comment:
The Temperature TMDL says that the 50.0% flow increases from the Big Springs Complex is "achievable" (Chapter 6, pp. 17). We are somewhat unclear as to how such increases will be achieved, how the modeling was done to accomplish these particular numbers, and what underlying assumptions were made in calibrating the model.

Response: Please see response to Comment Category 7 – Water Temperature, Flow and Allocations.

Siskiyou County Supervisor Marcia Armstrong comment:
Volcanic activity appears to be a reason behind the constant year-round temperature in the Big Springs area, 58 degrees in Big Springs and 56 degrees in Little Springs. These temperatures are higher than what should be expected from the melt of snowpack on Mount Shasta and likely reflect a geothermal heating of these spring waters, which would be part of the natural conditions of Shasta Valley. It would seem that the Shasta River would naturally have temperatures above 18 degree Celsius, or 64.4 degrees Fahrenheit, the rearing threshold for Salmonids, for water traveling approximately 18 miles or more down stream during the summer period.

Response: Regional Water Board Staff have found no evidence that volcanic activity influences the temperatures of Big Springs. Our own temperature measurements of Big Springs show the groundwater emerging at a temperature of 11.3 deg C (52.3 deg C) . This temperature is in fact lower than ground water temperatures measured at other locations throughout the north coast. For instance, Regional Water Board staff measured Scott Valley groundwater temperatures of 13-14 deg C (56-58 deg F). These temperatures reflect the temperature of the earth that the groundwater passes through. The only thing thermally unique about the Shasta River is the large volume of cold water sources. Please also see response to Dr. Daniel Drake, comment 27 in the Individual Comments and Responses section of this document.

Siskiyou County Supervisor Marcia Armstrong comment:
The modeling approach that was utilized only takes in consideration one climatic year, and that seems like a risky proposition when this single sampling period becomes the baseline for the Action Plan/Basin Plan.

Response: TMDLs must result in attainment of water quality standards throughout the year, including under critical conditions [40 CFR 130.7(c)]. For the Shasta River, temperature and dissolved oxygen objectives are not being met during the summer months. The temperature and dissolved oxygen load allocations were developed based on the water quality compliance scenario, which was run for the period August 29 – September 4, 2002. As detailed in section 6.3 of the Staff Report, both air temperature and flow conditions represented critical conditions during this time period. Results of the water quality compliance scenario demonstrate that when the TMDL is fully implemented, water quality standards can be achieved under critical conditions.

Siskiyou County Supervisor Marcia Armstrong comment:
Unfortunately the information and data are presented in a highly technical methodology. If we do not understand the data, then it becomes likely that we have the potential to end up in a “box canyon” with the North Coast Regional Water Quality Board (NCRWQCB) taking actions that we have no chance to prevent. We need to be able to run additional scenario modeling, using the particular model that was configured for the Shasta Valley TMDL. We feel it is appropriate to have the NCRWQCB empower the Shasta Valley Resource Conservation District (RCD)/CRMP to be able to undertake this task.

Response: We agree that the information and analysis is complex and highly technical. The Regional Water Board will make the Shasta River water quality model available to the Shasta Valley RCD/CRMP. A training will be provided by Dr. Deas of Watercourse Engineering for Shasta Valley RCD/CRMP staff on use of the Shasta River water quality model, paid for by Regional Water Board TMDL funds. Regional Water Board staff are in the process of detailing the specifics of this training with Dr. Deas.

Santa Rosa Public Workshop comment:
Siskiyou County Supervisor Jim Cook: Setting hard and fast requirements using modeling approach with limited data and only one climactic year seems to us to be a little bit too risky. We wonder why an adaptive approach is not a better way to firm up the basis for those requirements.

Response: See response to similar comment by Supervisor Armstrong above. See also response to the California Cattlemen's Association comment in Comment Category 7 – Scientific Support.

Shasta CRMP comment:
The Environmental Analysis states that "the public will have time to come up with alternatives". Devising and assessing alternatives will require functional access to the temperature and dissolved oxygen model as modified by RWQCB. The Shasta Valley RCD invested over $300,000 in the development of components of that model, and feels it is appropriate for RWQ to provide training to the RCD on the model in its current form so that we can do at least limited modeling of alternatives on our own.

Response: See response to similar comment by Supervisor Armstrong above.

Shasta CRMP comment:
We are not sure the temperature model outputs are as yet wholly reliable as it is being used by RWQ. Data from June, 1998, when Dwinnell Reservoir was releasing 400 cfs (MWCD estimate) of cold water from the bottom of the reservoir from June 1-14 with corresponding maximum water temperatures of 68-72 F at R.M. 15.4 suggests that additional examination of model assumptions is in order. Runoff in 2006 appears likely to provide similar opportunities for field observations of the river with supplemented by Dwinnell flows into the late spring when air temperatures have the potential to affect water temperatures significantly. Perhaps RWQ should take advantage of that opportunity to further test model outputs.

Response: Regional Water Board staff agree that additional water quality modeling could be completed to gain additional insights into the temperature dynamics of the Shasta River. We look forward to working closely with Shasta Valley RCD/CRMP staff in additional modeling efforts.

Shasta CRMP comment:
There was no assessment of the impacts of the loss of aquatic plants on other aquatic organisms which form the food base for the cold water fish being targeted, nor were possible loss of habitat issues, since in many areas rooted aquatic plants seem to be providing the only cover for the fish present. This may be of greatest concern upstream of RM 24 where the highest reductions in aquatic plants per mile are targeted, yet this is where human impacts should be lowest due to limited tailwater return and greatest amounts of springwater inflows. These factors suggest that additional considerations should be given to this before it is proposed as a blanket implementation method.

Response: The Shasta River is highly productive. Regional Water Board staff, including fishery biologists, believe that there would be ample food and cover to fully support the cold freshwater habitat beneficial use under TMDL compliant conditions. The total oxygen demand reductions for the reach upstream of Highway A-12 (River Mile 24.1) to Big Springs Creek is among the highest for the designated river reaches, as summarized in Table 7.9. As the commenter notes, this reduction is largely due to reduced respiration associated with reduced aquatic plant growth under water quality compliant conditions. Photosynthesis and respiration rates of aquatic plants for the water quality model were developed based on the July/August 2004 aquatic vegetation survey results (see Appendix A of Staff Report), as outlined in section 5.3.3 of Appendix D in the Staff Report). The amount of aquatic plant cover was comparatively high within this reach. Also, the channel width tends to be wider in this reach, compared to other reaches. The resulting reduction in total oxygen demand is based largely on these two factors. Regional Water Board staff believe that the reductions attributed to the Big Springs Creek to Highway A-12 reach can be met given implementation of the Action Plan, and point out that actions taken in upstream reaches will benefit downstream reaches.

6. Scientific Support

Rancho Hills Community Association comment:
From the information provided, it seems the recommendations lack the supporting science or quantity of data, therefore, the results are questionable and require further investigation. The state-hired consultant even suggests that more data is needed and we believe this recommendation should be given full consideration by your board before any action plan is approved.

Dan Drake comment:
It seems absolutely imperative that before this draft can be accepted, an evaluation of these interrelated factors on the functioning of the coldwater fisheries is necessary, not just a mechanistic or modeled response for temperature or oxygen levels. Much real world data and historical as well as local knowledge has not been included in this draft. The risk of not making an integrated evaluation is the risk of the fishery itself. Why isn't a more integrated and thorough evaluation conducted on the functioning of the coldwater fisheries?

Tom Wetter comment:
I appreciate that the NCRWQB has a difficult and necessary job to do. But, in considering solutions and sources of funding, I ask the NCRWQB staff and directors to take a step back and clearly identify the core issues and problems and do the work called for by your consultants. By default, the residents of Siskiyou County will be the implementers of the solution. Please make certain we're working on the right problem with the right solution before you issue a call to action.

Montague Water Conservation District comment:
The District has concerns and questions in regards to the data collected for the development of the TMDL. The District feels this is a weak foundation to build an action plan on.

California Cattlemen's Association comment:
It is recommended that further research be conducted to support the outlined activities, and any regulatory actions be based upon sound reliable data.

Response: Regional Water Board staff has completed a thorough technical analysis and is confident that their conclusions are scientifically supported. Staff collected quality data for the TMDLs for over 2 years before developing the technical analysis. The staff used appropriate models to develop the load allocations and the technical work was peer review by Dr. Charles Coutant, an aquatic ecologist. He writes in his technical review, "In summary, I found the analytical approach sound and quite thorough, and the analyses to be of generally high quality." Therefore, staff believe the TMDLs are based on sound science. Further, other agencies such as the California Department of Fish and Game (DFG or CDFG) and NOAA Fisheries support the findings of the TMDLs. They have identified the same impairments and have established the same linkage to sources of pollution in the Shasta River watershed. Additionally, the EPA, in their comment letter, supported the level of science that serves as the basis for the Action Plan.

However, the Regional Water Board is continually in the process of updating the technical analysis whenever new information is discovered. The TMDL process allows for adaptive management as described in a report to Congress by the National Academy of Sciences entitled "Assessing the TMDL Approach to Water Quality Management (2001)". TMDLs do not have to be based on 'complete science' before implementing actions. The authors of the report recommend an approach called 'adaptive implementation' and describe it as "a process of taking actions of limited scope commensurate with available data and information to continuously improve our understanding of a problem and its solutions, while at the same time making progress toward attaining a water quality standard."

The report further explains:

> By definition, science is this process of continuing inquiry. Thus, calls to make policy decisions based on 'the science,' or calls to wait until 'the science is complete,' reflect a misunderstanding of science. Decisions to pursue some

> actions must be made, based on a preponderance of the evidence, but there may be a need to continue to apply science as a process (data collection and tools of analysis) in order to minimize the likelihood of future errors. The immediate actions alone should not be expected to completely eliminate the impairment.

USEPA's Region 9 *Guidance for Developing TMDLs in California* also allows for a 'phased approach' to the TMDL technical analysis. "This 'phased approach' to TMDLs enables States to adopt TMDLs and begin implementation while collecting additional information needed to review and, if necessary, revise TMDL elements based on new information"(EPA, 2000).

The RWB will work with the stakeholders to apply 'adaptive implementation' or a 'phased approach' and refine the analysis as more data becomes available. Adaptive management is needed to ensure that the TMDL program is not halted because of a lack of data and information, but rather progresses while better data are collected and analyzed with the intent of improving upon initial TMDL plans.

7. Water Temperature, Flow and Allocations

General Comment Regarding Analysis of Flow and Water Temperature:
A number of commenters (Siskiyou Supervisor Marcia Armstrong, Dave Webb, and Tim Louie) raised questions about how the flow increase component of the water quality compliance scenario was represented in the model, and how these model results were incorporated into the temperature allocations for the temperature TMDL.

Response: The Tennessee Valley Authority's River Modeling System model (RMS) was applied for the Shasta River in developing the temperature and dissolved oxygen TMDLs. For TMDL development the Shasta River RMS model was calibrated for the period from 9/17/2002 to 9/23/2002 and validated for the periods from 7/02/2002 to 7/08/2002 and from 8/29/2002 to 9/04/2002 (see calibration and validation results in section 5.5 of Appendix D of the Staff Report). Calibration procedures are detailed in section 6.0 of Appendix D of the Staff Report. The water quality compliance scenario was run for the period from 8/29/2002 to 9/04/2002.

Flow input locations and types for the Shasta RMS model are identified in Table 6 of Appendix D of the Staff Report. The Shasta River has many ungaged diversions, spring flows, irrigation return flows, and tributaries. In the absence of gaged flow records for all flows, some flow inputs (spring flows, irrigation return flows, and tributaries) and outputs (diversions) were accounted for together as accretions and depletions in the Shasta RMS model. Due to access limitations, flow measurements of Big Springs Creek and the Shasta River within the vicinity of the creek were unavailable for application in the current (for TMDL development) and previous (for Shasta River RCD) model efforts. However, accretion flows in the Shasta River reach from downstream of Parks Creek to the Grenada Irrigation District pumps (GID) were determined based on a water balance, including measured flows at Shasta River above Parks Creek, Parks Creek inflow, and

Shasta River at GID, taking into account the GID diversion (see section 4.1.3 of Appendix E of the Staff Report). All of the accretion flow within this reach was assigned as an input from Big Springs Creek (as described in section 5.1 of Appendix D in the Staff Report). The accretion flow in this reach is referred to as the Big Springs Creek "complex" in the Staff Report, and this "complex" includes Big Springs proper (assumed to originate at the eastern end of Big Springs Lake), Big Springs Lake, Big Springs Creek, Little Springs and the channel between Little Springs and Big Springs Creek. Further, based on examination of historic Shasta River flow and temperature data from locations downstream and upstream of the Big Springs Creek confluence, it is postulated that the "complex" may also extend into the Shasta River proper (Appendix G of Staff Report).

The water quality compliance scenario included a 50% increase in flow in the Shasta River at the location just downstream of Big Springs Creek. The average flow at this location under the baseline and water quality compliance scenario conditions was 93 and 138 cubic feet per second (cfs), respectively. This increase was due to an increased Big Springs Creek complex flow input of 45 cfs, from 74 cfs to 119 cfs. For the water quality compliance model scenario this increased flow of 45 cfs served as "dedicated" instream flow, moving all of the way down the river to the mouth.

Shasta River flow measurements made during the late spring through summer period in 2002 at Louie Road (above Big Springs Creek) and at the Grenada Irrigation District (GID) diversion dam (below Big Springs Creek) indicated that the net accretion between these two locations ranged from approximately 55 cfs to over 80 cfs (Watercourse, 2004a, 2004b as reported in Appendix G of Staff Report). These flows are within the range of flows of Big Springs Creek (52 and 70 cfs) described by one commenter. As reported in Appendix G of the Staff Report, the California Department of Public Works measured flows within the Big Springs Creek complex in 1922 and 1923 during the Shasta River adjudication proceedings. Measured flows at the mouth of Big Springs Creek ranged from 35 to 118 cfs, with mean flows of 63 and 58 cfs in the 1922 and 1923 irrigation seasons, respectively. Based on measured flows in Big Springs Creek (Gage #21 located below the confluence of Little Spring Creek and below all diversion points in 1922-1923) and gaged diversion flows, the average total flow from Big Springs Creek including Little Springs Creek was reported to be 114.3 cfs during the 1922 and 1923 irrigation seasons (California (1925), as reported in Appendix G of Staff Report). Documented water rights to Big Springs Lake total approximately 47.5 cfs and rights to Little Springs total approximately 7.6 cfs (for additional details see Appendix G of Staff Report).

Based on the information outlined above, Regional Water Board staff estimate that pre-diversion flows from the Big Springs Creek complex were on the order of 100 to 125 cfs. In section 6.4.1.2 of the Public Review Draft Staff Report it was stated that the "50% flow increase from Big Springs Creek is achievable". The intended meaning of this statement is that Regional Water Board staff estimate that the flows represented in the water quality compliance scenario are within the historic (pre-diversion) flow range.

Big Springs Creek complex was selected for the 50% flow increase component of the water quality compliance scenario because it is a unique source of cold water. As discussed in the revised text in section 6.2.3.1, the temperature of Big Springs proper is quite constant at approximately 11.3°C (52.3°F); this is cold water.

The results of the water quality compliance scenario are presented in Figure 6.3 of the Staff Report, along with results of the Master 1 and Big Springs Q150% scenarios. The conditions of these scenarios are detailed in section 6.4.2 of the Staff Report. The effect of the flow increase component of the water quality compliance scenario can be determined by comparing the water quality compliance scenario results to those of the Master 1 scenario; the additional reduction in maximum stream temperature achieved in the water quality compliance scenario compared with the Master 1 scenario is attributed to the average increased flow of 45 cfs from the Big Springs Creek complex. As shown in Figure 1 below, the flow increase component of the water quality compliance scenario accounts for approximately 1.5°C, 1.2°C, and 2.1°C decrease in maximum stream temperatures at river miles (RM) 24.1, 15.5, and 5.6. These river miles are temperature compliance points, and are important locations for summer rearing of juvenile salmonids, as discussion in section 6.3 of the Staff Report.

US EPA regulations require that all sources or factors affecting a water quality impairment are allocated the appropriate responsibility for improving water quality conditions. In this case, our analysis demonstrates that flow alteration affects natural receiving water temperatures. Therefore, the Shasta River temperature TMDL includes a load allocation for flow: reduction in the maximum daily stream temperatures of 1.5°C, 1.2°C, and 2.1°C from baseline at RM 24.1, 15.5, and 5.6. The following is cited from US EPA's comment letter regarding the Public Review Draft Staff Report and Basin Plan Language:

> "EPA also supports the Regional Board's determination that the narrative temperature objective necessitates the consideration of all factors that influence natural stream temperature - including flow alterations. The TMDL appropriately included an analysis of the relationship of flow alterations in determining natural stream temperatures. TMDL submittals must demonstrate that all significant sources be considered in order to be approvable by EPA. The inclusion of the influence of flow on temperature is consistent with previous EPA temperature TMDLs in the North Coast."

We interpret the term 'sources' to refer to source categories or classes of sources. The temperature load allocation for flow does not specify a flow regime necessary to achieve the stream temperature reductions. While the water quality compliance scenario was based on a 50% flow increase in the Shasta River due to an average flow increase of 45 cfs from the Big Springs Creek complex, Regional Water Board staff recognize (and acknowledge in section 6.5.1.3 of the Staff Report) that there are other opportunities to increase flows that may achieve the same temperature improvements. Several commenters indicated, and we agree, that Parks Creek has significant cold spring water inflows, and could provide temperature benefits to the Shasta River. There are other

sources of cold water, and the Action Plan includes a goal of increasing the dedicated cold water instream flow in the Shasta River by 45 cfs. Dedicated cold water instream flow is defined in the glossary as "water remaining in the stream in a manner that that the diverter, either individually or as a group, can ensure will result in water quality benefits. Temperature, length and timing are factors to consider when determining the water quality benefits of an instream flow."

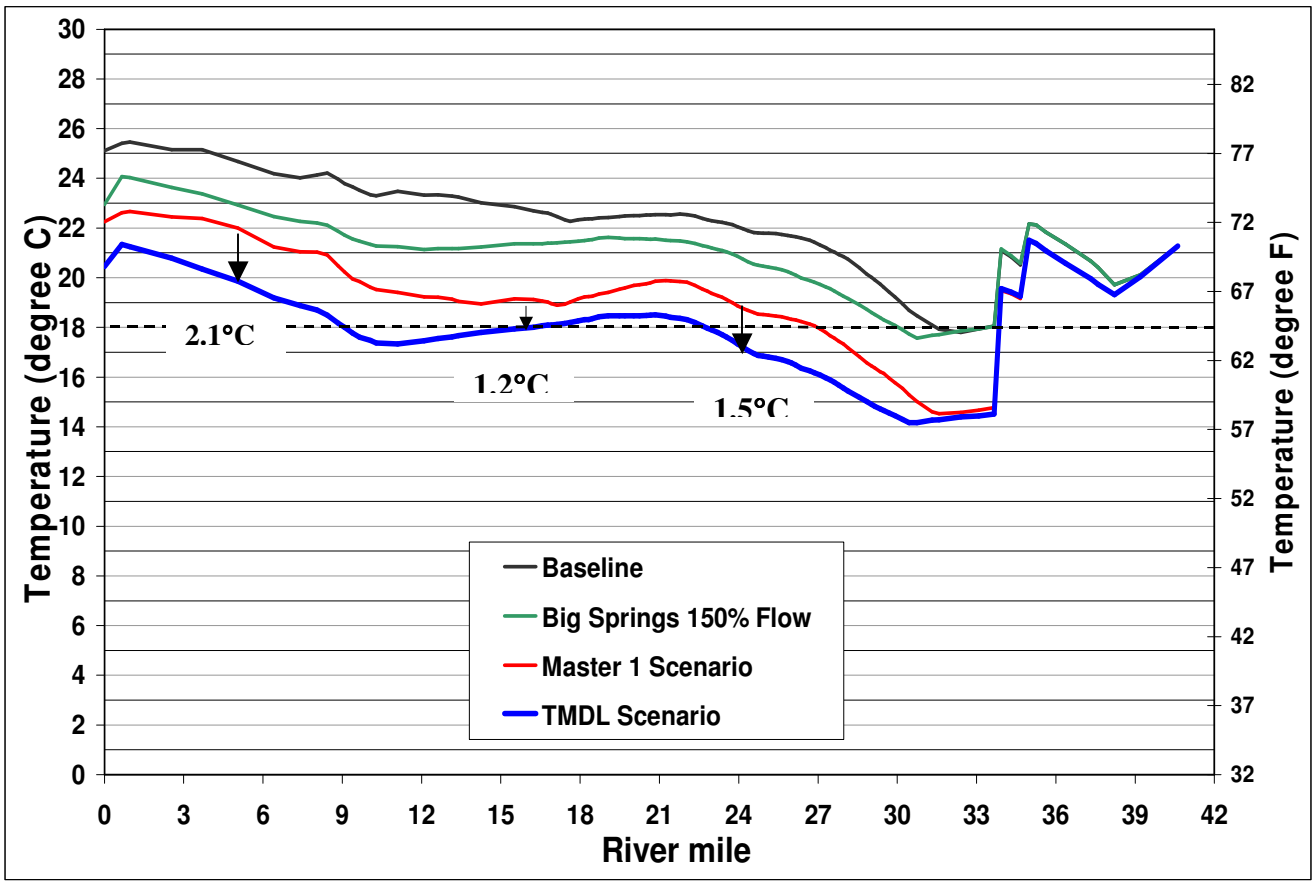

Figure 1. Temperature load allocations for flow.

8. Dissolved Oxygen Allocations

Siskiyou County Supervisor Marcia Armstrong comment:
It is not clear whether the 50.0% reduction in respiration rates as assigned to the Shasta River reaches in Table 3 (BPL, pp. 7) is achievable.

Response: Based on our best professional judgment, Regional Water Board staff believe 50% reduction in respiration rates is achievable given full implementation of the Action Plan. The factors staff believe will contribute to 50% reduction in respiration rates are outlined in section 7.3.2. We acknowledge uncertainty in quantifying the contribution of the various factors in achieving this reduction.

9. Volunteerism and Timelines

Eureka Public Workshop comments:
Felice Pace: we've had plenty of experience to evaluate volunteerism and we need to rethink timelines for evaluation in the TMDL.

Michelle Marta: your data describes a crisis and I'm alarmed at the amount of time allocated for implementation and returning with studies and I urge you to accelerate your evaluations and implementations so that we can get this river out of crisis.

Pacific Coast Federation of Fishermen's Associations comments:
Include numeric goals and fish-friendly timelines for achieving water quality standards.

Voluntary actions over the past 30 years have not alleviated the current degraded water quality conditions of the Shasta River. "Tier 2" "regulatory-based encouragement" should be followed by "Tier 3" "effluent limitations" in a reasonable time for fish to respond, as well as for people to respond to the requirements—say five years. Please outline steps and requirements that will meet water quality objectives in a timely manner.

Tim McKay comment:
I believe the NCRWQCB needs to work on more action in its Action Plan for implementing the clean-up provisions of the TMDL. The causes of impairment in the Shasta, Scott and other tributaries are well documented, and were well documented decades ago. Why is it that a small minority of people in the Klamath~Trinity region can be allowed to take actions that can have such a large impact on so many other people?

Santa Rosa Public Workshop comment:
Daniel Myers: In other words, what we mostly have heard about (in the Action Plan) are things that are not specific that are not discernable, they rely up on a 2 year period, a 5 year period, a 40 year period, and reexamination. I don't think that's what TMDL action plans are supposed to be like.

Sandy Bar Nursery and Ranch comment:
Thirty years of voluntary pollution clean-up has failed; it is time for real regulation.

John Spencer comment:
The TMDL Action Plan should review the 30-year history of the "voluntary" approach to meeting water quality standards in the Shasta River Basin including past 319 and restoration grants, successes and failures. Based on this analysis the Action Plan should stress "regulatory-based encouragement" for a maximum of 5 years followed by "effluent limitations" if the "encouragement" is not effective in meeting applicable standards.

State Water Resources Control Board comment:
In the BP language, Part V. Implementation is lacking a specific time frame for certain events, i.e. page 8 last paragraph. How long is the time period for notice of failure of voluntary actions if that scenario does happen? It's not clear when the various

implementation actions are to take place, or when they are to be initiated. Some sort of timeline is needed so the regulated community can know what is expected.

In the BP language, Page 14, Part VIII, the first sentence is unclear. "The Regional Water Board shall take enforcement actions for violations of the Shasta River TMDL Action Plan where elements of the TMDL Action Plan are made enforceable restrictions in a specific permit or order, as appropriate." Should be more specific on how items in the implementation plan will be made enforceable per the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program which emphasizes that any discharge must be regulated using waste discharge requirements, waivers, or prohibitions as appropriate. Staff recommends adding language to be clear that discharges will be regulated.

Klamath RiverKeeper comment:
The Draft TMDL relies heavily on voluntary action by landowners in order to address pollution impairments. Klamath RiverKeeper supports voluntary restoration. However, the NCWQCB is a regulatory agency. The Board should not and cannot legally avoid its obligation to fulfill its regulatory mandate. Therefore, voluntary approaches should be kept in perspective and utilized properly.

Jane Turnbull comment:
Fifty years of damaging activities will take some major changes in patterns of use, if the river is to be returned to health. Reparation cannot be accomplished by means of incremental changes. I hope that you and your board members will make the tough decisions that will be needed to remedy this vital waterway.

Response: Many commenters raised objections to the voluntary nature of the actions identified in the Action Plan and recommended that the Regional Water Board include more specificity in its timeline for when discharges will be regulated. The *Policy for the Implementation and Enforcement of the Nonpoint Source Pollution Control Program* requires all current and proposed nonpoint source discharges to be regulated under waste discharge requirements (WDRs), waivers of WDRs, a basin plan prohibition, or some combination of these administrative tools. All nonpoint source pollution control programs must contain the five key elements listed in the California Code of Regulations, title 23, section 2915. These include (1) the clear purpose to achieve and maintain water quality, (2) a description of the management practices to be implemented and a way to determine progress, (3) a time schedule with quantifiable milestones, (4) feedback mechanisms to determine whether the program is meeting its stated purpose, and (5) a clear consequence for failure to achieve the stated purpose. As detailed below, the Action Plan contains discrete time limits at which point the Regional Water Board will review the implementation and effectiveness of the recommended actions. If a solution to impairment is being implemented by another regulatory entity or a non-regulatory action of another entity, the Regional Water Board may certify that such action will correct the impairment, in lieu of adopting a redundant program. The Regional Water Board cannot rely on such programs until it makes certain findings supported by substantial evidence, including that the program will be adequate to correct the

impairment. The Regional Water Board must allow sometime in order to make this determination. If the information shows that parties are not implementing measures to improve water quality in all source categories listed in Table 4 of the Action, or if parties are not providing information to determine whether measures are being implemented, the Regional Water Board will adopt a different approach.

Each source category includes a time schedule that contains a deadline at which point the Regional Water Board will review the success of the measures. For example, for tailwater discharges, Regional Water Board staff will review the adequacy of voluntary actions within one year from EPA adoption and within five years, adopt a WDR, waiver, prohibition, or combination thereof that may be based on a third-party program or not. For range and riparian activities, the Action Plan allows two years to monitor implementation and effectiveness of recommended actions, and specifies that the Regional Water Board will adopt a WDR, waiver or prohibition either regionwide or by watershed within ten years. It is not appropriate to set a closer date for Regional Water Board adoption of a WDR, waiver or prohibition in this source category because the regulation may be adopted on a state or regional level in a broader policy. Low flows are not discharges subject to Regional Water Board permitting authority; however, the Regional Water Board will monitor the effectiveness of various actions to dedicate cold instream flows to the Shasta River and its tributaries and may make recommendations to the State Water Board based on the success of these programs. It is appropriate to rely on third-party and other regulatory programs in this source category given that the Regional Water Board authority is limited. In the interim, a conditional waiver has been added to the Action Plan that waives the requirement for dischargers to file a Report of Waste Discharge (RWD) so long as they are participating in the recommended actions and programs. This provides an incentive to implement voluntary action. Those not participating must file a RWD immediately.

10. Ranch and Riparian Implementation

Edward Jones comment:
You say that it is harmful to fish to have livestock in or near the water. This is also untrue. I have seen cows, horses, and deer in the water and steelhead and salmon would be swimming around and between their legs.

Response: Adverse impacts to fish from livestock has been well documented in the Shasta Watershed Restoration Plan, the California Department of Fish and Game Coho Recovery Strategy, and the draft Shasta Valley Resource Conservation District master incidental take permit application for Coho Salmon cited in the Staff Report. Impacts include direct damage to redds from livestock hoofs, to increases in nutrient concentrations from livestock waste.

Eureka Public Workshop comments:
Unidentified: How will you reduce aquatic plants?

Debbie Duckworth: Will the reduction in plants in channel leave open the door for an invasive plant to become established?

Response: See response to Yreka Public Workshop comment below.

Yreka Public Workshop comment:
Don Meamber: Grazing the riparian corridors could control the invasive weeds such as in the horrible photo you showed at the public meeting of the "white top."

Response: Reduction in aquatic vegetation will be achieved by limiting light availability through increased riparian shade, decreasing nutrient concentrations from tailwater return flow restrictions, and by decreasing water temperatures through a combination of measures. See Section 4.3.3.2 (Factors Affecting Aquatic Vegetation Productivity in the Shasta River) in the Staff Report for a more complete discussion.

The TMDL does not require the elimination of aquatic vegetation. Total elimination would likely result in the creation of a situation that would be conducive for invasive plant introduction and establishment. Rather, the TMDL requires a reduction in aquatic vegetation to a more "natural" condition by such measures as described above.

Regional Water Board staff concurs that well planned and timed grazing activities in riparian areas can be a viable measure to control invasive species.

Yreka Public Workshop comment:
Tim Louie: The problem when you fence the cattle out is that the weeds are going to start to grow. You need to make a study on that.

Response: The existing Shasta Watershed Restoration Plan, the California Department of Fish and Game Coho Recovery Strategy, and the draft Shasta Valley Resource Conservation District Master Incidental Take Permit Application for Coho Salmon all recommend exclusion of cattle from riparian areas. Regional Water Board staff is not recommending total exclusion of grazing from these areas, but rather implementing practices that will allow riparian shade producing vegetation to get established and grow to natural site potential.

Pacific Coast Federation of Fishermen's Associations comment:
Shade is not an adequate treatment to reduce water temperatures—it may help, but only in the very long term. The fish cannot survive long enough to realize the benefits of shade.

Response: Regional Water Board staff recognize that the development of adequate riparian shade is a long term (+40 year) action. As such the Action Plan was crafted to require a multi-faceted approach. Shade is only one component of the required

implementation actions; increase in stream flow and reduction in oxygen demand are also crucial parts of the recovery strategy.

Santa Rosa Public Workshop comment:
Siskiyou County Supervisor Jim Cook: Because of the long lag time for shade to affect temperature it might be helpful to investigate gravel supplementation as a way to encourage lower temperatures, which that does happen, and improve spawning conditions.

Response: Regional Water Board staff is unaware of any water temperature reduction strategy in use in California that uses gravel supplementation to lower water temperature. Staff would be interested in reviewing information germane to this issue. The Action Plan does not prevent the implementation of additional measures designed to protect beneficial uses.

Santa Rosa Public Workshop comment:
Siskiyou County Supervisor Jim Cook: And while shading is important, an important component to the stream temperature, which we found out using Dr. Deas' models, assigning a blanket value of 90% to the site seems to be not particularly helpful.

Response: A blanket value of 90% shade is not the load allocation for shade. The temperature TMDL riparian shade allocation for the Shasta River is reach average potential solar radiation transmittance; the temperature TMDL riparian shade allocation for Class I and II tributaries is equal to 90% of the site potential solar radiation riparian shade, which allows for natural disturbance to the riparian vegetation from such events as windthrow, flooding, bank erosion, fire, and disease.

Santa Rosa Public Workshop comment:
Siskiyou County Supervisor Jim Cook: Regarding the wetland and riparian protection policy that is mentioned in the implementation plan but has not been developed yet. You're going to approve this, we're going to say, by golly we're going to do all these things, and in a year or two we're going to find out what (the riparian protection policy) actually meant, and we're very concerned about that.

Response: The wetland and riparian protection policy will go through a full California Environmental Quality Act (CEQA) review process, including scoping meetings, public workshops and board hearing(s). The interested public will be kept fully informed and Regional Water Board staff will actively solicit public comments throughout the entire process.

Yreka Public Workshop comment:
Tim Louie: The riparian vegetation along Big Springs Creek has remained the same for many years. Altering the riparian zone of the creek will be difficult and unpractical. The stream is wide and there is little fall over the approximate 3-mile course to the Shasta River.

Response: Comment noted**.** Increasing riparian vegetation along Shasta River tributaries, including along Big Springs, is an important component of the temperature TMDL. As such, staff would be interested to know what riparian enhancement practices had been applied to the riparian zone along Big Springs Creek in the past that lead to this "static" condition. This kind of information will be useful in developing a fuller understanding of the site specific conditions along the riparian zones in the Shasta River. The Action Plan incorporates adaptive management principles to allow for implementation of additional measures and alternative approaches if the current proposal proves ineffective.

Yreka Public Workshop comment:
Don Meamber: Grazing the riparian areas will probably help remove the nutrients as long as the livestock don't do more damage. I've always felt a single wire temporary electric fence at the bank edge would eliminate the damage if the livestock are there for a short period, with a more permanent fence further back, like I have, to keep them out the remainder of the time. Most ranchers probably wouldn't feel they have the time to be bothered stringing an electric fence each season like this.

Response: Comment noted.

11. Tailwater Implementation

Yreka Public Workshop comment:
John Giorgi: I'm concerned about tailwater recovery when it goes back into the streams. If you are required to treat this water that's a heavy burden when the water may have come 10-15 miles back up the road, and all you're using is tailwater from your neighbors place because you don't have a water right, and you're next to the river. Therefore you're responsible for cooling the water that you didn't take out. And my understanding is to return water at the same quality it came out and again your nitrates and DO is going to change. So I hope you consider this. The other thing is incidental take. We have streams in the Shasta Valley that don't have record of fish going up them and will these streams have the same regulation because they are a tributary to the Shasta? I'm referring to fencing and creating a terrible weed base. I'm talking about water hemlock, which is poisonous to livestock. Who will determine the price if we have an incidental take on fish?

Response: The Action Plan outlines several measures for consideration applicable to tailwater management, including recycling and reuse where possible. The Action Plan,

Table 4, describes the path to bring tailwater return flows into compliance with the Basin Plan water quality standards, the TMDL, and the NPS Policy.

The TMDL Action Plan, Table 4, describes steps that may be necessary in working with the Shasta RCD's Coho Incidental Take Permit and CDFG's Coho Recovery Strategy regarding the restoration potential of various watercourses in the Shasta Valley, including the potential for the incidental take of salmonids. The CDF&G has the expertise to determine watercourses that do, or have the potential to provide fish habitat. When the habitat and restoration potential, based on site conditions, of a watercourse is ascertained, actions necessary to comply with the TMDL and Basin Plan will take into consideration economic impacts to landowners, and the management measures necessary to control minimize adverse environmental affects from the unwanted proliferation of weedy plants.

Yreka Public Workshop comment:
Siskiyou County Supervisor Jim Cook: In two years you're going to give a report on tailwater. The CRMP has been working on tailwater projects for a number of years, the easy ones are done, the more difficult ones haven't been done mostly because of the cost but also the engineering. You're basically creating a dam to create a lake to pump water back into the system. So I'm concerned that in two years, you can stand there and say well, I think they might be doing an engineering study, we're being set up for disaster. I think it needs to be extended to five years. In five years, we might get the engineering done. It's a function of money. Two years is not enough. The riparian protection policy and three tiered irrigation policy have not been done yet they are included in this Implementation Plan. You should make the statement that "other policies may be applied on top of this" instead of these policies will be applied, so you are not committing us to a policy before we know what it is.

Response: The TMDL Action Plan for irrigation water management does not specify a three tiered management approach. However, tailwater management does call for a "tiered approach" if prohibitions, WDRs, Waivers of WDRs, or any combination of the latter are selected for tailwater management. The Action Plan requires the Regional Water Board's Executive Officer to report to the Regional Water Board one year after EPA approval of the TMDL on the status of an evaluation plan for tailwater management. After the evaluation phase, the Action Plan, Table 4, provides for an adaptive approach that relies on cooperation between irrigators, the Shasta RCD and Shasta Valley CRMP, CDFG, and the Regional Water Board to implement management measures that best comply with the TMDL, the Basin Plan water quality standards, and the State's NPS policy (SWRCB 2004). When the latter is completed then the determination is made to either issue WDRs, Waivers of WDRs, prohibitions, or any combination of the latter.

Pacific Coast Federation of Fishermen's Associations comment:
Agricultural return flows need to be treated before being returned to the river for downstream use. Technology is available to do this with vegetative filters and settling or wetlands ponds.

Response: The TMDL Action Plan expressly encourages the use of appropriate technology for tailwater management, including vegetation filtrations strips, wetland "polishing"ponds, and upslope settling basins.

EPA comment:
EPA recommends that the allocations by river reach be supplemented by additional water quality allocations for tailwater return flows. EPA's review of the Shasta TMDL indicates that a more explicit statement of what modeled inputs of agricultural return flows is possible, albeit with qualifications. The analysis indicates to EPA that NBOD reductions from agricultural sources are likely needed in order to attain the dissolved oxygen standard.

Response: NBOD reductions from tailwater return flows are included in the water quality compliance scenario. The text of section 7.5.2 of the Staff Report and the Action Plan has been modified to add a specific NBOD concentration-based allocation for tailwater return flows.

EPA comment:
EPA also suggests that the implementation plan would be strengthened by adding a reasonable level of monitoring and reporting on tailwater return flows. The TMDL should clearly indicate how tailwater-related nutrient load will be monitored and assessed in the future.

Response: The Implementation Plan, Chapter 8, and Action Plan, Table 4, will require a comprehensive monitoring and reporting program after tailwater sources, usage, and discharges are evaluated and a management plan is formulated. Chapter 9, Monitoring of the Staff Report, and Chapter 10, Reassessment, tasks the Regional Water Board to develop a compliance and trend monitoring plan within one year, and reassessment occur with five years, respectively, of the date of EPA approval. The EPA will have the opportunity to fully review proposals for monitoring and reassessment planning before they are enacted in the watershed.

Marcia Armstrong comments:
The current action plan notes that projects referencing tail water return flows must be accomplished within two years by the impacted landowner. Oftentimes the engineering backlog prevents a timely design concept, and the potential for non-compliance arises as the tail water projects are not built within the stipulated time frame. We would ask that serious consideration be given to extend this compliance timeline to <u>five years</u>.

The Basin Plan talks about adherence to a certain tiered tail water management program (BPL, pp. 10). This particular program has yet to be developed. There needs to be appropriate language that allows some review and approval process as these policies or regulations are defined.

Response: The Basin Plan Language for the Action Plan does not call for strict adherence to a tiered approach to tailwater management; however, it does state that a tiered approach *may* be instituted for compliance if prohibitions, WDRs, or Waivers of WDRs, or any combination of the latter are instituted for tailwater management. Prior to tailwater implementation actions and management, an informational gathering phase is required where the regulated community will have opportunity to comment and offer management options best suited to site specific conditions. It will then be determined if a timeline greater than 5 years is necessary.

Santa Rosa Public Workshop comment:
Palma Risler of USEPA: It would be in line with other nutrient TMDLs in California if your staff would look again at monitoring recommendations for irrigated AG return flow quality. As it stands now I think that there was an evaluation phase in a year, but in many other nutrient TMDLs in California, the parties, the dischargers, come to the agencies with some reasonable monitoring that they have collected. Now (I don't know) whether or not irrigated AG is monitoring tailwater already through the Coho Incidental Take Permit. I didn't see it in there, maybe it is, but if we could again make it more explicit that the dischargers should report to the board so the evaluation phase is clearer: what is to be expected in the evaluation phase? Are they to collect what type of information? And they should produce that for the board and for your staff. I would think that your staff could best characterize what they think is the most important parameters to monitor for. Because without that how will they measure the success and the need for any additional programs?

Response: Any existing (and future) monitoring data collected by dischargers and/or other parties that are scientifically defensible would be considered appropriate to assess tailwater compliance with TMDL and Basin Plan targets.

The Coho Incidental Take Permit has not yet been approved and, in its current draft, there are no provisions for irrigated agriculture to institute tailwater monitoring.

The Implementation Plan, Chapter 8, and Action Plan, Table 4, will require a comprehensive monitoring and reporting program after tailwater sources, usage, and discharges are evaluated and a management plan is formulated. The Staff Report in Chapter 9, Monitoring, and Chapter 10, Reassessment, tasks the Regional Water Board to develop a compliance and trend monitoring plan within one year, and reassessment occurs with five years, respectively, of the date of EPA approval. During all steps in the process, Regional Water Board staff will seek to involve dischargers and other parties involved to prioritize and then select appropriate sampling locations, constituents, and field and laboratory analytical methodologies.

Santa Rosa Public Workshop comment:
Siskiyou County Supervisor Jim Cook: Making targets, especially tailwater that are reached specific where inputs are supposed to not degrade the water where they're

joining, effectively imposes a higher standard on persons upstream and we think it might be better that you have identical standards for them all.

Response: Actions necessary for similar types of land use activities to achieve water quality compliance are expected to be similar regardless of the location of the activity in the watershed.

Sandy Bar Nursery and Ranch comment:
Please adopt a plan that will require irrigators to clean-up irrigation water before returning it to the Shasta River. The technology exists; all that is needed is an agency with the guts to require clean up of polluted agricultural wastewater.

Reponse: The TMDL Action Plan, if implemented, should provide for a reasonable time frame and appropriate management measures, methods, and technology to allow irrigation return water to be discharged to receiving waters in compliance with the TMDL and the Basin Plan.

John Spencer comment:
The TMDL should fully lay out the technology available to eliminate agricultural return flow pollution and include a time-line for all those responsible for polluted discharge to come into compliance.

Response: The TMDL Action Plan, Table 4, encourages the use of appropriate technology to bring tailwater discharges into compliance with the TMDL, the Basin Plan, and the Nonpoint source Policy. The Regional Water Board's Executive Office may require, depending on site conditions, dischargers and other responsible parties to develop and implement tailwater management plan(s) to prevent discharges of pollution that elevate water temperatures and decrease dissolved oxygen concentrations in nearby watercourses.

Shasta CRMP comment:
The tailwater goal of no net increase in receiving water temperature may or may not be achievable, but no time frame is identified—is this intended to be at any time, or averaged over the course of a 24-hour period?

Zero tolerance for tailwater seems inconsistent with shared resources uses.

Response: The Action Plan calls for tailwater returns to be at or below river temperatures. This would apply any time.

Don Meamber comment:
All parties involved up here feel that "zero net increase" is too unrealistic of a regulation to enforce. It is an ideal goal but an achievable percentage increase would be more realistic.

Response: Thank you for your comment.

Klamath River Keeper comment:
The Action Plan should refer to the following Basin Plan provision: "Controllable water quality factors shall conform to the water quality objectives contained herein. When other factors result in degradation of water quality beyond the levels or limits established herein as water quality objectives, then controllable factors shall not cause further degradation of water quality. Controllable water quality factors are those actions, conditions or circumstances resulting from man's (sic) activities that may influence the quality of the waters of the State and that may be reasonably controlled." Because the Basin is in violation of the nutrient standard, this controllable source MUST be controlled in order to comply with the Basin Plan provision quoted above. The Basin Plan should lay out the steps by which the Board is going to require compliance, i.e. adequate treatment of all ag return flows so that they are not further degrading those parameters currently out of compliance.

Response: The Action Plan and Basin Plan Language for the Shasta River will be incorporated into an amendment to the present North Coast Water Quality Control Plan. As such, the Basin Plan Amendment when approved by the Regional Water Board and adopted by the State Water Board, will assure that proper steps are enacted for the treatment and compliance of all agricultural return flows that are protective of the beneficial uses of water.

California Cattlemen's Association comment:
CCA has some general concerns with Chapter 9, Monitoring. Specifically, monitoring "shall be conducted upon the request of the Regional Water Board's Executive Officer in conjunction with existing or proposed human activities that will likely result in increased dissolved oxygen and reduced water temperature in the Shasta River Watershed…The Executive Officer will base the decision to require monitoring on site-specific conditions, the size and location of the discharger's ownership and/or the type and intensity of land uses being conducted or proposed by the discharger." CCA strongly recommends that any additional steps taken beyond the voluntary tiered approach be based upon a reasonable need or evident problem, not assumptions or theory.

Response: As presently written, Chapter 9, Monitoring Plan, takes into consideration the management practices of individual landowners and dischargers. If ranch and other land managers choose voluntary land use practices that are proven to be effective at controlling discharges of pollutants from entering watercourses, then a "reasonable need

or evident problem" is less likely to occur, thus, also making it less likely that monitoring may be required.

12. Flow and Water Use

Flow and water use comments have been divided into five categories and the comments within each category are given a single response that addresses all comments. At the end of this section, there are also comments that were responded to individually.

Flow and Water Use Comment Group 1 – Shasta River Adjudication

Save our Shasta and Scott Valley comment:
If in the judgment of staff the plan is not successful, it specifically calls for modification to the water decree. This is totally unacceptable.

Eureka Public Workshop comments:
Denver Nelson: isn't the Shasta River fully appropriated, and are you suggesting that you are taking water rights and giving them to the environment.

Unidentified: The adjudication didn't take into consideration public trust flows because it was done in 1930's before the case law came down. It's possible that water rights can be arranged. There's another comment about groundwater, and they are not covered in the adjudication, and you do not need a water right to pump groundwater. It also doesn't address riparian rights, I took a look at the decree, and at the time, there was 40,000 acres of agriculture and now there are 50,000 so there has been an increase in diversions.

Yreka Public Workshop comment:
Blair Hart: And for that to be done and to have those milestones met (Big Springs Creek flow increases and temperature targets), those temperature reductions are not doable in the first five years. And you have down that if this isn't done in five years, there is a possibility of re-adjudication and that just scared the thunder out of everyone.

Pacific Coast Federation of Fishermen's Associations comment:
Problems with the Shasta River Adjudication must be identified and addressed in the TMDL Action Plan.

Siskiyou County Supervisor Marcia Armstrong comment:
We are very concerned that if the public draft of the Shasta River TMDL was adopted in its present form, it would have the potential to (sooner or later) re-open water adjudication (Basin Plan Language (BPL), p. 11, Flow). The current beneficial use of water for agriculture, municipal and domestic use would be diminished to such an extent that open space would be lost to development or that litigation for property takings would occur.

Santa Rosa Public Workshop comments:
Siskiyou County Supervisor Jim Cook: We are very concerned about this reopening of the water adjudication which it seems that if the current beneficial uses for water: agricultural, municipal, domestic, are diminished that's what would happen and open space would be lost to development and that's a great concern in our county or litigations for taking might occur.

Daniel Myers: The draft Scott Action Plan initially addressed the role of the Water Resources Control Board to participate in the restoration of stream flows. I think that they have to be a partner in any successful TMDL. I don't think you can leave water flows and the involvement of the State Water Resources Control Board out of it, I think you need to shake them a little bit and say, "You're part of this, participate."

Steve Orloff comments:
Even if the Action Plan does not specifically require an increase in flow from Big Springs, the wording implies that is does and creates a great deal of anxiety. I believe that the language in the plan relating to increased flow should be removed.

These areas should be investigated before reduced agricultural water use to augment flows is included in a TMDL Action Plan.

Klamath Siskiyou Wildlands Center comment:
KS Wild supports the adoption of a Shasta River plan that will reevaluate the Shasta River Watershed Adjudication so as to protect beneficial uses that rely on clean and abundant water.

Sandy Bar Ranch and Nursery comments:
Call on the Department of Fish and Game and Water Resources Board to enforce those provisions of the California Constitution that require water users to maintain habitat for fisheries and other beneficial uses.

Inform the State Water Resources Board that the Shasta River Water Adjudication is not adequate to protect beneficial uses and must be fixed. Completed in the1920s, the Shasta River Adjudication did not address riparian rights. Landowners along the river can - and do - remove all the water they want even when this damages fisheries and other beneficial uses.

John Spencer and Klamath RiverKeeper comments:
The modeling also clearly shows the connection between flows and water quality. Yet the staff (as in the Scott) has skirted around the problems with the adjudication.

Thus the EO and staff have a positive obligation to identify in the course of preparing TMDLs provisions of adjudications and DFG codes that are being violated when those violations contribute to violation of water quality standards. Such is the case in the Shasta, Scott and Mainstem Klamath. The TMDL must identify the problems with the

Shasta River Adjudication, elucidate how these problems have impacted water quality and lay out a path in the Implementation Plan to resolve these issues.

Shasta CRMP comments:
The implementation report and the Basin Plan language vaguely describe a 5 year review at which time all aspects of water use will be examined if adequate progress has not been made, including re-adjudication. The lack of detail here suggests a broad process is being envisioned.

By failing to describe any process (for the 5 year review), the appearance is created of a process in which both those persons who have been actively addressing water quality impacts and those who have not will be treated identically (i.e. punished) via (a very inflexible) re-adjudication process. That is hardly the way to encourage participation. A tiered approach should be laid out, with a mechanism for a person to create a "safe harbor" for himself through proactive efforts.

Concerning the 5-year progress report and possibility of review of the adjudication, no guidance is given to allow a person to gauge whether or not adequate process is possible or has occurred.

Shasta CRMP comment:
The legal assessment did not address the very complex problems in securing 40 cfs for instream flows (in the Shasta) from a combination of surface and groundwater users, nor the multiple jurisdictions that would need to be collaboratively involved.

Tim McKay comment:
I believe that the NCRWQCB must clearly explain the importance of the Shasta River in the historical context of beneficial uses in the Klamath-Trinity Basin. This analysis should address how the state has exercised its affirmative duty to protect public trust fishery resources.

Response to Comment Group 1: Many parties submitted comments addressing the Regional Water Board's approach to the problems with the Shasta River adjudication. Comments range from expressing severe reservations over the consequences of opening the decree, to expressing the serious need to reopen the adjudication to protect water quality. The response below should correct some misunderstandings evident in several of the comments, as well as describe how the Action Plan adequately balances this issue in light of legal and practical constraints.

Surface water diversions in the Shasta watershed were subject to a statutory adjudication that resulted in a judgment and decree approved by the Superior Court of the State of California, in Siskiyou County in 1932. The court recognized at that time that the water supply of the stream system is inadequate for all agricultural needs throughout the irrigation system. At the time the watershed was adjudicated, there were approximately 40,000 acres of irrigated agriculture. Today there are 50,000 acres under irrigation, presumably from additional diversions under riparian rights and groundwater pumping,

which are not subject to the decree. This increased use exacerbates an already over-allocated system. The decree contains no requirements for the protection of instream beneficial uses.

The Staff Report makes clear that the State Water Board, Division of Water Rights is the agency with authority to oversee and regulate water rights. The Regional Water Board's ability to request that the State Board consider various water right actions is the extent of the Regional Water Board jurisdiction in this matter. The Regional Water Board cannot compel any action and has no guarantee that the State Water Board will address the issue. The State Board shall consider the Basin Plan in acting on applications to appropriate water under Water Code section 1258. The Basin Plan allows the Division sufficient flexibility in carrying out Basin Plan objectives in any water right proceeding. If the State Water Board were to consider taking an action that affects water rights, based on a Regional Water Board recommendation or for some other reason, there would be extensive opportunities for public participation at that time. Water rights comments such as takings and affirmative public trust duty are more appropriately addressed if and when the water rights issues are focused in a hearing at the state level.

The TMDL Action Plan requests water diverters to participate in, and implement applicable flow-related measures that result in dedicated cold instream surface flow in the Shasta River and tributaries. The Regional Water Board expects a progress report after two years, and will reassess the success of these measures after five years. There are several reasons to support this approach. First, applicable flow-related measures implemented via the CRMP or DFG programs are collaboratively based, and could therefore involve all diverters including riparian and groundwater users. All water users contribute to low flow problems and therefore should participate in solutions, not just those subject to the decree. Second, the collaborative nature of the programs will allow flexibility for more efficient results without procedural burdens. Reopening an adjudication, or any public trust or waste and unreasonable use hearing before the State Water Board will be costly and time-consuming. Investing those resources in solutions now could yield better results. Finally, the collaborative approach allows parties to generate and implement the solution in a more creative way, assuming that parties take advantage of the opportunity. That being said, it would be inappropriate to rely on the collaborative approach if it fails to yield measurable results. For this reason, progress reports and a five-year evaluation period are incorporated into the Basin Plan.

Some comments requested more definition on how the Regional Water Board will assess the progress in this area in its five-year evaluation. The following language has been added to the Action Plan:

"Within five years, water diverters shall report to the Regional Water Board, either individually or through the Shasta Valley RCD and its CRMP on the measures taken to increase dedicated cold water instream flow in the Shasta River by 45 cfs or alternative flow regime that achieves the same temperature reductions."

"Dedicated cold water instream flow" is defined in the glossary as "water remaining in the stream in a manner that that the diverter, either individually or as a group, can ensure will result in water quality benefits. Temperature, length and timing are factors to consider when determining the water quality benefits of an instream flow."

This language has been added to express the target by which the Regional Water Board will gage progress toward increasing cold flows into the Shasta River. It does not mean that 45 cfs must be in the river within five years. The Regional Water Board will consider all evidence that indicates what efforts water diverters have made to reach this target. Individual water diverters should document implementation of any steps and measures that they have taken and should be prepared to submit this information to the Regional Water Board.

Flow and Water Use Comment Group 2 – Technical Issues

Yreka Public Workshop comment:
Blair Hart: I think a big reason people are here, is the 50% increased flow out of Big Springs and it had me alarmed. It is something that is physically undoable, the water is not there.

Eureka Public Workshop comment:
Unidentified: Where are we going to get the extra water in Big Springs Creek?

Siskiyou County Supervisor Marcia Armstrong comment:
It appears that the amount of increased flow necessary for the water compliance scenario (150.0% at Big Springs) **would not** allow for the diversion of water further downstream in accordance with the water rights adjudication. In order to obtain the benefits of the colder water of the Big Springs Complex, that water would seemingly have to flow "un-impaired" past the check points on the Shasta River.

Santa Rosa Public Workshop comments:
Siskiyou County Supervisor Jim Cook: We're not quite sure what to do with this cornerstone approach of increasing the flows of the Big Springs to 40 cfs. At the present time there's only 25 cfs in gross surface diversions from that system some of which returns as tail water and that's making the net diversion even less, so stretch it as you might you just aren't going to turn 25 cfs into 40 cfs.

We believe (your staff) provided little guidance on alternatives (to Big Springs Creek flow increases). Park Creek in particular, which was mentioned during this but we didn't find it in the documents, which joins the Shasta in almost the same area as the Big Springs Creek has significant cold spring water in flows. And could potentially provide similar benefits but no similar singling out occurred there, so it seems that the water users from Big Springs were targeted simply because the data was available there while other areas were ignored. We understand you can only get cold water from where you find

cold water but we're reasonably convinced that Big Springs is not the only place it can be found.

As far as the modeling goes, well the Action Plan says that 50% flow increase from the Big Springs complex is achievable. What we don't understand and we might be able to get that information is: how is that achievable? And how is it modeled to be achievable?

Patrick Griffin comment:
If all the water currently being used from the Big Springs complex was allowed to flow to the Shasta River, it would increase flows by about 25 cfs and dry up a considerable mount of agricultural land. Where is the rest of the water going to come from?

Tim Louie comment:
I am concerned about the amount of water claimed to be available based on some historic documentation in the 1922/1923 years. The flow in Big Springs Creek has remained constant at approximately 52 cfs after the dam is put in place. It doesn't seem to matter how much water is taken from the lake, the flow below the dam stays constant.

Steve Orloff comments:
There is insufficient information relating to whether or not increasing flow would even have a significant impact on temperature. The analysis done by Dan Drake, comparing two years with significantly different flow rate showed no difference in temperature. According to the presentation in Yreka and the figures in the document, increasing flow at best would only account for one-third of the desired effect on temperature and would have no effect on DO or other water quality parameters.

It is doubtful that the desired increase in flow of 50 cfs could be acquired from Big Springs. If the desired quantity of water cannot be obtained from Big Springs, will the next step be to acquire more water form other irrigators? An even greater quality of water would likely be required from another area where the source was warmer.

Shasta CRMP comments:
We don't know what to do with the cornerstone approach chosen of increasing flows at Big Springs by 40 cfs. At present, there are only ~25 cfs in gross surface diversion from that system, some of which returns as tailwater, making the net diversion even less. Stretch it as you might, it will never equal the 40 additional cfs identified.

It seems as if water users from Big Springs are being targeted simply because data was available, while other areas were ignored. We understand that you can only get cold water where you find it, but Big Springs is not the only place it is found.

Response to Comment Group 2: Please see response to Comment Category 7 – Water Temperature, Flow and Allocations.

Flow and Water Use Comment Group 3 – Flexibility

Yreka Public Workshop comments:
Siskiyou County Supervisor Jim Cook: I'd like verification on that. If you don't use flows, that puts more stress on the other activities. That infers that there is a trade off, and if we can beef up the trees, we won't have to improve flows. That's my inference – can I find that in the document? Since you're cooling the water, and flows don't matter.

Siskiyou County Supervisor Jim Cook: I think you gave us an out. I infer that shade, tailwater and flows are three things we need to do. But from what you're saying is that we don't need the flows if we can compensate. Is it there right now?

Siskiyou County Supervisor Jim Cook: Just a clarification again – is there something you could put in that the flow model you used is nothing more than a what if scenario and is nothing more than a tool to see what can be doable.

Siskiyou County Supervisor Marcia Armstrong comment:
We would like to ensure that the "potential alternatives" for mitigation are not mandated for implementation. For example, the proposal to increase the flows to 150.0% at Big Springs may have a distant historic basis, but reality may dictate that this alternative may not be currently attainable. A realistic mix of increased riparian shade, higher flow rates, reduction of nitrogen levels, and the recognition of storm water impacts could be used to achieve the end result, but the flexibility to use all alternatives is critical.

John Spencer and Klamath RiverKeeper comment:
Staff appears ready to propose shade as the solution to the temperature impairment. The shade solution is problematic due to soil conditions but even if it were to work staff says it would take upward of 60 years to achieve the temperature standard. We can't afford to wait 30 years for compliance!

Because the shade alternative is problematic and will only solve the temperature problem over the long-term, the Implementation Plan should focus on increasing Big Springs flows as the most effective, quickest and (in all likelihood) the most cost effective method to address water temperature pollution.

Shasta CRMP comment:
The implementation report and the Basin Plan language vaguely describe a 5 year review at which time all aspects of water use will be examined if adequate progress has not been made, including re-adjudication. The lack of detail here suggests a broad process is being envisioned. This presents several problems. First, given ordinary design and engineering hurdles, tree growth rates, lack of planting stock at present, and time for securing any permits required, realistically little will be substantially different in 5 years.

Response to Comment Group 3: Several commenters requested clarification on the degree of flexibility in substituting measures from one source category to another, so long as it cools the water. This overstates the issue of flexibility. To be clear, the Regional

Water Board expects to see implementation of actions in each applicable source area as defined in Table 4. Actions to increase shade are fully independent from actions to improve tailwater quality, or actions designed to increase flow. A responsible party cannot offset flow related measures by planting additional shade trees because full planting is expected already to be necessary to meet the assigned load allocation for shade. This is especially true due to the long duration until water quality benefits can be realized from shade plantings. That said, the Action Plan has incorporated sufficient flexibility in its iterative approach that would allow for implementation of additional measures that are effective at decreasing temperature and increasing DO that could lessen the need for other measures. All recommended measures should be implemented unless and until the TMDL targets are met and water quality in the Shasta River is no longer impaired. The following text has been added to the Action Plan to clarify that implementation actions are independent of one another: "Action items are fully independent from each other and require 100% implementation within each Source or Land Use category."

Flow and Water Use Comment Group 4 – Jurisdiction

Yreka Public Workshop comments:
Blair Hart: Does staff have a full understanding of what the Shasta CRMP is? I'm very concerned that you're adding on to what DFG has proposed for the ITP. The Shasta River CRMP does not have authority to do anything.

Siskiyou County Supervisor Jim Cook: It seems you had usurped DFG's fiduciary responsibility to do an IFIM. They're going to undertake that in the next 5 years. That will be the water quality standard. I was afraid you had set the standard without any input from DFG. So that needs to be clarified.

Pacific Coast Federation of Fishermen's Associations comment:
Emergency responses to adverse flow conditions (drought years) should be outlined.

Steve Orloff comment:
Alternative measures in lieu of increasing summer flows should be evaluated and perhaps mentioned in the plan. It is doubtful that historic summer flows in the Shasta River prior to the construction of Dwinnell Dam were as high as current flows. Dams usually moderate flows – decrease winter and early spring flows and increase summer flows. Increasing summer slows may eliminate cold water refugia and be harmful to fish. Studies are needed to determine whether salmonid fisheries habitat could be improved by creating side channels to better take advantage of cold water accretions. In additions, more studies are need the to assess the potential benefits of flushing flows or pulse lows to reduce sediment oxygen demand.

Response to Comment Group 4: Blair Hart commented that the Regional Water Board may not understand the extent of the CRMP authority and expressed concerns, along with others, about consistency with DFG, specifically in the area of flows. These comments

stem from the Plan's approach to largely rely on the ongoing efforts of the Shasta Management Plan of the CRMP, and DFG's ITP and Coho Recovery Strategy.

The Shasta Valley Resource Conservation District (Shasta RCD) formed in 1953 is a non-profit public agency organized under Division 9 of the California Public Resources Code. The Shasta RCD is authorized to provide conservation work within it boundaries and cooperate with other public agencies or districts, private entities, or private individuals to accomplish its goals and work for the benefit of the public (Shasta Valley Resource Conservation District Long Range Plan 2001-2005). The Shasta RCD formed the Shasta River Coordinated Resources Management and Planning Committee (CRMP) in 1991 with the goal of examining and understanding local factors effecting anadromous fisheries in the Shasta River watershed. The landowners who founded the Shasta CRMP recognized that many of the water quality problems that affect salmon were the result of the cumulative impacts of agricultural practices along streams in the Shasta Basin. Since that time the Shasta CRMP has directed many projects designed to help agricultural producers to include elements of salmon and steelhead conservation in their ongoing ranch activities. These projects include erosion control, installation of fish screens, outmigrant assisting pulsed flows, tree planting, livestock exclusion fencing, and irrigation tailwater recovery. (Shasta Watershed Restoration Plan.)

Regional Water Board staff recognize that the RCD and CRMP cannot compel actions from unwilling participants. This cooperative framework allows for more creative problem solving and efficiencies in administration. This TMDL finds that the RCD through the CRMP could be an effective way to implement measures necessary to protect water quality. Dischargers can choose to not participate in the process, and if so, will have to pursue a different approach, either through a different watershed group or individually with the Regional Water Board. The Regional Water Board would prefer to avoid developing redundant programs, and instead lend support to a process that is ongoing and shows promise toward meeting water quality goals if implemented. Its success, however, will be determined by how actively engaged the parties become in the process. The Regional Water Board intends to work with closely with the RCD to develop sufficient monitoring in order to gage the effectiveness of the Program.

This collaborative approach is not intended to interfere with the IFIM study planned by DFG. The IFIM (Instream Flow Incremental Methodology) is a flow assessment tool in the management of freshwater environments. It is not a water quality standard; rather, it is a tool to be used in the context of endangered species regulation. When DFG completes the study, the Regional Water Board may consider the results and modify its Basin Plan if appropriate.

Other parties raised specific ideas that are appropriately addressed in the context of these on-going programs. The suggestion to create an emergency response program for drought years appears already contemplated in the Coho Recovery Strategy. This applies similarly to parties providing comments on refugia and the roll it plays for fish protection. Parties are encouraged to fully participate in these programs to develop the best most comprehensive solutions.

Flow and Water Use Comment Group 5 – Flow Measures

Yreka Public Workshop comment:
Don Meamber: On implementation, this is instream flow type statement. It says explore if there are unused appropriative rights to water not belonging to a particular landowner can remain in the river, not to be used by other diverters downstream.' I think if you have an appropriative right, you still have that right even if you are not using it. I think you mean unused appropriative rights or water not belonging to a landowner.

Siskiyou County Supervisor Marcia Armstrong comment:
We have been told by the NCRWB staff that diversions can occur, but we are unable to determine how that would be implemented based on the data in the current staff report and Action Plan. The concept of fairness and water rights priority does not allow for junior rights holders to divert water when more senior holders would give up water under this scenario.

Don Meamber comment:
In Chapter 8, pg. 13, last bullet: Not sure what was meant in the sentence about the unused appropriative water rights, which I brought up at the public hearing. Did the RWB staff mean as a permanent in stream flow, or for short periods of time? If someone failed to use that right for 5 years, he could lose it unless he was notifying Water Rights Board in the every 3 yr. (I believe) reports that he was substituting reclaimed water, etc. without losing his right. A lost right could be considered instream flow, I imagine. I don't believe the riparian or adjudicated rights are lost by disuse.

Response to Comment Group 5: The following paragraph has been added to Chapter 8 to better describe water right legal issues as it relates to dedicated cold instream flow measures:

Implementation of water conservation measures may not be effective in benefiting water quality because other water right holders may divert more water if more water is left available in the stream. In addition, an appropriative water right holder risks forfeiture for non-use if water is not used for a period of five years. The law of forfeiture applies to appropriative water rights, including those that were adjudicated, but will not affect riparian rights. There are numerous legal tools available to water diverters to ensure that conserved water is applied to instream beneficial uses and will not be lost to forfeiture. Water made available through the implementation of conservation measures must be dedicated to beneficial use in order to be effective under this Plan. Dedicated means that the diverter, either individually or as a group, can demonstrate that the measure contains assurances that it will result in water quality benefits.

For example, under Water Code section 1707, any person entitled to use water, whether based on an appropriative, riparian or other water right, may petition the State Water Board to change the purpose of use to the preservation and enhancement of wetlands habitat, fish and wildlife resources, or recreation. The State Water Board may approve the petition if the change does not increase the amount of the original entitlement, does

not unreasonably affect any legal user of water, and meets other requirements of the Water Code. The Plan also encourages water conservation and other flow measures on a watershed-wide scale to be the most effective, such as coordinating pulse flows as contemplated in the DFG Coho Recovery Strategy. The Plan allows for creative solutions to dedicate these flow measures, including collaborative agreements. Any agreement should clearly delineate how measures ensure benefits to water quality.

Flow and Water Use Individual Comments

Yreka Public Workshop comment:
Blair Hart: One of things we have been discovering is what we don't know or understand about it. We have shot ourselves in the foot by converting the sprinkler irrigation from flood – it's been documented.

Response: Comment noted. Regional Water Board staff defer to knowledge of local experts on the appropriate means and methods to achieve water conservation.

John Spencer comment:
Staff is ignoring the Basin Plan at 4-34.00, which specifically instructs the Executive Officer to "investigate the violation or threatened violation of those rules and regulations of other agencies which have been adopted to protect the quality of the waters of the region."

Response: The language cited in this comment is directed specifically toward discharges of herbicide wastes from silviculture applications. It is not clear what violation or threatened violation the commenter is requesting the Regional Water Board to investigate. Enforcement actions are discretionary and dependent on staff resources and priorities. The Basin Plan Amendment clearly preserves the Regional Water Board's enforcement authority for violations actions affecting water quality of the Shasta River and its tributaries. The commenter is encouraged to write to the Regional Water Board staff to better describe the alleged violation.

Don Meamber comments:
In Chapter 8, pg. 18, Table 8.5, 3rd Recommendation, 'stagger of irrigation starts', temperature. The large X means it is important? This doesn't seem right, because we are at that point now and the water and air temperature are both normally cool this time of year, so even if the landowners dried up the river for a few days, the water should stay cool. The large X for habitat makes more sense.

In Chapter 8, pg. 21, last bullet, 'Flows required to clean spawning gravels.' We get some high water most winters, yet not enough to clean spawning gravels adequately. Maybe the valley does not have enough downgrade to create velocity to move the fine sediment out of the gravel.

Response: Comment noted.

California Cattlemen's Association comment:
CCA has some specific concerns with Chapter 8, Implementation. Under the key points section there should also be cooperation with the North Coast Regional Water Board staff, with BLM, Non-governmental organizations, landowners, and the local agricultural commissioner. CCA does not agree with "no net increase in irrigation return flow," and 50% reduction of sediment oxygen demand behind minor impoundments." CCA is willing to work with the Regional Board and local landowners to find environmentally and economically feasible options with alternatives.

Response: See response to comments on tailwater implementation above regarding tailwater issues. Regarding cooperation, Regional Water Board looks forward to working with CCA and many other agencies and organizations during implementation of the TMDL.

13. Minor Impoundments

Yreka Public Workshop comment:
*Don Meamber***:** Dissolved oxygen at Montague Grenada Road was the lowest – is this because the DWR has a weir that is there year round – it is collecting sediment. Is this increasing oxygen demand at this location?

Response: We assume the commenter is referring to Figure 2.8, which presents a summary of summer time dissolved oxygen conditions within reaches of the Shasta River, based on data collected from 1994 through 2004. The information presented for the Montague-Grenada Road to Anderson Grade Road reach includes measurements from Montague Grenada Road, Highway 3, Yreka Ager Road, I-5, upstream of Yreka Creek confluence, and at Anderson Grade Road. The dissolved oxygen measurements made at Montague Grenada Road are from a location immediately downstream of the DWR weir, and therefore do not necessarily reflect sediment oxygen demand occurring behind the weir.

Don Meamber comment:
The DWR needs to remove the check dam weir used at my place. The fines never get flushed there because there are no flashboards to remove to open up the river there, like the irrigators' dams. Fish passage is a problem at low flow as well. The USGS has measured the Shasta flow for years at the mouth without a dam.

Response: Required actions associated with "Irrigation Control Structures, Flashboard Dams, and other Minor Impoundments" identified in the revised Action Plan apply to all minor impoundments in the Shasta River watershed, including the DWR weir at Montague Grenada Road.

14. Lake Shastina

Lake Shastina CSD comment:
The Plan states repeatedly in the document that the most important timeframe is mid to late summer. At this time of the year, the quantity of water in the River immediately below the Dam is so minute, how can this impact the rivers or fish? It is believed that what is going down the river at that time is mostly used for irrigational reasons.

Response: Regardless of the quantity of water in the Shasta River, the time of year, or the relative portion of stream flow used for irrigation, the water quality objectives must be achieved and all beneficial uses protected, including for fisheries. If more water is required to restore the designated beneficial uses, then more water of suitable quality should be made available.

Lake Shastina CSD comment:
If one reviews the incoming flows prior to the construction of the Dam, it may be questionable what the TMDL would have been or if there would have even been year round flows. Since the construction of Dwinnell Dam, there have been 75 salmon runs. It is not believed that over these years, and quite possibly prior to the construction of the Dam, the TMDL has changed all that much. If they have, it is not certain as to if the change created a positive or negative impact on the salmon.

Response: Comment noted. See response above regarding requirement to comply with water quality objectives and beneficial uses. The TMDL analysis indicates that the current discharge from Dwinnell Dam is not in compliance with water quality objectives nor is it protective of beneficial uses. The TMDL addresses the effects of the dam on water quality. The TMDL doesn't address other effects of the dam and its operations on loss of migration, spawning and rearing habitat, or changes in the hydrologic continuity, for example.

Lake Shastina Community Services District (CSD) comment:
There are several other factors that have greater impacts (than the Dam)
1. 30 years back, commercial boats had to stay miles off the coast, creating something equivalent to a safe fish reserve. Results, less fish were taken.
2. 30 years back, commercial boats caught enough fish to feed a population of 'y'; today they take enough fish to feed a population of 'x', a substantial difference. Results, more fish are now taken.
3. 30 years back, scientific equipment such as fish finders and electronic tracking equipment was not on every boat to locate fish. Results, less fish were taken.
4. Over the past 30 years, it is believed the number of sport anglers on the Klamath River and on the West Coast has increased drastically. Results, more fish being taken.
5. Over the past 30 years, due to the quantity of drift boats and guides, it is believed the success of sport anglers has increased substantially. Results, more fish being taken.

6. Over the past 30 years, it is possible the quantity of seals has increased. Results, more fish being taken.
Recognizing the above, in conjunction with the NCRWQCB's issue with TMDL year after year, how are these fish surviving? Maybe things are not as bad as is being implied. They are definitely not bad enough to imply to people that they may lose their water rights and thus their livelihood, or dams need to be removed.

Response: The threatened status of salmon fisheries has been thoroughly documented in a number of scientific studies as documented in the Staff Report. See, for example, the National Research Council Report, Endangered and Threatened Fishes in the Klamath River Basin. See also sections 1.4.10 and 2.6.1 of the Staff Report for additional information. The TMDL does not mandate either the loss of water rights or the removal of Dwinnell Dam.

Lake Shastina CSD comment:
How does this Plan affect real estate disclosure laws (around Lake Shastina)?

Response: The Shasta River watershed was listed as impaired for temperature in 1992 and for dissolved oxygen in 1994. The TMDL Action Plan is the proposed mechanism to bring the waters in the Shasta River watershed into compliance with existing water quality law. If actions are identified for Lake Shastina homeowners, these could require disclosure similar to any other legal disclosure requirement of a regulation that may affect a homeowner once the Action Plan is adopted into the Basin Plan.

Lake Shastina CSD comment:
Is it known what the water temperature was below Dwinnell Reservoir before the Dam was constructed? Is it known if the temperature of the water coming out of the springs in the bottom of the Lake is equal to the temperature at Big Springs? Remember that approximately 90 plus years ago, Big Springs was a field of small springs one could ride a horse across. Did this marsh increase temperature due to shallow waters? Does one know if the water production from this marsh was higher or lower and by what percent? If the temperature was higher and volume less, again before man installed the pipes, how did these fish survive over these many years?

Response: Unfortunately there is no known water quality data available from prior to the Dam's construction (circa 1928) either for the springs in the bottom of the lake or for the Big Springs "marsh", so comparisons to this timeframe must be based on application of engineering and scientific knowledge and tools.. Available information on fish populations indicates that the Shasta River watershed produced much larger numbers of salmon in the early part of the 20th century than it does today (see the Staff Report section 1.4.10) and that water quality conditions today do not reflect conditions supportive of cold water fish requirements, thus indicating at least one explanation for the change in productivity.

Save our Shasta and Scott Valley Comment:
The Montague Water Conservation District is being directed to prepare a "nitrogenous oxygen demand" study. There is no further discussion as to what another wasteful study hopes to accomplish.

Response: Discharges of water from Dwinnell Dam are not in compliance with water quality objectives in the Basin Plan. The intent of the study is to inform both the Montague Water Conservation District and the Regional Water Board on the condition of the discharge from the Dam and possible solutions to bring the discharge into compliance with water quality standards.

Yreka Public Workshop comment:
Stan Sears: Why is water district responsible for water quality conditions in Lake Shastina and how is reducing nitrogen levels by 67% possible?

Response: The Montague Water Conservation District is not exclusively responsible for water quality conditions in Lake Shastina. Anyone who discharges into Lake Shastina, including Caltrans, the County of Siskiyou, homeowners, homeowner associations, the City of Weed, and other upstream landowners are responsible for the water quality conditions of the Lake. This clarification was made to Table 4 of the TMDL Action Plan. Nevertheless, the Montague Water Conservation District, as owner and operator of the dam and its associated facilities is responsible for the quality of water discharged from the lake.

Yreka Public Workshop comment:
Stan Sears: Who's gonna pay for it [reducing nitrogen levels in Shastina], and what is the estimate of the cost of that?

Response: The Montague Water Conservation District, as owner and operator of the dam and its associated facilities is responsible for the quality of water discharged from the lake, and is therefore responsible for bringing that discharge into compliance with Basin Plan water quality objectives. All responsible parties will be responsible for reducing nitrogen levels in the Lake.

Yreka Public Workshop comment:
Don Meamber: What does coordinating groundwater storage with the operation of Lake Shastina mean?

Response: Regional Water Board staff believes this comment is related to a measure cited in the Staff Report (Table 8.4) that summarizes some of the avoidance, minimization and mitigation measures contained in the CDFG Coho Recovery Strategy. These measures were included in the Table as representative of the extent of measures

proposed under the draft ITP. Further information should be obtained from either CDFG as the lead agency or from the Shasta River RCD as the permit applicant.

Yreka Public Workshop comments:
Rex Houghton: You showed temperatures and you referred to water above Lake Shastina, are we going to have to make the water coming out of Lake Shastina cleaner than it is coming in?

Harry Sampson: I'd like to go back to the discussion of nitrogen in and out of Shastina. You said it was necessary to decrease by 67%. This is a mathematical thing. It doesn't work out.

Response: The TMDL requires that water discharging from Dwinnell Dam be in compliance with water quality standards. The outflow currently is in conformance with the temperature objective (supportive of beneficial uses) because the water comes from the bottom of the reservoir and is cold. However, the outfall does not currently meet the water quality objective for dissolved oxygen, nor does it comply with the TMDL load allocation for nitrogenous oxygen demand (NBOD). The TMDL allocation for Dwinnell Dam is an NBOD concentration of 0.91 mg/L, which reflects the average NBOD concentration in the Shasta River where it flows into the lake. As a result of physical processes in the reservoir (e.g. stratification), the NBOD at the bottom of the reservoir is substantially increased. The average NBOD concentration immediately downstream of Dwinnell Dam is 2.74 mg/L. The TMDL load allocation requires that the NBOD outflow concentration be equivalent to the average inflow concentration to the reservoir. Reducing the average NBOD concentration from 2.74 mg/L to 0.91 mg/L constitutes a 67% reduction. This is more fully described in the Staff Report (see Sections 2.4.4, 4.4.3 and 7.5.2).

Siskiyou County Supervisor Marcia Armstrong comment:
The Montague Water Conservation Board is charged with the responsibility for initiating an investigative study of Lake Shastina for potential reductions in the nitrogenous oxygen demanding substances. The cost of the study could be financially prohibitive to such a small water agency. Every effort needs to be made to assist the Montague Water Conservation Board with the financial resources to fund this critical component of the Basin Plan.

Response: Comment noted. Regional Water Board staff is aware that possible cost of the required study would be a considerable expense for the district. Staff will aid the district in the identifying appropriate grant programs to help fund the study costs.

Siskiyou County Supervisor Marcia Armstrong comment:
Any entity contributing to the nitrogenous levels should also be named as a responsible party for the study (on nitrogenous demanding substances) and any other potential remediation/mitigation.

Response: Comment noted. Additional responsible parties, as appropriate, are included in the revised TMDL Action Plan, Table 4.

Tom Wetter comment:
The underlying data used in the development of Shasta River TMDL Action plan is a report known as the Lake Shastina Limnology Study (Circa 2005), completed by Watercourse Engineering Inc., of Davis California. The reports author's concluded that there wasn't sufficient data to actually formulate effective mitigation strategies. The report actually calls for additional study and a systematic assessment of the reservoir. In all, there are ten specific areas of study identified in the report that the experts from Watercourse Engineering say need to be completed before a realistic action plan can be developed and implemented.

Response: Comment noted. Regional Water Board staff concurs that additional study is likely required before an effective plan can be developed. The TMDL Action Plan was developed to incorporate a time schedule for the development and implementation of a study, rather than requiring immediate implementation of a design solution.

Montague Water Conservation District comment:
Table 4 of the TMDL implementation actions lists the MWCD and other appropriate stakeholder as responsible parties for implementing an investigation into ways to reduce nitrogenous oxygen demanding substances contributing to low DO. The District feels that "Appropriate Stakeholders" as a responsible party is vague at best. The District would like to see specific organizations listed that have influence on the water quality in Lake Shastina. Lake Shastina Property Owners Association. Juniper Valley Homeowners Associations, the City of Weed and Siskiyou County for their control of the lake's recreational usage and being the responsible party for areas above the Lake. The California Department of Fish and Game should also share responsibility as they have participated in enhancement activities for fish habitat.

Response: Comment noted. Additional responsible parties, as appropriate, are included in the revised TMDL Action Plan, Table 4.

Montague Water Conservation District comment:
The wording in the TMDL states that: effecting the beneficial uses of water in Lake Shastina and waters of the Shasta River downstream from Dwinnell Reservoir." It was mentioned at the meeting of March 15th by Matt St. John that RWQCB was not expecting to have the entire Lake meet their requirement, just the waters being released into the Shasta River below the Dam. The District would like this clarified in the documentation.

Response: The revised Action Plan identifies the Montague Water Conservation District (MWCD) as the responsible party for Dwinnell Dam and requires MWCD to report to the Regional Water Board, within 2 years of EPA approval of the TMDL, on a plan to bring

the discharge from Dwinnell Dam into compliance with the TMDLs, the Basin Plan and the NPS Policy. In this case, the discharge refers to water flowing or seeping from the Dam. In addition, the revised Action Plan identifies MWCD as one of six responsible parties required to complete a study of water quality conditions and factors affecting water quality conditions in Lake Shastina, and to a plan for addressing factors affecting water quality conditions within 2 years of EPA approval of the TMDL.

Montague Water Conservation District comment:
The mention of reducing the nitrogenous oxygen demanding substances released from Dwinnell Dam raises the question, since the water released into the Shasta River during the summer months is done so to satisfy the prior rights established prior to the construction of the Dam, could alleviating that water entirely by pipelining it to the appropriate right holder satisfy the requirements set forth by RWQCB?

Response: It is not appropriate to solve a water quality problem by eliminating the water body in question.

Montague Water Conservation District comment:
The implementation action states, "Based on the results of the investigation, the RWQCB shall determine appropriate implementation actions necessary to reduce the nitrogenous oxygen concentrations in Lake Shastina and affected areas downstream from Dwinnell Dam." The District would like the wording to state the RWQCB would suggest various alternatives in which the MWCD will then decide the appropriate implementation action necessary for the District.

Response: The Porter-Cologne Water Quality Control Act prohibits the Regional Water Board from requiring the "manner of compliance". The typical process involves the development of a study, including a proposed solution, by the discharger, which is then reviewed by Regional Water Board staff. The Regional Water Board staff would work with the MWCD in the development of an appropriate plan.

Montague Water Conservation District comment:
One of the many questions is since the water released from Dwinnell Reservoir is for prior right use, how much of the actual lake water reaches past these points, and if any does, how does this affect the water downstream from these reaches is it is of minimal quantities?

Response: Discharges of water from Dwinnell Dam are not in compliance with water quality objectives in the Basin Plan. The Montague Water Conservation District, as owner and operator of the dam and its associated facilities, is responsible for the quality of water discharged from the lake, and for bringing the discharge into compliance with applicable water quality standards.

Klamath Siskiyou Wildlands Center comment:
KS Wild supports the adoption of a Shasta River plan that includes mitigation and pollution reduction efforts for the chronic toxic algae problem in the Dwinnell Reservoir.

Sandy Bar Nursery and Ranch comment:
Adopt a plan that will clean up Dwinnell Reservoir (aka Lake Shastina). Dwinnell Reservoir is part of the Shasta River and needs to be included in the clean-up plan. The reservoir is a breeding ground for toxic algae that has killed pets and can kill children.

Response: The TMDL Action Plan, Table 4, includes a time schedule for development and implementation of a study to address the NBOD, which acts as a stimulant for algae growth.

Klamath River Keeper Comment:
You have failed to adequately address Dwinnell Reservoir. Dwinnell Reservoir is part of the Shasta River and it lies astride its course. The Reservoir itself is therefore part of the impaired listing. Therefore you are obligated to identify those actions, which are needed to restore water quality in Lake Shastina to compliance with Basin Plan standards. Your proposal to defer dealing with the problems of Dwinnell Reservoir is unacceptable, illegal and a violation of the TMDL Consent Degree.

Response: The Action Plan identifies a clear set of requirements for parties responsible or potentially responsible for discharges to the lake and for operation of the lake to identify their discharges and bring those discharges into compliance with Basin Plan water quality standards.

Montague Water Conservation District comment:
The time it may take to go through the appropriate steps such as funding, identifying, engineering, and implementing will take many more years than allowed in the draft. Therefore, a five year guideline may not be adequate enough to satisfy what the RWQCB is asking for and would like wording pertaining to extension periods if found necessary for completion of any work already being done or ultimately extending the periods of time for completion.

Response: Comment noted. Any responsible party may petition the Regional Water Board for extension of due dates.

15. Yreka Treatment Plant

City of Yreka comment:
As an operator of the Yreka Wastewater Plant, I am concerned that you are looking at the nitrates from the sampling site called Anderson Grade Bridge, and not considering the fact that we are not the only nitrate contributors to the Creek. There are cattle around and

in the Creek twenty yards upstream of the aforementioned sampling site. I am requesting that you look at the Plant's monthly effluent samples to determine the Plant's nitrate reduction instead of the Anderson Grade sampling site since this would be a more accurate count of the Plant's contribution to the Creek. I am submitting this statement in view of the fact that at the last meeting, Board staff was calling for a 32% reduction in nitrates from our Plant, and it would not be fair to hold the Plant responsible for the pollutants in the Creek for which we have no control over. We further request that the language in the Basin Plan, Chapter 4, Page 4-17, Paragraph 2, and Page 4-18, Paragraph, 1, be revised accordingly.

California Cattlemen's Association Comment:
Annually tens of thousands of acres within California are converted from rangeland to other uses. It is mutually recognized that there is increased residential development and associated urbanization, particularly within Shasta Valley. Therefore, CCA encourages the Shasta TMDL to place further emphasis on urban factors contributing to the water quality impairments, including an emphasis on the City of Yreka's wastewater treatment and disposal facility.

Response: For clarification, the document "Basin Plan" referred to in the comment is the *Public Review Draft Staff Report for the Action Plan for Shasta River Watershed* (Staff Report). Neither Chapter 8 (Implementation) of the Staff Report, nor the TMDL Action Plan requires a 32% reduction in nitrates to Yreka Creek from the Sewage Treatment Plant. The technical analysis identifies that the NBOD concentration at the mouth of Yreka Creek must be 0.91 mg/L, representing an average reduction in the NBOD concentration entering the Shasta River from Yreka Creek of 32%. As discussed in section 4.3.2 of the Staff Report, recall that NBOD (nitrogenous oxygen demand) is a measure of the amount of oxygen consumed from the conversion of organic nitrogen to ammonia (NH_4^+) and the oxidation of ammonia to nitrite (NO_2^-) and subsequently to nitrate (NO_3^-). The total amount of oxidizable nitrogen is equal to the sum of organic-nitrogen and ammonia-nitrogen, and is measured as Total Kjeldahl Nitrogen (TKN). The oxidation of organic-nitrogen and ammonia-nitrogen consumes 4.57 grams of oxygen per gram of TKN, and therefore, NBOD is estimated as 4.57 times the ambient TKN concentration. Therefore, an NBOD concentration of 0.91 mg/L corresponds to a TKN concentration of 0.2 mg/L.

There are several potential sources of elevated NBOD loads in the Yreka Creek watershed in addition to the Yreka wastewater treatment plant, including grazing and other uses affecting the riparian zone, and urban stormwater runoff. The wastewater treatment plant is expected to be responsible for discharges from the plant. The Action Plan identifies the existing permitting mechanisms, Monitoring and Reporting Program Order No. R1-2003-0047 and Cleanup and Abatement Order No. R1-2004-037, as the vehicles for achieving compliance. Other sources noted in the comment are addressed in other actions identified in the Action Plan, which include actions for range and riparian land management.

16. Stormwater Runoff

Yreka Public Workshop comments:
Siskiyou County Supervisor Jim Cook: Should the text in Lake Shastina not include the other communities that input stormwater so they can be identified as a source and part of the impairment of Shastina? Essentially, so they can share some of the responsibility for meeting the load allocation for Shastina?

I think the text should include something about other communities that input water into that facility. The communities being Lake Shastina, Weed, and Edgewood. Caltrans may have an input as well.

Response: The community of Lake Shastina, city of Weed, and other populated areas with urban and suburban runoff, as well as CalTrans, are identified in the TMDL Action Plan to improve on existing and/or develop future management actions to minimize, control, and, preferably, prevent discharges of nutrients and other oxygen consuming materials, sediment, and elevated water temperature waste discharges to the Shasta River and its tributaries, including Lake Shastina. The City of Montague and Edgewood have been added as responsible parties under the "urban and suburban runoff source" in Table 4 of the Action Plan. The TMDL Action Plan also specifies that measures also apply to all suburban communities with stormwater discharges and other runoff related events that may contribute to dissolved oxygen depleting, and water temperature elevating waste discharges to Lake Shastina.

Santa Rosa Public Workshop comment:
Siskiyou County Supervisor Jim Cook: There are storm drains in Yreka that discharge directly into Yreka Creek and we think those might be more of a point source pollution, however in this report they are not identified as that.

Response: Typically the term "point source" is used in reference to those discharges subject to federal Clean Water Act (CWA) permitting. Traditionally, the CWA had contained an exception for discharges of storm water runoff. Changes in federal regulations modified the point-source permit program to include certain specific types of stormwater discharges. Currently, the point source program requires permitting for stormwater runoff discharges from certain categories of industry, from construction projects that create land disturbance in excess of 1 acre (excluding agriculture), and from large and medium municipal storm drain systems. Other categories of stormwater discharges can be regulated by point-source permits when the state permitting authority can show that the discharge is a significant source of pollutants to waters of the US. At this time, Yreka does not meet the definition of a regulated municipal point source discharge.

17. CEQA Issues

Shasta CRMP comments:
The example approach utilized to meet the requirement of demonstrating that TMDL targets were achievable relied in part on the dedication of 40 cfs from Big Springs. Since this water is presumably not being delivered via Big Springs currently, presumably there will need to be reductions in up gradient water use. The CEQA checklist did not indicate that roughly 3-4000 currently irrigated acres would need to be effectively abandoned for agricultural uses.

The CEQA checklist does not acknowledge that a re-adjudication will almost certainly have major impacts and costs.

Response: The TMDL does not mandate either the abandonment of irrigated fields nor re-adjudication of existing water rights. Rather, the TMDL and its associated Action Plan request that diverters implement applicable measures that allow additional flow to be dedicated to instream flows to provide for full support of beneficial uses of water. This can be accomplished in a number of ways including increased irrigation conveyance and use efficiency, purchase of water rights from willing sellers, or alteration of other land management activities. The Regional Water Board would consider requesting the State Water Board to re-open the water right adjudication on the Shasta River only if, after five years, the irrigating community can not show good faith efforts and meaningful progress toward increasing dedicated cold water flows. If the State Water Board determined that a water right action was necessary and in the public interest, it would have to satisfy its own CEQA requirements at the time with opportunity for public comment and participation.

18. Economics

Yreka Public Workshop Comment:
Tim Louie and Patrick Griffin: In Chapter 13.3, references are made to the economic benefit resulting from camping, fishing and boating. Not sure that would apply here. Most of the Shasta River system is privately owned. Most of the river frontage is agricultural land not housing developments. There is limited BLM ownership in the lower Shasta River.

Response: The section of the economic analysis that looks at benefits to outdoor recreation is referring to the current land owned by BLM and also the potential for the Shasta River to support more recreational uses in the future as water quality is improved.

Yreka Public Workshop Comment:
Tim Louie, Patrick Griffin and Shasta CRMP:
The economic analysis failed to acknowledge the very complex problems in securing the above 40 cfs for instream flows (in the Shasta). Under the circumstances, claims put

forward through the (technical) analyses that TMDL targets are achievable without significant impacts are disingenuous at best. Diverting 40 cfs of water from agricultural use to the river for temperature enhancement will decrease agricultural production by about 4,000 acres, which results in approximately $1,000,000 lost revenue per year. I believe the economic impact cannot be mitigated. Is the Board considering the value and economic benefit of agriculture production made possible by these waters? Will the landowners served by the water in Big Springs have a choice of how to lower water temperatures or will the water be taken? Improvements to water delivery could help save some of the water – perhaps that's something you could focus on without taking it from the users.

Response: The economic analysis has considered potential costs to agriculture but has concluded that the benefits of restoring the Beneficial Uses of the Shasta River outweighs the costs. The Action Plan requires water users in the Shasta River Basin to collectively increase dedicated instream cold water flows in the Shasta River by 45 cfs. The means for accomplishing this is at the discretion of the responsible parties. The TMDL does not require any agricultural land to be taken out of production. See also response to Comment Category 7 – Water Temperature, Flow and Allocations for a more detailed explanation of compliance with the requirement to increase flows by 45 cfs.

Yreka Public Workshop Comment:
Tim Louie; Patrick Griffin:
In Chapter 13.2, TMDL implementation will require compliance with the Non-Point source program. Those costs are not considered even though they are significant.

Response: Compliance with the Non-Point Source Program is required regardless of the TMDL analysis results and Action Plan.

Yreka Public Workshop Comment:
Tim Louie; Patrick Griffin:
The costs of containing wastewater are listed as $20/acre. I am not sure that is adequate. The topography of the Shasta Valley will make zero tolerance for wastewater a serious and costly element of this plan.

Response: Comment noted. Costs listed were noted as estimates. Please note that the Action Plan seeks to improve irrigation return flows to a quality equal to river water quality, and doesn't rely on elimination of return flows. Certainly, recycling of return flows would constitute a means for compliance, but is not the only option available.

Yreka Public Workshop comment:
Tim Louie: Cost of establishing vegetation is underestimated, a one-time maintenance cost is not adequate – some of the soils are going to be difficult to get trees established in and I think you've addressed that.

Response: Staff concurs and notes that the costs outlined in Chapter 13 are estimates.

Montague Water Conservation District comment:
The District would like to know the cost estimates of (the nitrogenous oxygen demand study) and if possible an estimate on the implementation of various outcomes. Along with these explanations, we would also like to have listed the various resources/grants available to help defer the bulk of the cost.

Response: Staff is not aware of a specific funding source that is available for this type of project; however, the following websites should be helpful to the District:

http://getgrants.ca.gov/

http://www.grants.gov/

http://www.swrcb.ca.gov/funding/

http://www.umbc.edu/economics/grad_699_abstracts/a_otis_proposal.pdf

Shasta Valley RCD comment:
It is suggested that a good addition to the TMDL documents would be a discussion of possible sources of funding for agencies, non-profits and landowners, etc., who wish to undertake projects or monitoring of conservation efforts.

Response:
In addition to the websites listed above in response to the MWCD comment, the following websites should be helpful:

NRCS
http://www.nrcs.usda.gov/programs
and
http://www.nrcs.usda.gov/programs/WSRehab

Grants.gov
http://www.grants.gov/NaturalResources

US Dept. of Ag.
http://www.rurdev.usda.gov/ca/index.htm

EPA
http://yosemite.epa.gov/r9/fsfc.nsf/fundingsources?ReadForm
and
http://yosemite.epa.gov/r9/fsfc.nsf/58cc78776e5e186b8825641b006a9bd8/d52443c83328333688256429006961 04!OpenDocument
and
http://www.epa.gov/region9/funding/index.html

The Rural Community Assistance Corporation
http://www.rcac.org

19. Process Issues

Montague Water Conservation District comment:
The district is interested in meeting with the staff of the California Water Quality Board and discussing the concerns of the TMDL recommendations.

Response: In response to this request, Regional Water Board staff met with the Montague Water Conservation District on April 12, 2006.

Rancho Hills Community Association comment:
Since the Shasta River runs through our development, it seems reasonable that some notification to our association regarding these hearings would have been justified. We would appreciate being notified in the future.

Tom Connick comment:
It's unfortunate as an adjudicated water rights landowner in Siskiyou County that I was not and have not been contacted directly about the 2/22/2006 Draft Action Plan for the Shasta River Watershed.

Tom Wetter comments:
First, statements contained in your documents use "Quality Management" and "Business Plan Development" terms and describe processes used to identify and involve stakeholders. However, for these phrases to become more than just slogans for your organization, a real effort must be made to involve, notify, and communicate with all of the stakeholders.

For the Shasta River TMDL Action Plan, the first report I saw in the newspaper was an article in the March 21st edition of the Siskiyou Daily News. According to your Department, the public comment period started on February 7th 2006. Again, access to the plan document (some nine inches thick) has been extremely limited. In response to the public outcry, the comment period was extended to April 3rd. The process used by NCRWQB to develop the Shasta River TMDL Action Plan seems to limit public input and comment by design.

Shasta Valley RCD comments:
Documents as posted on the RWQCB website are not accessible for people on dial-up Internet connections. Even with a 10-day extension in time for review, we do not feel that adequate review has been done.

A 30-day review is quite short for reviewing documents as lengthy as published for any TMDL study and implementation plan. A longer review period should be allowed for subsequent TMDL efforts.

Response: The Basin Plan amendment process must adhere to legal requirements put forth in the California Water Code regarding adequate noticing of hearings, workshops

and the public comment period. The TMDL load allocations from the technical analysis and the Action Plan are the parts of the TMDL proposed for adoption as an amendment to the Regional Water Board Basin Plan. All the legal requirements for public participation were met for the Shasta TMDL process. The public had ample time to review the public draft and provide comments. The public comment period began on February 7, 2006 and ended on April 3, 2006. The notice for the public comment period was mailed to those who expressed interest in receiving it in January. Although not a legal requirement, it was also noticed in three newspapers in early February, including the 'Siskiyou Daily News'; circulated where the commenters reside. The first five chapters of the TMDL Staff Report were posted on the Regional Water Board website on February 7, 2006. Chapters 6 and 7 were posted on February 10, 2006 and the rest of the Staff Report and the Basin Plan amendment language (TMDL Action Plan) were posted on February 22; meeting the legal requirement for at least a 30-day comment period. The public hearing scheduled for May 17, 2006 was noticed on March 28, 2006 and published in the Siskiyou Daily News meeting the 45-day noticing requirements. Chapter 14 of the staff report further describes the public participation process for the Shasta TMDLs.

If interested parties did not receive the notice in the mail before the comment period started, it is because they did not notify staff that they wished to be included on the mailing list. Regional Water Board staff made numerous and continual efforts to include interested parties in the TMDL process and to provide opportunities for public input, including commenting on the public draft TMDLs. The Regional Water Board will include all those who expressed an interest during the public comment in future notices and mail-outs.

Santa Rosa Public Workshop comment:
Siskiyou County Supervisor Jim Cook: … there were no meetings with the local technical advisory group and the board staff to go over the current draft (of the Basin Plan language) before it was released. There was no opportunity for the staff to fine tune the wording for better understanding by the people that are most likely to be affected, based on discussions that might and should have taken place.

We would like to have you provide time for technical advisory group review and discussion of this document. We'd like you to provide for public distribution electronic and/or hard copies of the document with any clarifying revisions identified as needed by that technical advisory group. And then schedule a final public workshop in Yreka area, and finally then and only then schedule the final public comments to the board with the time for the board and the staff reflection for those comments to be taken into action.

Shasta Valley RCD comment:
Another concern is the lack of input by a local stakeholders group (TAG) before the TMDL documents were made public.

Shasta CRMP comments:
… there was no meeting with the local technical advisory group and RWQ staff to go over the current findings before they were released. No opportunity for RWQ staff to fine tune wording for better understanding by the people most likely to be affected based on discussions that might and should have taken place. Provide time for a TAG review and discussion of the document.

Schedule a final public workshop in the Yreka area, and finally then and only then, schedule final public comments to the board with time (i.e. a month) for board and staff reflection on those comments before taking action.

Response: The above commenters called for another Technical Advisory Group (TAG) meeting before the public comment period ends. Although, as explained above, the Regional Water Board staff have met all of the legal requirements for public participation, staff have scheduled two additional meetings before the Regional Water Board adoption hearing on May 17 to review the revised Action Plan and supporting Staff Report. These meetings will be held on May 4 in Orleans and May 5 in Yreka. Further, if and when the Regional Water Board adopts the amendment, the public can provide additional comments on the adopted draft before the State Water Resources Control Board (State Board), the Regional Water Board's parent agency, holds their adoption hearing.

Shasta Valley RCD comment:
It is suggested that the Basin Plan language be provided in a Word format for easy review and comment/language change documentation. In trying to make suggestions for language change, we had to scan the document (with many associated mistakes) and then work off of this poor copy, as time was short to complete this effort and have the document ready to submit by the April 3rd deadline.

Response: Staff will consider using Word format for future online posting. Adobe Acrobat was used to create a pdf file of the TMDL documents. It is possible to select, cut and paste text from a pdf document to a Word document, although we agree that posting in the Word format is more convenient for editing.

Shasta CRMP comment:
And maybe the greatest problem in the near term--those who did not have access to a high speed internet connection were effectively disenfranchised from <u>any</u> opportunity to get and review the document; given its 96 mb size.

Santa Rosa Public Workshop comment:
Siskiyou County Supervisor Jim Cook: **…**the greatest problem in the near term for those of us that don't have access to high speed internet connections. We're effectively disenfranchised from any opportunity to get and review the document because of its size.

We would like to see the electronic or hard copy form so that we can distribute it effectively.

Save our Shasta and Scott Valley comment:
In order to meet deadlines, the TMDL process for the Shasta Valley has severely limited the public from providing meaningful input. The electronic version available shortly prior to the public meeting was unreadable and hard copies are only now available.

Shasta Valley RCD comment:
Documents as posted on the RWQCB website are not accessible for people on dial-up Internet connections. Even with a 10-day extension in time for review, we do not feel that adequate review has been done.

Response: The chapters were posted individually in order to make it easier to download. However, the above commenters have indicated that people with a 'dial-up' Internet connection were not able to download some of the chapters due to their size. The Regional Water Board staff apologize for this inconvenience, but note that 'DSL' internet connections are available in Siskiyou County. Using a connection at least as fast as 'DSL' allows easy access to posted information on the Regional Water Board website. The Siskiyou County Library has a 'T1' internet connection, which is faster than 'DSL', and the library allows users to make copies for 10 cents a page. In addition, the newspaper notices announcing the availability of the public draft on February 7 included the phone numbers of Regional Water Board staff. The Regional Water Board website where the document was posted also included the phone numbers of Regional Water Board staff. Staff were available to help stakeholders in obtaining the Shasta TMDL documents. If staff had received a request by phone, email, fax, or in person, arrangements would have been made to ensure that all those interested were able to receive a copy of the TMDLs and the Basin Plan language. However, no requests in any form were received and the first staff heard of downloading problems was at the March 8, 2006 Regional Board Workshop in Santa Rosa. Regional Water Board staff provided Mr. Jim Cook with a hard copy and CD containing the Action Plan and Staff Report at the March 8, 2006 workshop. On March 9, 2006, Regional Water Board staff sent by overnight delivery service 25 CDs containing the Action Plan and Staff Report, in response to a request from the Shasta Valley RCD.

Santa Rosa Public Workshop comment:
Siskiyou County Supervisor Jim Cook: The (TMDL) document was posted on two separate days and that served to confuse people. Those who could download it right away had no clear indication that there were major components that were arriving some time later, the next day or slightly later and that information needed to be downloaded, there was no indication that that was happening.

Shasta CRMP comment:
And the document itself, posted on two separate days served to confuse people—those who downloaded it right away had no clear indication that major components would be

arriving sometime later and would absolutely need to be captured also, or that the draft basin plan language was to be found elsewhere.

Response: The above commenters expressed concern that people downloading the document from the Regional Water Board website on February 7 were not aware that Chapters 1-5 of the staff report did not make up the entire document. However, on the website where these chapters were available, it was made clear that this was not the entire document and that the remainder of the document would be posted no later than February 22, 2006. There were over 30 days to review the document and provide comment from the time all Shasta TMDL documents were posted on February 22, 2006.

Shasta CRMP comments:
During the Yreka Workshop, staff frequently stressed the desire to adaptively respond to additional information over time, yet there doesn't seem to be provision for that in the draft basin plan language.

Response: Many of the actions in the Action Plan require that staff give an update to the Regional Water Board on how implementation of and compliance with the TMDLs is progressing. At that time, the Board may direct staff to amend the Basin Plan in response to implementation or compliance issues that may have arisen. Staff can amend the Action Plan as appropriate in the form of a Basin Plan amendment that will undergo the same public process as the Shasta TMDLs. See also Section VIII of the Action Plan for "Reassessment and Adaptive Management" for additional information.

Tom Connick comment:
Will independent scientific peer review support the data and conclusions presented in this report?

Response: Prior to development of the Public Review Draft of the Shasta River TMDL staff report, Dr. Charles Coutant reviewed the draft report as part of a formal state-mandated peer-review process. Dr. Coutant's comments on the peer-review draft are presented in Appendix I of the Staff Report.

Klamath River Keeper comment:
It is instructive that - in spite of your and your staff's many *"mea culpa's"* concerning your failure to implement your own Environmental Justice Policy during development of the Shasta, Scott and Lost River TMDLs you have yet to hold one TMDL meeting in a Klamath River community.

Response: Although Eureka is not on the Klamath River; the Regional Water Board did hold a public workshop there, in response to a previous request from the commenter. At that time, both Regional Water Board staff and the commenter believed that this adjustment was responsive to the concerns expressed by the commenter. Since that time,

the commenter has expressed further concerns regarding the need for meetings in communities on the river, and the Regional Water Board is making arrangements to do this for subsequent meeting sequences for this and other Klamath Basin TMDLs. Staff acknowledge the need to hold TMDL meetings closer to those communities affected by water quality in the Klamath River and its tributaries. Staff encourage members of the Klamath communities to comment on the Shasta or other TMDLs.

California Cattlemen's Association comment:
CCA agrees with the general concept and voluntary approach taken by the North Coast Water Board (Regional Board) to address the impairments of the Shasta River and tributaries.

Response: Comment noted.

20. Miscellaneous

Edward Jones comment:
In regards to the temperature and dissolved oxygen being a factor in the small salmon and steelhead runs in the Shasta River, this is just not true. The fish are accustomed and adapted to this water. Having lived here 73 years I have seen big runs of salmon some years, and small runs other years. I just about lived down at the Shasta River swimming, the water was very warm but the small salmon and steelhead hatch would be swimming right with us. The low oxygen and the high temperatures have always been present in the Shasta River, I guess back then the young fish had not been told they were dead due to these conditions.

Response: While it is true that a certain percentage of fish can tolerate adverse conditions for a limited amount of time, there is ample evidence of the overall decline of Shasta River salmonid populations. Chapter 1, Section 1.4.10 details the well-documented legacy of population declines. Chapter 2 details the life stage requirements of various salmonid species with respect to water quality and clearly demonstrates that existing water quality conditions in the Shasta River and to a lesser extent in its tributaries are not supportive of biological requirements of these salmonid species. The TMDLs are aimed at restoring water quality and supporting beneficial uses, including those related to salmonid populations.

Eureka Public Workshop comment:
Denver Nelson: for a lot of the summer, there isn't any flow at the mouth of the Shasta into the Klamath.

Response: The Shasta River is important both because it provides rearing and spawning habitat for juvenile salmonids within the Shasta River drainage as well as well as because it discharges to the Klamath River. TMDL analysis results indicate that restoring water

temperatures in the Shasta River would have a significant effect on temperatures of the Shasta River at its confluence with the Klamath River, and this effect would be further enhanced by increases in contributions of cold water from upstream parts of the watershed. In addition, the watershed remains a crucial part of the recovery of salmonid populations in the Klamath Basin.

Eureka Public Workshop comment:
Tim McKay: I would like that if in your implementation plan and monitoring that you could identify your institutional barriers to achieving your affirmative duty to protect the resources under the public trust.

Response: The Regional Water Board must work with and coordinate with a variety of local, state, and federal agencies with authority or responsibilities that overlap with those of the Regional Water Board. Coordinating with these other agencies is an ongoing challenge for both the TMDL process and for water quality regulation in general. For example, the Regional Water Board is working to improve communication between the Division of Water Rights and the Division of Water Quality at the State Water Board to better coordinate the agencies' actions.

Yreka Public Workshop comment:
Rex Houghton: We've been working with DFG with the ITP – are we going to jump through the same hoops?

Response: The Regional Water Board staff are committed to working with the Department of Fish and Game (DFG) to dovetail the ITP with the Shasta River TMDL Action Plan, as is noted in the Action Plan and the Staff Report

Yreka Public Workshop comment:
Dom Meamber: Dr. Coutant said in his review that 16 C is too low for juvenile coho growth.

Response: Dr. Coutant suggested 16 C is low for juvenile core rearing, but that it is "a useful goal". Regional Water Board staff chose to include 16 C as a chronic effects temperature threshold for core juvenile rearing, based on US EPA (2003) guidance, as discussed in section 2.3.1 of the Staff Report.

Tom Connick comment:
One can only hope that the assumptions and conclusions reached in this report are being applied equally and as rapidly throughout, and to every watershed in the entire state, not just the ones with the smallest populations.

Response: There are two main driving forces behind the Regional Water Board's development of the Shasta TMDLs. First is the Shasta's inclusion on the 303(d) list of impaired waters, which triggered TMDL development. The Shasta River is listed for water temperature and dissolved oxygen. The second is a the Consent Decree entered into in 1997 between the USEPA and a group of plaintiffs. The Consent Decree required a schedule for completion of TMDLs for listed waters in the North Coast region including the Shasta River. The Consent Decree requires completion of TMDLs for 18 watersheds in the region by the end of 2007. The Shasta is thus one of the last watersheds for which TMDLs are being completed as part of the Consent Decree.

Pacific Coast Federation of Fishermen's Associations comment:
Inadequate enforcement of Basin Plan standards by other agencies should be addressed by the NCWQCB.

Response: The Regional Water Board staff is committed to working with other agencies to enforce Basin Plan standards.

Marcia Armstrong comment:
We feel that the Temperature TMDL does not take into consideration the potential for adaptive genetics within the salmonid fish stocks. The statement is also made that USEPA feels that "temperature change is linked to multiple genes, and thus would not be easily modified through evolutionary change without a radical shift in associated physiological systems." To the extent that differing locations for runs of anadromous fish stocks are identified as significant units of those species' populations, we feel that the salmonid species of fish in the Shasta River Basin have demonstrated their capacity for genetic adaptation. In addition, hatchery fish stocks are said to be different from wild fish stocks even when hatchery fish are bred from wild fish. It is not then too far to go to recognize that there could be fish in the Shasta River system that are different from those fish studied to determine temperature thresholds. Therefore, we feel that the question of temperature thresholds applicable to Shasta River stocks is still an open question."

Tom Connick comment:
The idea that one-size salmonid fishery standard fits all is expedient, but no very scientific or realistic. Salmonids by nature return to specific streams because they are categorically different and unique.

Tom Connick comment:
Were the benchmarks presented site specific to this particular watershed with its unique hydraulics, geological and volcanic activity?

Response: As the commenters note, USEPA Region 10 investigated the potential for variation in temperature requirements among stocks or species of salmonids (*Issue Paper 5: Summary of Technical Literature Examining the Physiological Effects of Temperature on Salmonids,* USEPA 2001a). USEPA concludes that there is not enough significant

genetic variation among stocks or among species of salmonids to warrant geographically-specific water temperature standards.

The EPA statement quoted by the commenter above explains why differences in temperature tolerances are not likely; "temperature change is linked to multiple genes, and thus would not be easily modified through evolutionary change without a radical shift in associated physiological systems." So while the genes may be different, there most likely aren't enough different genes to affect the fundamental biological makeup that generally determines temperature tolerance. While it is true that hatchery fish genetics differ from wild fish, it has not been proven that these genetic differences result in differing temperature tolerances. Likewise, while Evolutionarily Significant Unit's are based on genetic differences between salmonid populations, they are not presumed to relate to temperature tolerance.

The same EPA document quoted above goes on to suggest that the salmonids' shared fundamental biological makeup is a product of evolution. Salmonid species in the Pacific Northwest all share the same ocean, where they spend most of their lives. Pacific Ocean temperatures do not vary much up and down the coast, and generally do not exceed the scientifically proven optimal temperatures for salmonids in freshwater.

The USEPA used the technical document cited to support their guidance document for developing water temperature standards in the Pacific Northwest (*EPA Region 10 Guidance for Pacific Northwest State and Tribal Water Quality Standards, [USEPA 2003]*). The 2003 guidance document presents temperature criteria for various salmonid lifestages. USEPA created this guidance to assist states and tribes in adopting temperature water quality standards that would be approved by USEPA and consistent with the Clean Water Act and National Environmental Policy Act. Staff feel confident that the USEPA numeric temperature criteria for salmonids used in this TMDL document are scientifically supported and reflect the best available data on temperature thresholds.

In conclusion, Regional Water Board staff recognize that salmonids species in the Pacific Northwest may have slight differences in temperature tolerance, but more data are needed to quantify these differences. Currently, enough data exist to determine that Shasta River temperatures are not supportive of salmonid species; in fact, they occasionally exceed scientifically proven lethal levels. If there is information that reflects different thermal tolerances of salmonids of the Shasta River Basin, Regional Water Board staff would welcome the opportunity to review this information.

Siskiyou Supervisor Marcia Armstrong comment: This TMDL appears to conclude that only a "naturally loaded TMDL" can satisfy the water quality objectives, rather than allowing for "non-point loading."

Response: The TMDL does not require the elimination of non-point source loadings. The loading capacity includes allocations to non-point sources.

Patrick Griffin comment:
13.4.2 states; "It is up to the landowner/discharger to decide which implementation actions and management measures are most appropriate to control sediment and water temperature on his or her property." Will the landowners and water users in the Shasta Valley actually have that choice?

Response: The landowner will have their choice in methods for addressing water quality on their property. The Regional Water Board does not prescribe management measures for controlling impacts to water temperature and dissolved oxygen in the Shasta River watershed. This is most appropriately developed by the landowners because they can make prudent judgments based on site-specific conditions on their land. The Staff Report does provide examples of measures for controlling impacts to water quality, however the landowner is not confined to these measures. The landowner is responsible for water quality impacts originating on their property. As stated in the Action Plan, the Regional Water Board will periodically assess the progress of this approach and decide whether more prescriptive measures are necessary.

Jim Henderson comment:
Please do everything you can to protect the Shasta River. It can be one of the greatest sources of cold water inputs to the mainstem Klamath River. Keep it cold and keep it clean. The salmon are counting on it. Salmon as you know are an elastic species but we as managers of their habitat need to keep the door open for their return. Cleaning up the Shasta to near pre-Euro contact is crucial and when combined with some CA dam removals will go a long way towards bringing the salmon back.

Response: Comment noted. The Regional Water Board recognizes the importance of the Shasta River Basin in providing crucial rearing and spawning salmonid habitat. The contribution of the Shasta River to the heat budget of the Klamath River will be more closely assessed in the technical analysis for the Klamath River TMDLs.

John Spencer comment:
Pleased be advised that we live on the Shasta River at Shelly Bridge and have spent years trying to be good stewards of the river. This river is too precious to exploit or pollute. However this is being done by ranches both upstream and my neighbor who takes water out day and night for example, with an 8-inch pipe even when the water is just a trickle. Rivers are too precious to be destroyed by the greed of those who exploit the river for their own selfish needs. It need not be that way. They can keep the river clean and cool whereas all concerned especially the fish and wildlife, may continue to sustain life instead of destruction.

Response: Comment noted. The technical analysis for the Shasta River Temperature TMDL recognizes the importance of flow in controlling water temperature.

Shasta CRMP comments:
The plan poorly addresses present and future suburb and rural residential impacts on water quality or stream shading. This becomes significant to the extent that agricultural land will likely be converted to rural residential, where land manipulation processes are no longer driven by agricultural return on investment economics.

Response: The TMDL Action Plan does not envision or require the conversion of agricultural land to suburbs and rural residential development. The TMDL does, however, require landowners to address their impacts to water quality through the implementation of appropriate management measures.

Don Meamber comment:
Concerning the gravel problem; I was talking to Dave Webb about the subject a couple years ago. I wondered if one of the old monster gold mining dredges could be put to work cleaning the bottom of the river. I was talking to a contractor recently who is putting in another tailwater pipeline for me now just N. of the River. He used to own and operate a stationary dredger in Scott Valley. He thought it might work to pick up the material off the bottom, screen the gravel and drop it back into the river and scatter the silt and sand back onto the stream bank. This might be an alternative to importing gravel and maybe less expensive. I know DFG has problems getting rocks or gravel to streams bed without damaging the banks in the process.

Response: Comment noted. The issue of spawning gravel conditions and abundance was not addressed as part of the TMDL analysis.

Save our Shasta and Scott Valley comment:
The Shasta Valley like the Scott has a unique history of major accomplishments through voluntary actions and hard work. If this plan is adopted in its present form, then the North Coast Board risks the undermining of all of these cooperative efforts.

Response: That would be unfortunate, especially since the TMDL Action Plan is crafted around and supports ongoing efforts by landowners and other interested stakeholders to restore and protect water quality. Regional Water Board staff believes that the proposed Action Plan provides landowners with a "feasible and reasonable" approach to bringing their discharges into compliance with water quality standards. The Regional Water Board hopes to continue working with landowners to implement projects that protect water quality in the Shasta River Basin.

General Comment Regarding Limited Time Scale of Analysis:
A number of commenters raised concern that the Shasta River model was applied for too short a time period, and was not appropriate to base the Action Plan on the results of this application.

Response: TMDLs must result in attainment of water quality standards throughout the year, including under critical conditions [40 CFR 130.7(c)]. For the Shasta River, temperature and dissolved oxygen objectives are not being met during the summer months. The temperature and dissolved oxygen load allocations were developed based on the water quality compliance scenario, which was run for the period August 29 – September 4, 2002. As detailed in section 6.3 of the Staff Report, both air temperature and flow conditions represented critical conditions during this time period. Results of the water quality compliance scenario demonstrate that when the TMDL is fully implemented, water quality standards can be achieved under critical conditions.

Section 2 – Individual Comments and Responses

1. Margaret J. Boland and J. Sharon Heywood – US Forest Service Comments

Comments:
Staff Report Pg. 8-5 – "Proposed implementation actions for sources related to activities on United States Forest Service holdings include application of the Interim Riparian Reserves management practices described in the Northwest Forest Plan Aquatic Conservation (ACS) Strategy, and rangeland management and grazing strategies detailed in the joint management agency document: Riparian Area Management 1997."

As an alternative to citing the Northwest Forest Plan we recommend that the Shasta-Trinity and Klamath Land and Resource Management Plans (LRMPs) be referenced. Both LRMPs have incorporated the Aquatic Conservation Strategy including direction for Interim Riparian Reserves, Key Watersheds and the nine ACS objectives. The LRMPs incorporate the Forest Service Best Management Practice guidance document as Forest-wide Standard and Guidelines (See Klamath LRMP page 4-19 and Shasta-Trinity LRMP page 4-25.) Referencing the Forest Plans would provide a stronger link between the TMDL Action Plan and activities on lands managed by the Forest Service.

Response: Citations have been revised to reflect the reference to the Shasta-Trinity and Klamath Land and Resource Management Plans.

Comment:
The citation for the Shasta-Trinity Forest LRMP is: United States Forest Service (USFS). 1995. Shasta-Trinity National Forest Land and Resource Management Plan, Shasta-Trinity National Forest, Pacific Southwest Region. The citation for the Klamath Forest LRMP is: United States Forest Service (USFS). 1995. Klamath National Forest Land and Resource Management Plan, Klamath National Forest, Pacific Southwest Region.

Response: The staff report, including reference section will be revised to use the correct citation.

Comments:
We would like clarification as to which document is being referred to as "Riparian Area Management 1997". We could not find a document that fit this description in the References chapter. We believe that this reference refers to 'Riparian Management, TR 1737-14 1997, Grazing Management for Riparian-Wetland Areas, USDI-BLM, USDA-FS." This document is a good technical reference but it does not set range management direction for the Forest Service. As an alternative to referencing this document we recommend that the TMDL Action Plan reference each Forest's respective LRMP and tier to existing management direction for range management. For example, the Shasta-Trinity NF LRMP contains goals and standards and guidelines for range management. Examples of this information follow:

Shasta-Trinity LRMP, pg. 4-5 – Forest Goals for Range Management
21. a. Manage rangeland vegetation to provide for healthy ecosystems and to make forage available on a sustainable basis for use by livestock and wildlife.
21. b. Manage livestock grazing activities to meet desired ecosystem conditions to the extent that such activities do not adversely affect the attainment of the Aquatic Conservation Strategy or Riparian Reserves. Similar goals can be found on page 4-9 of the Klamath LRMP.

Shasta-Trinity National Forest LRMP, pg. 4-6 – Forest Goals for Water
39. Maintain or improve water quality and quantity to meet fish habitat requirements and domestic use needs.
40. Maintain water quality to meet or exceed applicable standards and regulations. Klamath Forest Water Quality goals are similar, and can be found on page 4-5 of the Klamath LRMP.

Standards and Guidelines (S&Gs) for Range are found on page 4-22 and 23 of the Shasta-Trinity National Forest LRMP and page 4-63 through 4-68 of the Klamath National Forest LRMP. These S&Gs lay the foundation for management of grazing activities on Federal Lands.

Because all range management activities tier to the Shasta-Trinity and Klamath National Forest LRMPs we believe that citing these documents under proposed implementation actions (instead of Range Area Management 1997) will more accurately meet the intent of implementation actions for the TMDL Action Plan.

Response: The Staff Report and Action Plan will be revised to cite the grazing measures as contained in the Shasta-Trinity National Forest and Klamath National Forest LRMPs. The reference will also be corrected

Comment:
Pg. 8-29 (first paragraph) – "The Pacific Northwest Forest Plan, including the Aquatic Conservation Strategy, is applicable to both these national forests. The USFS also

administers the Klamath National Forest Land & Resource Management Plan (KLRMP) and the Shasta-Trinity National Forest Plan."

It would be good to note that both Forest LRMPs have incorporated direction from the Northwest Forest Plan (i.e. the Aquatic Conservation Strategy) and all amendments. The LRMPs are the guiding management documents for both forests.

Response: Comment noted. Staff Report will be revised to clarify this incorporation.

Comment:
Pg. 8-29 (second paragraph) – "To date, there have been no watershed analyses by the USFS for their management areas in the Shasta Valley…"

This is a correct statement for the 5th Field Watersheds located partly within the Shasta-Trinity National Forest. These watersheds include Parks-Willow, Upper Shasta River and Whitney-Herd Peak. However, portions of the Klamath National Forest, including Little Shasta River and Grass Lake watersheds, are covered in the Goosenest Adaptive Management Area Ecosystem Analysis (USFS, 1996, Goosenest Adaptive Management Area Ecosystem Analysis, Goosenest Ranger District). That analysis functions as a watershed analysis.

Response: This clarification will be made in the staff report.

Comment:
Pg. 8-29 (second paragraph) – "…the USFS implements best management practices (BMPs) for the protection of water quality contained in the guidance document, Water Quality Management for Forest System Lands in California, Best Management Practices (guidance Document), referred to by the USFS as the Forest Service 208 Report."

We recommend that the wording "Forest Service 208 Report" be dropped. This term isn't commonly used to reference the BMP program. Retain the reference "Water Quality Management for Forest System Lands in California, Best Management Practices".

Pg. 8-29 (second paragraph) – "The Forest Service 208 Report arose from a formal Management Agency Agreement …"

Replace '208 Report' with 'Best Management Practices Program'.

Response: The phrase "Forest Service 208 Report" will be replaced with Best Management Practices Program.

Comment:
Pg. 8-29 (third paragraph) – "The Aquatic Conservation Strategy, referred to above, also elucidates the Standards and Guidelines for Riparian Reserves that, for the most part, provide variable width no-harvest and reduced harvest buffers around fish-bearing streams."

Drop the phrase "no-harvest". Harvest could be prescribed on a site-specific basis in order to meet the Aquatic Conservation Strategy under the LRMPs (and Northwest Forest Plan).

Response: The phrase "no harvest" will be deleted from the Staff Report to maintain consistency with the approved Aquatic Conservation Strategy under the LRMPs (and Northwest Forest Plan).

Comment:
Pg. 8-29 (last paragraph, first sentence) – "The USFS defines "Riparian Reserves" as forestland allocations……."

Change "forestland allocations" to "Forest land allocations" in order to indicate that these are land use determinations, in keeping with provisions of the National Forest Management Act.

Response: Change will be reflected in the Staff Report.

Comment:
Pg. 8-29 (last paragraph, third sentence) – "After each USFS management district performs a watershed analysis, decision-makers can then tailor the riparian reserve buffers of the Aquatic Conservation Strategy to conform to local conditions."

This sentence is confusing because the Forest Plans (per the Northwest Forest Plan) required a watershed analysis if there is to be a change in the interim widths. To add clarity, replace "riparian reserve buffers" with "riparian reserve buffer widths". Refer to language in the Scott River TMDL Staff Report (Section 5.1.11.2) which is more accurate than the subject wording.

Response: "Riparian reserve buffers" will be replaced with "riparian reserve buffer widths" to maintain consistency with the approved Aquatic Conservation Strategy under the LRMPs (and Northwest Forest Plan).

Comment:
Pg. 8-29 (last paragraph, next-to-last sentence) – "Specifically, Table 8.7 identifies the riparian type and Riparian Reserve buffer widths that would apply to USFS land in the Shasta Valley."

This statement is not accurate because of several inaccuracies in Table 8.7:

1. The source for the table is incorrect. We couldn't find the page cited in the footnote.

2. The third column ("Buffer Widths") should be deleted. The height of site potential trees is determined for a specific area during a project environmental analysis process. The widths shown in this column apparently were taken from a project well outside the watershed, because site-potential trees on the drier east side forest types, typical of those in the Shasta River watershed, are smaller than 150 feet, regardless of species.

3. Remove the footnote stating that one site potential tree is for Douglas fir, since the **number** of site potential tree heights is Forest direction, while the **height** is determined on a site or project scale.

4. The "Wetlands <1 acre in size" width should not be N/A, as this would confuse the reader. Incorporate the intent of the actual directive, which says that "The wetland and area from the edge of the wetland to the outer edges of the riparian vegetation" comprise the interim riparian reserve width.

Response: Table 8.7 has been revised to correct inaccuracies and maintain consistency with the approved Aquatic Conservation Strategy under the LRMPs (and Northwest Forest Plan).

Comment:
Pg. 8-29 (last paragraph, last sentence) – "Within the Riparian Reserve buffers, timber may not be harvested and additional management practices and restrictions are required pertaining to livestock grazing, mineral extraction, and recreation."

Replace this sentence with "any land management activity occurring within the Riparian Reserves would have to be consistent with the Aquatic Conservation Strategy and applicable Standards and Guidelines for Riparian Reserves."

Response: Revision will be made to maintain consistency with the approved Aquatic Conservation Strategy under the LRMPs (and Northwest Forest Plan).

Comment:
Pg. 8-30 (second paragraph) – "…the USFS implements rangeland management and grazing strategies designed to lessen impacts to water quality that are detailed in the joint management agency document: Riparian Area Management 1997 (USDA/USDI 1997), and also in the Forest Service 208 Report (USDA 2000)."

Consider rewording first sentence as follows: the USFS implements rangeland management and grazing strategies designed to lessen impacts to water quality as described in Water Quality Management for Forest System Lands in California, Best Management Practices, 2000 and in grazing allotment management plans.

Remove the reference to Riparian Area Management 1997. See also the comment for page 8-5 (third comment bullet) and the comment for Pg. 8-30 (last paragraph).

Response: Suggested revision will be incorporated into Staff Report and citation corrected.

Comment:
Pg. 8-30 (last paragraph) – "… the USFS shall consistently implement the best management practices included in Riparian Area Management 1997, and Water Quality Management for Forest System Lands in California, Best Management Practices (USFS 2000)."

Drop Riparian Area Management 1997 reference and replace with respective Forest LRMPs.

Response: See response above. Citation will be corrected.

Comment:
Pg. 8-31 – "Additionally, the Regional Water Board shall work with the USFS to draft and finalize a Memorandum of Understanding (MOU). The MOU shall be drafted and ready for consideration by the appropriate decision-making body(ies) of the USFS within two years of the date the TMDL Action Plan takes effect."

The Forest Service supports the development of an MOU with the North Coast Water Quality Control Board. We also appreciate that the TMDL Action Plan acknowledges the need to take into consideration USFS resources available to carry out actions developed in the MOU.

Response: Comment noted.

Comment:
Pg. 8-31 – "Contents specifically related to elevated water temperatures:

1. A commitment by the USFS to continue to implement the Riparian Reserve buffers width requirements.
2. A monitoring plan to ensure that the Riparian Reserve buffer widths are effective at reducing high water temperatures.
3. A commitment by the USFS to implement the monitoring plan and conduct adaptive management."

For #1: Text correction, should read: 'implement **its** Standards and Guidelines for Riparian Reserves per the Shasta-Trinity and Klamath LRMPs.

For #2: Text correction, should read: "a monitoring plan to ensure that the Standards and Guidelines for Riparian Reserves are effective at preventing or minimizing effects on natural shade."

For #'s 2 and 3. The MOU requires "a monitoring plan to ensure that the Standards and Guidelines for Riparian Reserve management are effective" and "a commitment by the USFS to implement the monitoring plan and conduct adaptive management." Our understanding is that the details of this monitoring plan will be worked out during preparation of the MOU and that consideration will be given to the availability of USFS resources to carry out preparation of the plan and monitoring activities.

Response: Revisions to 1 and 2 as recommended will be made to the Staff Report. The proposed MOU will include specifics of the monitoring plan.

Comment:
Pg. 8-31 – "Contents related to grazing activities affecting both dissolved oxygen concentrations and water temperatures:

1. A date for the completion of a description of existing grazing management practices and riparian monitoring activities implemented on grazing allotments in the Shasta Valley.

2. A commitment by the USFS and the Regional Water Board to determine if existing management practices and monitoring activities are adequate and effective at preventing, reducing, and controlling discharges of biostimulatory waste discharges and elevated water temperatures.

3. A commitment by the USFS to develop revised management practices and monitoring activities should such measures be inadequate or ineffective, subject to the approval of the Regional Water Board's Executive Officer.

4. A commitment by the USFS to implement adequate and effective grazing management practices and monitoring activities and to conduct adaptive management."

#1: Does this requirement pertain to Forest Service Allotments in the Shasta Valley only or was it intended to include all Forest Service grazing allotments in the Shasta River Watershed?

Response: The requirement pertains to the Shasta River watershed rather than just to the Shasta Valley. Clarification will be made to the Staff Report.

Comment:
#'s 2, 3 and 4 in previous comment: Currently range management activities on the Shasta-Trinity and Klamath National Forests are directed by the LRMPs, and management plans for each grazing allotment. Range management activities are also monitored under the Best Management Practices Evaluation Program. The BMP Evaluation Program provides for an annual assessment of BMP effectiveness for all management activities monitored. We would like to see the MOU incorporate to the extent possible the BMP monitoring program. The existing program should, with minor modifications, satisfy the requirements of #'s 2, 3 and 4. This existing coordination along with other coordination activities is noted in the TMDL Action Plan on page 8-32 under 'Implementation Schedule'.

Response: It is Regional Water Board staff intent that the existing BMP monitoring program would be the basis for the monitoring as defined in the MOU. An appendix measures were added to the revised Action Plan to clarify grazing measures.

Comment:
#2 in previous comment: There is a typo; "discharges" is repeated.

Response: Typo will be deleted.

Comment:
#3 in previous comment: Replace "should such measures be inadequate" to "should **existing** measures be inadequate". This clarifies which measures you are referring to.

Response: This clarification will be made to the Staff Report.

Comment:
There are 3 current grazing allotments on the Klamath National Forest in the Shasta River Watershed (Horse Thief, Ball Mountain, and Deer Mountain Allotments). Currently there are no grazing allotments on the lands in the Shasta River Watershed administered by the Shasta-Trinity National Forest. The Bear Creek Allotment, located in the headwaters of the North Fork Sacramento River and Upper Trinity River Watershed is the closest active Shasta-Trinity Forest allotment to the Shasta River Watershed.

Response: Comment noted.

Comment:
Pg. 8-32 (Implementation Schedule, #3) – 'MPs' should read 'BMPs'.

Response: Typo will be corrected

Comment:
Action Plan Pg. 13 – Table 4: "Shasta River Dissolved Oxygen and Temperature TMDL Implementation Actions – Activities on Federal Lands.

1. The USFS shall consistently implement the best management practices included in Riparian Area Management 1997 (USDA/USDI 1997), and Water Quality Management for Forest System Lands in California, Best Management Practices (USFS 2000).

2. The Regional Water Board staff will continue its involvement with the USFS to periodically reassess the mutually agreed upon goals of the Management Agency Agreement between the State Water Resources Control Board and the USFS.

3. Additionally, the Regional Water Board shall work with the USFS to draft and finalize a Memorandum of Understanding (MOU). The MOU shall be drafted and ready for consideration by the appropriate decision-making body of the USFS within two years of the date the TMDL Action Plan takes effect. The MOU shall include buffer width requirements and other management practices as detailed in the Implementation chapter of the TMDL."

#1. As noted previously, consider replacing Riparian Area Management 1997 reference with LRMP reference for both Forests. You might consider language used in the Action Plan for the Scott River TMDL in Table 4 under USFS and BLM: "The following items shall be addressed during the MOU development:……8. A commitment by the USFS/BLM to continue to implement the Riparian Reserve buffer width requirements."

Response: See response above. The Riparian Area Management 1997 reference will be replaced with LRMP reference for both Forests.

Comment:
#3 in previous comment: See our previous comments (on pages 1 through 6 of this attachment) relating to problematic language in the Implementation chapter, which are to be the details of USFS Action #3.

Response: Revisions will be made to both the Staff Report and the Action Plan to ensure consistency of language.

2. Dr. Dan Drake – UC Cooperative Extension Comments

Dr. Drake's comments on issues related to the technical analysis of flow reflect the need to distinguish inflows based on the quality of the water. Additional language has been

added to the staff report to clarify this distinction. The water quality compliance condition requires 45 cfs of water from Big Springs Creek (a cold source), or an equivalent flow increase of dedicated cold water that results in the same temperature conditions at the temperature compliance points.

Comment 1:
Figure 3.1 shows surface water temperatures for the river and indicates the location of diversions. I identified 27 diversions on that figure. Water temperatures did increase downstream of 3 of those 27 diversion. However, temperature was cooler after 4 diversions. At 5 diversions the temperature stayed about the same, and at 15 diversions the temperature rose only slightly. If reduced flow increases temperature dramatically (i.e. there is a valid practical observable relationship in this river system) then why wasn't there a consistent increase in surface temperature downstream of diversions?

Response: The temperatures presented in Figure 3.1 reflect the net effect of all the heat exchange processes that affect the river temperature. These heat exchange processes are described in section 3.1.1. It is clear from the available information that cold tributaries, groundwater inputs, and riparian shade have a cooling effect in some reaches. The combination of these and other processes determines the temperature of the river. We maintain that the laws of thermodynamics indicate that the thermal mass of water in a waterbody is a major factor influencing the response of a stream to heat exchange processes. In other words, a larger volume of water heats and cools more slowly in response to heat exchange processes compared with a smaller volume of water. We also point out that the temperatures presented in Figure 3.1 are based on a thermal infrared remote radiometry (TIR) survey of the Shasta River conducted on July 26, 2003. While Figure 3.1 identifies all known locations where there are surface water diversion, it is not known whether (and is unlikely that) diversions were occurring at each of the diversion locations on the date of the survey.

Comment 2:
I address the flow study conducted by Mike Deas and published in 2003, summarized in Figure 3.7. This study uses a model specific for the Shasta River that evaluates solely the impact of various flows with everything else held constant. The study shows that a 10-fold increase in flow (the example in the study from 10 cfs to 100 cfs) impacted average water temperature only 4 degrees at the mouth. This is a very large increase in flow for a small impact. A 5-fold increase in flow was hardly even detected at the mouth by the model. If a 5 or 10 fold increase had such a minimal impact what impact if any could a more achievable increase in flow have on temperature?

Response: Figure 3.7 represents the changes in temperature solely associated with different flow volumes. The information presented in Figure 3.7 was developed assuming that the increased volumes are at ambient river temperature. Thus, the results only quantify the change in the rate of heating and cooling due to increased thermal mass and decreased travel time. The TMDL water quality compliance scenario assumes that the increase in flows will be achieved by increase in sources of cold water. The modeling

results presented in Figure 3.7 do not quantify the effects of increases of cold water. Nevertheless, although the change in flow volume has a modest effect on the river temperature at the mouth, the increase in volume alone results in an additional six miles of river habitat thermally sufficient for salmonid rearing. An addition of six miles of habitat is not trivial.

Comment 3:
Using public information collected and available from the Department of Water Resources, I looked at flow and water temperatures at the Montague Grenada Road weir. Using data from 1998, a very good water year, I found the average daily flow from mid June to September was 180 cfs. During that same time the water temperature average was 21.9 ºC. Average flow in 2000 was much reduced at 60 cfs at the same location with the same collection procedure by DWR. According to the hypothesis suggested by the draft report, the reduced flows should have seen much warmer water temperature. However, the measured average was nearly identical at 21.7 ºC. Actually, a 0.2 ºC decrease with a 3-fold decrease in average flow rate. The same pattern was seen at the mouth of the Shasta with temperature differences of 0.3C between the years with very different flows. A similar pattern was seen at both locations focusing on just the warmest months of July and August.

The analysis above considered average temperature. I also looked at the number of days over a threshold temperature of 20 ºC. I found, despite the huge difference in flows, the number of days with temperatures over that threshold were about the same (70 and 74). This analysis shows almost no impact with a 3-fold difference in flow rate. Again, what possible impact could a more achievable increase in flow have on water temperature? These data are readily available and published in documents on the web. A Google search will quickly find these data. Yet it was not included at all in the draft document. Why was this information not included to show the impact of flow (or lack of impact) on temperature?

Response: The argument presented further illustrates the need to distinguish between additions of any water versus the addition of cold water. The argument presented leads to more questions than conclusions. For instance, were differences in cold water inputs proportional to the overall increase in flow between the two years? Groundwater discharges are often relatively constant from year to year. Without additional information describing the source and condition of the additional flow, conclusions about the effects of the differences in flow cannot be made.

Comment 4:
I refer to Figure 1.8. Prior to completion of the dam, there are 7 years of data showing total annual discharge at the DWR weir (1911 to 1922). That discharge was about 80,000 acre-feet. There are also 3 values for total discharge from the same location in 2002, 2003 and 2004 indicating about the same total annual discharge of about 80,000 acre feet. Why is that important? How does that relate to reduced flows and warmer temperatures?

We know that dams and particularly Shastina fill in the winter and that they reduce high winter flows. So, if the high winter flows are reduced and we are discharging the same total amount, then flows after the winter have to be higher to discharge nearly the same total annual flow. In this case the summer flows have to be higher than they were before the dam was built. This is not discussed and recommendations to increase flows would only make even greater summer flows than historical.

This concept is supported by anecdotal historical records that suggest the Shasta River may have dried up in some years or been extremely small in late summer (see History, Condition and Prospects of the Indian Tribes of the United States. Journal of the expedition of Colonel Redick McKee, U.S. Indian Agent, through North-western California, Performed in the summer and fall of 1851. By George Gibbs; plus personal communication with Montague resident). The river never dries up or has extremely low flows now with the dam.

Response: Regional Water Board staff agree that reservoirs, including Shastina, store water from wet periods for use in dry periods. The comment points again to the need to distinguish inflows based on the quality (i.e. temperature) of the water. Most of the water released from Lake Shastina is used for irrigation, some of which is lost to evapotranspiration, while some percolates and becomes groundwater, and some other amount enters the river as irrigation tailwater (a.k.a. tailwater return flow). Because irrigation tailwater generally enters the river hot during the day, the increase in river flow is accompanied by an increase in heat load. If the percolated irrigation water enters the river as cold groundwater, then the augmentation of flow may have a beneficial effect on stream temperatures (as the commenter points out in Comment 15). Changes from irrigated tailwater returning as surface water to cooler groundwater inputs may present opportunities for water quality enhancement.

In addition, please note that some areas of current cold water discharge are not impounded by or diverted to Lake Shastina.

Comment 5:
My last point related to flows relates to pool stratification and cool water refugia for fish. In nearby Modoc County, pool stratification has been measured. The stratification is enhanced during periods of the hottest temperatures providing safer places for fish. The Shasta doesn't have stratification but it does have cool water refugia due to springs. Stratification in pools has been found elsewhere in California, north coast streams, the Sierra Nevada and Southern California. The researchers on the north coast concluded that cool water refugia occur when stream pools are isolated from main channel flows and/or streamflow levels fall below some threshold level. That means higher flows could actually reduce or eliminate the refugia. Would higher flows reduce or eliminate the cool water refugia that we have on the Shasta. Do we already have higher flows than historical and could encouraging still higher summer flows exacerbate a possible lack of cold-water

refugia? There needs to be some consideration of the potential effect of increased flow on cold water refugia. This information needs to be included in the analysis.

Response: The commenter claims that higher flows could reduce or eliminate Shasta River thermal refugia. Thermal refugia are important habitat especially when ambient water temperatures are inhospitable for fish. However, the temperature analysis demonstrates that the water quality compliance scenario results in miles of thermally suitable habitat that don't currently exist. If monitoring data indicate the re-introduction of dedicated cold water has a deleterious impact on beneficial uses, then revisions to the plan can be made consistent with an adaptive management approach.

Comment 6:
There is no comment 6

Comment 7:
This section (Chapter 4) was much more difficult to understand than the temperature section. Efforts to improve the understanding and readability would be beneficial.

Response: Regional Water Board staff agree that the processes affecting dissolved oxygen in the Shasta River are complex and explanation of these processes is highly technical.

Comment 8:
Page 4-3 identifies 4 primary factors affecting the DO. In looking at Figure 4.3 it appears that the reach below A12 has improved DO levels compared to reaches upstream and downstream. Yet the reach below A12 has all the features (high light intensity, fine sediments, macrophytes, and slow moving water for example) that you indicate contribute to low DO. Then how are the improved DO levels at this reach of the river explained?

Response: Figure 4.3 summarizes hourly dissolved oxygen conditions for reaches of the Shasta River. The dissolved oxygen data for a given reach presented in Figure 4.3 is a compilation of measurements within the designated reach. While the reaches were selected to reflect observed differences in temperature and dissolved oxygen conditions between reaches, the differences are most reflective of the specific locations at which the data was collected and the amount of measurement data at these locations. The Highway A-12 to Little Shasta River Reach included dissolved oxygen data collected just below A-12 for 3 to 5 day periods in June, July, August, September, and October 2003 and at Freeman Road for 3 to 5 day periods in June, July, and August 2003. In contrast, the Montague- Grenada Road to Anderson Grade Road reach included dissolved oxygen collected at Montague-Grenada Road for all summer months in 2002 and 2003, at Highway 3 for all summer months in 2003, and at Yreka Ager Road for 3 to 5 day periods in June, July, August and October 2003. With this information in mind, Regional Water Board staff agree that the DO conditions in the Highway A-12 to Little Shasta

River reach are different from those in the upstream and downstream reaches, but the differences do not necessarily represent "improvements". As discussed in Chapters 4 and 7 of the Staff Report, most of the oxygen demand in the Shasta River is attributed to aquatic plant respiration. Based on the aquatic vegetation survey of the Shasta River conducted in 2004 (NCRWQCB 2005) there is not a lot of aquatic vegetation cover or biomass in the Shasta River at Highway A-12 and at Freeman Road. Regional Water Board staff believe these aquatic vegetation conditions explain the difference in the dissolved oxygen conditions compared with the upstream and downstream reaches, as presented in Figure 4.3.

Comment 9:
Pg 4-10 chlorophyll a values in the Shasta are compared to other streams. Are they appropriate streams for comparison? One of the 3 references is not listed (Lohman et al. 1992), and another is not available for us to review (Tetratech 2005). I was not able to find the USEPA report either. So, I have no way to evaluate the material. Therefore I recommend more text describing why it is an appropriate comparison.

Response: The referenced citations in section 4.3.3.1 include benthic chlorophyll a values that are generally representative of stream trophic status. All references cited in the Shasta River TMDL documents are part of the administrative record and are available for review.

Comment 10:
On Pgs 4-14 and 7-1 various nutrient concentrations in the Shasta are compared to values from the headwaters. The headwaters originate in totally different soils, have much higher gradients and are not an appropriate comparison. The valley sections of the Shasta are a reflection of the volcanic soils it flows through. Other comparisons could be more appropriate to help evaluate the nutrient levels in the Shasta River.

Response: Regional Water Board staff agree that nutrient concentrations are affected by geology and soil characteristics. Section 2.5.2 discusses the variability of nutrient conditions in the Shasta River watershed, and notes that phosphorus concentrations in tributaries that flow through volcanic soils (e.g. Beaughton and Boles Creeks), as well as springs which flow from lava tubes originating near Mount Shasta, have comparatively higher phosphorus levels.

Comment 11:
Pg. 4-15 discusses a tailwater return flow water quality study. The study is not adequately described. It states primarily ditches were sampled and we don't even know if those ditches enter the river. Ditch values do not necessarily reflect overland or sheet flow water quality. Lastly, the term "flows in ditches" is used once but from then on it becomes tail water return flows. All of the attributes assigned to these ditch samples are

supposed to reflect tailwater return flows. Values from ditches do not necessarily reflect the water that actually enters the river as tailwater; especially overland sheet flows.

Response: As a TAG participant, the commenter may recall that Regional Water Board staff identified water quality sampling of tailwater return flows as an important objective of the dissolved oxygen TMDL monitoring plan, and staff requested permission of landowners to conduct such sampling. Regional Water Board staff collected tailwater return flow samples at those locations for which we were granted access in the summer of 2003. The results of these samples were first reported in the report "Shasta River Water Quality Conditions 2002 & 2003" (NCRWQCB 2004b). At the request of landowners the locations of the tailwater return flow samples were not identified. All of the samples reported as tailwater return flow were collected at locations where the water returned to the river at a downstream location as a surface flow, including flow in ditches. In the TMDL documents "tailwater return flow" refers to surface runoff of irrigation water to a surface water body, and is synonymous with "irrigation return flow".

Comment 12:
Tailwater returns are continued onto Pg 4-16 where it is stated that tailwater return flows are common. Are they really that common? How common is common? What is the volume of return flows compared to the river volume?

Response: As stated in section 4.4.1, "The quality of tailwater return flows in the Shasta River watershed has not been well documented." The same can be said for the volume of tailwater return flows. As mentioned in the response to Comment 11, Regional Water Board staff collected water samples of tailwater return flows at locations for which we were granted access in the summer of 2003. A review by Regional Water Board staff of the Thermal Infrared Radiometry imagery and associated data products collected by Watershed Sciences LLC, on July 27, 2003 (Watershed Sciences 2004, included as Appendix B of the Staff Report), indicated tailwater return flows to the Shasta River at 19 locations on the date of the survey. During the aquatic vegetation survey conducted in July/August 2004, Regional Water Board staff walked or floated nearly 27 miles of the Shasta River from Dwinnell Dam to the mouth. While documentation and measurement of tailwater return flow locations and volume were not study objectives, Regional Water Board staff estimate tailwater return flows occur at a minimum of 19 locations on the Shasta River at rates ranging from 0.25 to 2 cubic feet per second.

Regional Water Board staff believe that more monitoring of tailwater return flows in the Shasta River watershed is needed in order to better characterize the quality and quantity of this discharge. We encourage the accurate measurement and reporting of the quality and quantity of all tailwater return flows in the Shasta River watershed. We believe that qualified organizations such as UC Cooperative Extension, could and should play a valuable and positive role in linking agricultural practices and conditions with water quality compliance in the Shasta River watershed.

Comment 13:
Were nutrient concentrations obtained from these "ditch water" samples used in modeling for tailwater return flows? Were nutrient concentrations obtained from these "ditch water" samples used for accretions to the river? Were any attempts made to adjust accretions for the source of the accretion, for example tributary source, overland flows, ditch returns, and/or subsurface flows? The volumes and quality of each of these sources could, and are likely to be very different. Any results of computer modeling that includes accretions would be highly suspect if the volume and quality of water were not segregated to account for the source of the accretion. It is my knowledge that all of the water quality modeling used aggregated volume and quality for accretions.

Response: The hydrodynamic and water quality input conditions (a.k.a. boundary conditions) for the Shasta River model are presented in section 4.0 and 5.1 in Appendix D of the Staff Report. The water quality concentrations assigned to distributed accretion flows were based on average concentrations of tailwater return flow samples collected by Regional Water Board staff in the summer of 2003. In the absence of detailed information and data, aggregating based on overall accretions to meet conservation of mass constraints is a routine modeling technique.

It is important to recognize that a water quality model is a tool for understanding the water quality dynamics of a waterbody. Any model is limited by the amount of data available to describe the boundary conditions in the model. The locations and quantity of hydrodynamic inputs (i.e. tributaries, groundwater accretions, spring inflows, and tailwater return flows) in the Shasta River watershed are not well documented. As identified in our response to Comment 12, additional data on the quality of tailwater return flows is also needed. The Shasta River water quality model relied upon all available hydrodynamic and water quality data. Regional Water Board staff point out that the model generally calibrated/validated well. However, we believe that the model could be improved with additional hydrodynamic and water quality data to better define the model boundary conditions. We believe that qualified organizations such as UC Cooperative Extension could and should play a valuable and positive role in collecting and interpreting this type of information. Additional information gained through future monitoring/study will be considered with respect to those actions identified in the Action Plan addressing tailwater return flows.

Comment 14:
There are considerable mis-statements and misleading statements related to SOD that are germane to interpretation, conclusions and implementation related to SOD (and dissolved oxygen):

Comment 14 i:
Six locations were not really sampled (as stated on pg 4-4). The first two "locations" near the Montague-Grenada road were about 500 meters apart. "Locations" 3 and 4 were 50 to 100 meters apart. And, "locations" 5 and 6 were 25 to 50 meters apart. When the river is about 40 miles long this does not truly represent 6 different locations. The samples

basically reflect two or maybe 3 locations: near the Montague-Grenada road, and near the Aruja dam (perhaps above and below conditions). Further note these are selected sites for expected high SOD, not representative or random sites to represent the river.

Response: The intent in selecting the SOD measurement locations was to quantify the variability of SOD rates in those reaches with assumed high SOD rates, and was not intended to be representative of variability throughout the river, as the commenter implies. Further, our documentation regarding the SOD measurements has consistently stated that SOD measurements were made at six locations within two short reaches of the Shasta River. Results of the sediment oxygen demand (SOD) measurements were first reported in the report "Shasta River Water Quality Conditions 2002 & 2003" (NCRWQCB 2004b), and reported in a USGS publication (Flint et al. 2005). Page 6 of the NCRWQCB report states: "SOD rates were measured and sediment characteristics classified in the Shasta River upstream and downstream of Montague-Grenada Road and at four locations near the Highway 3 bridge." On page 76 of the NCRWQCB report (in its Appendix 2: Sediment Oxygen Demand Study of the Shasta River – Methodology) it states: "The rate of SOD was measured at six sites in two reaches of the Shasta River (Table 10). These sites were chosen because they are located in a reach of the Shasta River that is known to have dissolved oxygen problems and to accumulate some amount of fine sediment and plant detritus." The text in section 4.3.1 has been modified slightly for clarity.

Comment 14 ii:
The draft text states "…the measured SOD_{20} rates in the Shasta River range from 0.1 to 2.3 $g/m^2/d$…". Based on i. above these samples cannot represent the range in values for the Shasta River. They represent values obtained from expected high SOD locations. In addition, the range is not really from 0.1 to 2.3. Those values are the range of replications or subsamples (2 to 3 replications were taken at each "location") rather than a true range between locations. Thus that range better represents the variation in values.

Response: As the commenter correctly quotes, section 4.3.1 reports the *measured* SOD_{20} rates of the Shasta River. The SOD_{20} rates applied for model calibration/validation and the water quality compliance scenario are presented in Table 7.4 of the Staff Report. It is critical to note that SOD_{20} rates of 1.5 to 2.0 are only applied to locations influenced by minor impoundments in the Shasta River. Significantly lower SOD_{20} rates are applied to all other areas of the river.

Comment 14 iii:
The values (Flint et al 2005) show remarkably high variation from replication to replication (e.g. 0.1, 0.7 and 1.5 for 3 replicates at one "location"). Often this amount of variation is due to poor experimental conditions or factors calling into question the validity of the measurements. It is stated that care was taken to avoid disrupting sediment (which would provide inaccurate SOD values). However, no quality control validation was provided to evaluate the effectiveness of the "care" to eliminate or reduce sediment

disruption. From personal experience it is extremely difficult to do anything in some areas of the Shasta River without disrupting the sediment. The high variation in the results (15 fold variation between replications) is strong evidence that errors in the data are present, making them unusable (in contrast to best available).

Response: The commenter is correct that measurement of SOD has inherent challenges, because there is variability in the oxygen demand exerted in the sediments of a dynamic river system. The Regional Water Board contracted with the USGS to conduct the SOD measurements at considerable expense, because the USGS has extensive experience in performing these measurements, and staff believed that careful representation of SOD rates was a very important component of the water quality model. Regional Water Board staff disagree that replicate variation represents error, as the commenter suggests. Finally, we believe the measured SOD_{20} rates do reflect the best available information for the Shasta River, and we would welcome submittal for review of information the commenter believes is superior.

Comment 14 iv:
The draft TDML document makes several points that SOD was related to fine sediments. However, the reference (Flint et al 2003) did not conduct a cause and effect analysis. They estimated the correlation between SOD and organic-matter content and particle size. Furthermore, they did not even find a correlation between those factors (as stated in Flint et al 2003).

Response: Again, we refer to Table 7.4. SOD_{20} rates of 1.5 to 2.0, rates representative of a reach with organic material decomposing at a moderate rate, were only applied to those areas of the Shasta River immediately upstream of minor impoundments, and are consistent with rates reported in the literature from other river systems with high organic loading. All other reaches of the river were assigned considerably lower SOD_{20} rates.

Comment 14v:
Table 7.4 reports SOD rates based on a model to the level of hundredths of a river mile. Modeled values are shown 20 miles from the only sites with actual field data (and those data were not representative samples but selected as high). No field data (except for the 2 or 3 selected locations) or validation of the model was presented. And, the model results were used to set parameters and for compliance, not as a tool to understand relationships (the purpose of a model).

Response: Table 7.4 does not report SOD rates "based on a model"; it reports the SOD rates applied to different locations of the Shasta River as input parameters to the model. The RMS model does not predict SOD rates, and model results were not used to set parameters for compliance. The RMS model applied the SOD rates assigned by Regional Water Board staff.

Comment 15:
The analysis is incomplete in estimating the overall impact of flood irrigation and overland flows associated with flood irrigation on river temperature, nutrients and dissolved oxygen. The conclusions to reduce or eliminate tailwater returns may have consequences not discussed in the draft. Overland flows entering the river may represent only a small portion of the total accretions to the river associated with the practice of flood irrigation. A far greater quantity of significantly better quality water may be entering the river through subsurface flows. This has been observed in several river systems (see for example Torgersen, et al 1995. Thermal refugia and Chinook salmon habitat in Oregon. In: Proc. 15th Biennial Workshop on Color Photography and Videography in Resource Assessment, May 1995, Terre Haute, Indiana. Am. Soc. Photogrammetry and Remote Sensing, and work by Tamzen Stringham, John Buckhouse and Bill Krueger, Oregon State University). Reductions or elimination of tailwater return flows may substantially reduce subsurface flows and their positive influence on water quality (both temperature and D.O.) of the Shasta River. Further analysis is needed to determine the net effect of changing tailwater return flows.

Response: As defined in section 4.4.1, in the TMDL documents "tailwater return flow" refers to surface runoff of irrigation water to a surface water body, and is synonymous with "irrigation return flow". Regional Water Board staff agree that allowing irrigation water to percolate into the soil is desired, as pollutants can be filtered and trapped within the soil column, and residence times of subsurface flow can help cool the water. See also response to Comment 27.

Comment 16:
As mentioned in #10 and 12 above, it is unclear in the analysis whether the nutrient concentrations determined from the "ditch water" samples were used in analysis of tailwater impacts and responses. Based on the information presented in the draft, those samples should not be used to represent sheet flows or tailwater return in general.

Response: See response to Comments 11 and 13.

Comment 17:
The reduction in warming attributed to a change in transmittance from 100 to 10 percent is a total of about 4 ºC a very small change for a dramatic and unrealistic level of transmittance. This weakens the relationship between shading and reduced warming and any potential to significantly reduce warming.

Response: We assume the commenter is referring to Figure 3.4, which as cited is referenced from Deas et al. (2003). The Deas et al. (2003) work was conducted under contract with the Shasta Valley RCD to evaluate the relationships between flow and shade and stream temperature in the Shasta River. The temperature and dissolved oxygen modeling applied for Shasta River TMDL development built upon this earlier modeling work. Findings of the earlier modeling work were used to further evaluate the factors

affecting Shasta River temperature and dissolved oxygen conditions, but the earlier findings were not used directly in calculating the TMDLs. We also disagree with the commenter's assertion that 4°C is a very small temperature change.

Comment 18:
The shade/water temperature relationship is also not strengthened by the shading model results (Deas et al 2003) as cited on pg 3.8. In this study again an unrealistic simulation of 22-foot tall trees on each bank in the canyon resulted in maximum daily water temperatures 3 ºC lower, but almost no change in daily average.

Response: As described in our response to Comment 17, the model results of Deas et. al. 2003 are used to identify the potential factors affecting Shasta River temperatures, but were not used directly in calculating the TMDLs. With this said, we believe 22-foot tall trees are a reasonable assumption for some reaches of the Shasta River, as trees of this height have been measured in places on the river. In addition, evaluating daily average temperatures is less appropriate than evaluating maximum daily temperatures with respect to salmonid temperature requirements.

Comment 19:
The study using 7 foot tall bulrushes (reported on pg 3-8) had only 1 ºC effect on maximum temperatures, but bulrushes are problematic due to their trapping of sediment, which according to the draft report encourages macrophyte rooting, growth and resultant dissolved oxygen problems.

Response: See response Comment 17.

Comment 20:
Considering these comments, there is extremely weak support for statements in the middle paragraph of pg 3-8 that claims riparian shading causes a cooling of stream temperatures and bulrush colonization could produce a noticeable reduction. It should also be noted that even the weak shade/temperature relationship does not support a cooling of water. It would support, however weakly, a reduction in warming.

Response: See response to Comment 17.

Comment 21:
Documented procedures for determining reach-average percent transmittance values (Table 6.2) are inadequate for evaluation. The only stated procedure is that existing vegetation, channel morphology and soil conditions were considered. What soil conditions were considered? How were those soil conditions determined? The Siskiyou County Soil survey is adequate for this level of detail. How did channel morphology affect potential transmittance values? Based on my experience, the level of riparian

vegetation suggested as reach-average potential is unrealistic based on local conditions. Many soil conditions are saturated clay soils that have site potential for sedges and similar vegetation adapted to those conditions. Many of these sites and other sites on the Shasta River will not support large trees required to reach the transmittance levels stated in Table 6.2.

Response: As stated in section 6.2.1, "Regional Water Board staff developed depictions of site potential percent transmittance values by river reach *based on available information* about Shasta River riparian conditions." The information used is described in section 6.2.1, and included anecdotal information about Shasta River riparian corridor soil conditions provided by local residents. Regional Water Board staff recognize there is site-specific variability in potential percent transmittance not described in the reach averages presented in Table 6.2. Regional Water Board staff responsible for implementing the Shasta River TMDL will evaluate such site-specific information if provided by a land owner, lessee, or their representative.

Comment 22:
What is the quantitative impact on fine sediment deposition from increased riparian vegetation such as bulrush (which will slow water and trap more sediment)? How would increased fine sediment deposition impact macrophyte population and growth and its impact on dissolved oxygen levels?

Response: The TMDL analysis has not quantified deposition of fine sediments from flow through emergent macrophytes such as bulrush. The Action Plan includes actions to reduce fine sediment delivery to the Shasta River and its tributaries, which would make the commenter's concern moot.

Comment 23:
What is the impact on flow due to water use by riparian vegetation needed to achieve the proposed potential average-reach level transmittance?

Response: The overall effect of riparian vegetation on stream flows is unknown. Mature riparian trees transpire water; however, the presence of mature riparian trees and riparian grasses, rushes, and sedges has also been shown to increase groundwater retention in areas where natural riparian vegetation has been restored, leading to increases in summerflow.

Comment 24. Considering that the CDFG documents cited here (pg 1-29) and elsewhere in the document are basically unavailable, it would be extremely helpful and is critical for stakeholder review to have at least the cited pages reproduced in a reference section.

Response: All references cited the TMDL documents, including those in sections 1.4.10 and 1.4.11 of the Staff Report, are part of the administrative record for the TMDL

document. The administrative record for the TMDL is available for public review. Many of the references (with the obvious exception of the personal communications) used in the fisheries section of this report are available on the internet through a simple key word search.

Comment 25. After living in this area for over 20 years, talking with landowners, fishermen and others, conducting scientific trials on local salmonids and hearing presentations by CDFG personnel, I have never heard anyone mention type II juvenile fall Chinook. To include them without the opportunity to even look at the single (CDFG, 1997) reference (what can we review about a personal communication?) is absolutely biased.

Response: The document, A Biological Needs Assessment For Anadromous Fish in the Shasta River (CDFG 1997, p.10), discusses the possibility of Type II or Type III Chinook in the Shasta River. The personal communication between Regional Water Board staff and California Department of Fish and Game staff (Whelan 2005a) cites details of a phone conversation in which CDFG staff commented on a draft version of the periodicity information for Chinook salmon in the Shasta River basin. The major comment from the CDFG staff during the phone call was to explain that there are Type II Chinook present in the Shasta River, and thus this fact should be reflected in the text and periodicity figure (Figure 1.17).

The 1997 CDFG biological needs assessment document is available on the internet, and can be found either using a search for the title, or by going to the following URL and looking for the title of the document: <http://krisweb.com/biblio/biblio_klamath.htm>. The 2005 personal communication (Whelan 2005a) is part of the administrative record for the Shasta TDML document.

Comment 26. What role do coldwater refugia play in fish development and the beneficial use of the Shasta as a coldwater fishery on the Shasta? What would be the consequence of reductions or elimination of those refugia? What impact would proposed increases in flow have on coldwater refugia? Why is this not discussed at all related to recommended changes in flow?

Response: Please see response to Comment 5.

Comment 27. At public meetings an analogy with a water glass was used to explain the theoretical effect of shade and flow on water temperature. Careful consideration of both model and real-world data suggests that within the natural limits of the Shasta River system, even with flow increases the water in the "glass" is so small in relation to the hot environment of this area and water temperatures will closely reflect air temperatures. Therefore, water temperatures in the Shasta are elevated compared to other more typical salmonid areas. Similarly, even with reduced solar transmittance, water temperatures are

elevated compared to some salmonid rearing areas. However, Shasta River water temperatures are not that different from water temperatures associated with salmonids in warmer areas such as central and southern California. In these systems, and in the Shasta River, cold-water refugia associated with seeps, spring inflows, and perennially flowing cool headwaters reaches are likely key (Dr. Lisa Thompson, UC Davis, pers. comm.). It is important to keep in mind the purpose of the TMDL is not to modify water temperature or dissolved oxygen; it is to strengthen the beneficial use of cold-water fisheries. Maintaining or enhancing refugia may be more important than anything else. Similarly, establishing shade at the level required to significantly lower water temperatures may so drastically alter the food cycle as to harm coldwater fisheries. Additionally, riparian vegetation at the required levels may also use significant amounts of water and reduces velocity (with concomitant increased warming), lead to more fine sediment deposition, macrophyte recruitment and even larger dissolved oxygen fluctuations. These would be countered to some degree by reduced light and that impact on macrophytes. Overall it seems like the advocates for increased flow, more shade, fewer diversions, dam removal or whatever have lost sight of the objective. It seems absolutely imperative that before this draft can be accepted, an evaluation of these interrelated factors on the functioning of the coldwater fisheries is necessary, not just a mechanistic or modeled response for temperature or oxygen levels. Much real world data and historical as well as local knowledge has not been included in this draft. The risk of not making an integrated evaluation is the risk of the fishery itself. Why isn't a more integrated and thorough evaluation conducted on the functioning of the coldwater fisheries?

Response: The commenter's speculation that the Shasta River is uniquely warm because of it's environmental setting does not agree with the modeling results presented in the temperature analysis, nor is it supported by temperature data from this and other north coast anadromous streams. In fact, the Shasta River watershed is unique in the North Coast in having a mountain exceeding 14,000 feet in height with permanent snow, and in having cold water sources that discharge at high levels throughout the year, including during the late summer and fall.

The current importance of thermal refugia speaks to the degree of impairment in a river that once supported Chinook runs as high as 80,000, including spring Chinook. The commenter's speculation about unintended negative consequences of water quality restoration is noted.

3. Quartz Valley Indian Reservation and Karuk Tribe Comments

Quartz Valley Indian Reservation Summary of Comments:

Overall, the technical analysis in the Shasta Dissolved Oxygen (D.O.) and Temperature TMDL uses sound logic, has good supporting graphics, and uses standard models that have been previously used in the basin. The models are transparent and their assumptions are clearly stated and for the most part well supported. The Shasta TMDL

recognizes that increasing flows is an important action needed to remediate water temperature problems, which is both scientifically accurate and commendable.

There are several ways in which the technical portion of the TMDL could be improved. First, there is no discussion of pH in the TMDL, despite the fact that pH values in the mainstem often exceed *Basin Plan* objectives (NCRWCB 2001), are high enough to be stressful to salmonids, and have similar causes as the dissolved oxygen issue. Second, the TMDL repeatedly refers to nutrient sources (such as from tailwater returns and Dwinnell Reservoir) as problems because of contributions to nitrogenous biological oxygen demand (NBOD), when NBOD is in fact only a small part of the oxygen demand in the Shasta River. The real problem with those nutrient sources, which the TMDL repeatedly overlooks, is the total amount of nitrogen (in all forms) contained in those nutrients sources and its stimulation of aquatic plant growth. This occurs throughout the Staff Report and the *Basin Plan* amendment language, and should be corrected.

A more holistic watershed focus is another way in which the TMDL could be improved. Partially due to the model-centric focus of the TMDL, the Shasta River is treated as a 40 mile trunk without functional tributaries. Flow data from the *Appropriation of Water Rights in the Shasta Basin* (CADPW, 1932) contained in the TMDL show that all tributaries had surface flow and were functional parts of the Shasta River, but there is no mention of restoring connectivity. Pollution from reaches of streams like upper Parks Creek are not recognized because they are not part of the model, although Parks Creek connected to the Shasta River during major storms. Water quality issues within Lake Shastina (aka Dwinnell Reservoir) are described, but the benefit of removing the dam for abating temperature and nutrient pollution is not discussed. It should be noted here that NRC (2004) recommends consideration of removal of Dwinnell Dam.

A summary of our comments regarding implementation is included below as Table 1 (patterned after Table 4 of the Basin Plan amendment language). The water quality compliance scenario in temperature TMDL includes a 50% increase in flow from Big Springs Creek. We strongly support that decision; however the TMDL implementation does not lay out a clear path for how such a substantial increase in flow could be achieved. The RWB proposes to take no action to increase flows to improve water quality for five years, which seems like a long wait given the stock status of Klamath River salmon (Kier Associates, 2006); we think two years would be a more reasonable amount of time. Implementation relies heavily on voluntary measures, although adjacent language stressing the Regional Water Board's (RWB) ability to follow up with enforcement is reassuring. The Action Plan proposes good ideas for how to manage tailwater return flows, riparian areas, and rangelands. The discussion of urban and suburban runoff does not contain any language regarding planning or design, an oversight that should be corrected.

The Shasta TMDL does not set a clear monitoring program, leaving it until a year after TMDL approval. It would seem wise to encourage continuation of specific on-going monitoring efforts of relevant parameters before the more comprehensive plan is drafted.

Karuk Tribe Summary of Comments:

Overall, the technical analysis in the Shasta Dissolved Oxygen (D.O.) and Temperature TMDL uses sound logic, has good supporting graphics, and uses standard models that have been previously used in the basin. The models are transparent and their assumptions are clearly stated and for the most part well supported. The Shasta TMDL recognizes that increasing flows is an important action needed to remediate water temperature problems, which is both scientifically accurate and commendable.

There are several ways in which the technical portion of the TMDL could be improved. The TMDL repeatedly refers to nutrient sources (such as from tailwater returns and Dwinnell Reservoir) as problems because of contributions to nitrogenous biological oxygen demand (NBOD), when NBOD is in fact only a small part of the oxygen demand in the Shasta River. The real problem with those nutrient sources, which the TMDL repeatedly overlooks, is the total amount of nitrogen (in all forms) contained in those nutrients sources and its stimulation of aquatic plant growth. This occurs throughout the Staff Report and the *Basin Plan* amendment language, and should be corrected.

A more holistic watershed focus is another way in which the TMDL could be improved. Partially due to the model-centric focus of the TMDL, the Shasta River is treated as a 40 mile trunk without functional tributaries. Flow data from the *Appropriation of Water Rights in the Shasta Basin* (CADPW, 1932) contained in the TMDL show that all tributaries had surface flow and were functional parts of the Shasta River, but there is no mention of restoring connectivity. Pollution from reaches of streams like upper Parks Creek are not recognized because they are not part of the model, although Parks Creek connected to the Shasta River during major storms. Water quality issues within Lake Shastina (aka Dwinnell Reservoir) are described, but the benefit of removing the dam for abating temperature and nutrient pollution is not discussed. It should be noted here that NRC (2004) recommends consideration of removal of Dwinnell Dam.

A summary of our comments regarding implementation is included below as Table 1 (patterned after Table 4 of the Basin Plan amendment language). The water quality compliance scenario in temperature TMDL includes a 50% increase in flow from Big Springs Creek. We strongly support that decision; however the TMDL implementation does not lay out a clear path for how such a substantial increase in flow could be achieved. The RWB proposes to take no action to increase flows to improve water quality for five years, which seems like a long wait given the stock status of Klamath River salmon (Kier Associates, 2006); we think two years would be a more reasonable amount of time. Implementation relies heavily on voluntary measures, although adjacent language stressing the Regional Water Board's (RWB) ability to follow up with enforcement is reassuring. The Action Plan proposes good ideas for how to manage tailwater return flows, riparian areas, and rangelands. The discussion of urban and suburban runoff does not contain any language regarding planning or design, an oversight that should be corrected.

The Shasta TMDL does not set a clear monitoring program, leaving it until a year after TMDL approval. It would seem wise to encourage continuation of specific on-going monitoring efforts of relevant parameters before the more comprehensive plan is drafted.

Response: Responses to each of the summary comments provided by the Quartz Valley Indian Reservation and the Karuk Tribe are provided in responses to the detailed comments below.

Detailed Comments for Quartz Valley Indian Reservation and Karuk Tribe:

Comment:
1.4.10 Anadromous Fish of the Shasta River Watershed (Comment only submitted by QVIR)
The section on fisheries (1.4.10) is thorough and there are useful charts that summarize data on fall chinook, coho and steelhead trout. Although data on steelhead and coho are sparse, the Shasta TMDL should state explicitly that life history requirements of these species make them more vulnerable to water quality problems. Consequently, coho and steelhead populations are likely to have declined more than fall Chinook salmon, which do not require extended freshwater rearing.

Response: Text has been added to section 1.4.10.6 of the Staff Report pointing out that one or more life stage of fall Chinook, coho, and steelhead are present in the Shasta River Basin during every month of the year. Section 2.3.2 identifies that Shasta River temperatures exceed salmonid spawning, incubation, emergence and rearing thresholds during most summer months.

Comment:
Although the TMDL makes no mention of it, Pacific salmon populations are effected changing ocean productivity and patterns of precipitation. The Pacific Decadal Oscillation (PDO) cycle causes major shifts in ocean productivity and conditions seem to shift from favorable for salmon to unfavorable approximately every 25 years. Good ocean conditions for salmon off the California and Oregon Coast prevailed from 1900-1925 and 1950-1975 and switched to favorable again in 1995 (Hare et al., 1999). The good ocean cycle is usually associated with increased rain and snow fall. Poor ocean cycles from 1925-1950 and 1976-1995 were associated with dry on-land cycles.

The Chinook salmon population of the Shasta River is showing a long term decline (Figure 1) that does not bode well for long term survival. The population is failing to rebound despite recent average and above average rainfall years and mostly favorable ocean conditions. Collison et al. (2003) point out that PDO conditions will switch back to negative ocean and dry on land sometime between 2015 and 2025 and that, if freshwater habitat conditions have not improved by that time, stock losses are likely to occur. Shasta stocks ranged from 533-726 from 1990-1992 during the last dry climatic cycle, a critically low level (Gilpin and Soule, 1990). The final Shasta TMDL should cite

the findings of Hare et al. (1999) and use it as a reason for urgency of to move forward on a TMDL Implementation Plan.

Response: Thank you for your comment. Dr. Coutant made a similar comment during our peer review process. Regional Water Board staff agree with the importance of initiating actions in the TMDL Action Plan in a timely manner. Table 4 of the Action Plan addresses all identified factors affecting the temperature and dissolved oxygen impairments. All actions are to be addressed concurrently and must be initiated upon EPA approval of the TMDL. Regional Water Board staff acknowledge that some implementation actions (i.e. dedicated cold water instream flow) will have more immediate benefits than others.

Comment: (Comment only submitted by QVIR)
The Shasta TMDL does not address the October 1 deadline for shutting off stock water and increasing stream flows for fish passage. Snyder (1931) noted that fall Chinook salmon entered the Shasta River in September. Fish now delay their migration until after October 1 because of lack of sufficient flow and associated warm water temperatures (Figure 2). This delayed pattern of entry into the Shasta River is manifest in both wet and dry years (Figure 3). Fall chinook forced to sit for weeks in stressful Klamath River conditions likely have reduced fecundity. This intensive selection pressure likely selects for later run timing. For discussion of similar impacts caused by Iron Gate Dam on mainstem spawning Klamath River fall chinook, see Kier Associates (2006).

Response: Comment noted. The revised TMDL Action Plan includes a goal of increasing cold water intream flows in the Shasta River by 45 cfs from May 15 to October 15.

Comment: (Comment only submitted by QVIR)
1.4.10.5 Habitat and Fish Distribution
The distribution map (Figure 1.16) showing very limited range for steelhead likely is conservative, with steelhead very likely occurring in Parks Creek at least during high flow years. A map showing gradient would be useful to judge the former range of coho salmon, spring chinook and steelhead. Expanding habitat toward historical range under TMDL Implementation would substantially improve prospects of long term Pacific salmon species population viability and stability.

The fish distribution map indicates that Big Springs is not currently salmonid habitat yet the California Department of Water Resources (1981) *Klamath and Shasta River Spawning Gravel Enhancement Study* showed a huge concentration of fall chinook spawning Big Springs Creek. This is a tangible indication that Big Springs Creek was a major refugia for Pacific salmon in the early 1980's before reduction of flows due to ground water pumping. Figure 4 shows riparian destruction in lower Big Springs Creek and the adjacent reaches of the Shasta River that would also degrade fish habitat and lead to thermal pollution (Kier Associates, 1999).

Response:
Regional Water Board have reviewed the California Department of Water Resources (1981) *Klamath and Shasta River Spawning Gravel Enhancement Study, and* agree that fall Chinook have been present in Big Springs Creek. However, as stated in Section 1.4.10.5 of the Staff Report, Figure 1.16 is based on information from the USFS (Klamath National Forest). Locations where fish are not marked as "present or suspected" in Figure 1.16 may reflect areas that were not surveyed by the USFWS for salmonid presence/absence. Thus although a particular area is not marked as having fish present, it does not indicate that salmonids and lamprey are absent from these areas.

Comment:
2.2.2 Water Quality Objectives: (Comment only submitted by QVIR)
Table 2.2 "Narrative and Numeric Water Quality Objectives applicable to the Shasta River basin TMDLs" should also include the *Basin Plan* water quality objectives for pH in the Shasta River. While the Shasta River is not officially listed as pH impaired, summer pH values in mainstem Shasta River are extremely high (>9.5), and are unequivocally related to nutrients and D.O.

The lack of analysis of pH in TMDL is troubling, and deserves correction, for several reasons. First, pH directly affects salmonids, with pH levels above 8.5 being stressful and pH 9.6 being lethal (Wilkie and Wood 1995). For a more complete review of the effects of pH on salmonids, see Kier Associates (2005a). Second, ammonia toxicity increases with pH (U.S. EPA 1999). Third, high maximum pH and high diurnal ranges of pH are often symptomatic of nutrient enrichment and excessive growth of aquatic plants, which makes pH a highly useful index of photosynthesis. As described in Chapter 4, the primary cause of the low dissolved oxygen problems in the Shasta River is excessive respiration by aquatic plants. Analysis of pH data is a valuable tool to help understand the spatial and temporal dynamics of D.O. and nutrient impairment.

The mouth of the Shasta River has been monitored with automated water quality probes since 2000. Data from 2000-2004 show that maximum pH typically exceeds the *Basin Plan* objective of 8.5 for most days from June through September (Figure 5). TMDL Appendices A and C contains continuous pH data from other sites in the Shasta River. Goldman and Horne (1983) note that at pH of over 9.5 that all ammonium ions would be converted to dissolved ammonia, which is highly toxic to salmonids. These pulses of extreme pH occurred in seasons of downstream juvenile migration (June 2002) and during periods when adult Chinook salmon may be holding (September 2001) downstream of the mouth of the Shasta in the Klamath River.

Response: Table 2.2 has been revised to include pH. Regional Water Board staff agree that the processes and factors that effect dissolved oxygen, and to a lesser extent temperature, also effect pH. In particular, photosynthesis of aquatic plants alters pH levels. In addition, Regional Water Board staff recognize that pH levels in the Shasta River regularly exceed the Basin Plan objective for pH of 8.5. Though not specifically analyzed as part of these TMDLs, Regional Water Board staff anticipate that

implementation of the temperature and dissolved oxygen TMDLs will result in improvements to pH. In particular, reduced photosynthetic rates by 50% would result in reduced pH levels. Future monitoring to assess the effectiveness of the temperature and dissolved oxygen TMDLs should include pH.

Comment: (Comment only submitted by QVIR)
2.3.1 Temperature Requirements of Salmonids
It is our opinion that this section presents the best available science, including from U.S. Environmental Protection Agency (2003).

Response: Thank you for your comment, it has been noted.

Comment:
2.3.2 Temperature Conditions of the Mainstem Shasta River
This section presents colorful and useful graphics (i.e. Figure 2.1) that show the seasonal variability versus life history requirements, duration of stressful conditions and the temperature profile of the river from Dwinnell Dam to the convergence with the Klamath River.

The TMDL states on page 2-12 that "Weekly maximum temperatures exceed the spawning, incubation, and emergence threshold (i.e. MWMT of 13°C) at all Shasta River reaches from April through June, and during the second half of September." An examination of Figure 2.1 shows that to be incorrect because temperatures are above 13°C until mid-October, not September. This should be corrected.

Response: The text in section 2.3.2 has been changed to acknowledge that Shasta River temperatures exceed the spawning, incubation, and emergence threshold into October.

Comment:
2.5 Biostimulatory Substances: (Comment only submitted by QVIR)
pH should also be specifically mentioned in this sentence on page 2-24, "In this context for the Shasta River TMDL, Regional Board staff define nuisance aquatic growth as that which contributes to violation of numeric water quality objectives (particularly dissolved oxygen) or adversely affects beneficial uses."

Response: The text in section 2.5 has been changed, identifying pH as an indicator of nuisance aquatic growth conditions.

Comment: (Comment only submitted by QVIR)
2.5.1 Nutrient Criteria and Trophic State Thresholds
This section of the TMDL should mention that site-specific data analyses are required to set meaningful nutrient criteria (Tetra Tech, 2004).

We recommend that this section start with this paragraph:

> "Nutrients do not directly affect salmonids, but impact them indirectly by stimulating the growth of algae and aquatic macrophytes to nuisance levels that can adversely impact dissolved oxygen and pH levels in streams. The concentration of nutrients required to cause nuisance levels of periphyton varies widely from one stream to another. Detailed data analysis is required to determine relationships. U.S. EPA (2000) and Tetra Tech (2004) provide excellent summaries of the literature on these analytical methods and will not be repeated here. Such analyses have not yet been conducted on the Shasta River, so in this section we discuss national (USEPA 1986), regional (USEPA 2002), and international (Dodds et al. 1998) literature."

Response: The text in section 2.5.1 has been modified, incorporating portions of the recommended text.

Comment: (Comment only submitted by QVIR)
The Dodds et al. (1998) reference is relied upon far too heavily, perhaps even misapplied, in this section of the TMDL. The trophic categories in Dodds et al. (1998) were derived from looking at the distribution of nutrient concentrations in many streams and then arbitrarily dividing them up into three statistically equal categories; they are not based on any type of ecological functionality.

EPA (2000) provides the following cautionary note about Dodds et al. (1998):

> "It should be stressed that this approach proposes trophic state categories based on the current distribution of algal biomass and nutrient concentrations which may be greatly changed from pre-human settlement levels."

In other words, it is likely that the population of streams used by Dodds et al. (1998) are skewed towards more impaired streams, thus the nutrient concentrations for the trophic boundaries are skewed high. In particular, the 0.7 mg/L total nitrogen value presented by Dodds et al (1998) as the oligotrophic-mesotrophic boundary is highly suspect. Note that USEPA's (2002) recommended ecoregional nutrient criteria for total nitrogen is 0.12 mg/L, more than 5 times lower than the 0.7 mg/L from Dodds et al. (1998). Based on analysis of nutrient, pH, D.O., and periphyton data in the Klamath, Trinity, and Salmon Rivers, Kier Associates (2005a) recommended a total nitrogen criteria of 0.2 mg/L for the lower Klamath River.

As noted above, the nutrient concentration required to cause impairment in a stream varies widely according to many factors, thus the more specific the analysis the better. Thus, we cannot see any justification for the TMDL to use the numbers presented Dodds et al. (1998) derived from across North America and New Zealand, rather than the

USEPA (2002) criteria derived from data in Nutrient Ecoregion II (Western Forested Mountains) of the western United States. We recommend that both Dodds et al. (1998) and USEPA (2002) remain in the literature review presented in 2.5.1, but that when analyzing Shasta River nutrient data in section 2.5.2 (Shasta River Watershed Nutrient Conditions), the USEPA (2002) recommended criteria should be used instead.

Response:
The commenter raises important points. An expanded discussion on Dodds et al. (1998) has been added to section 2.5.1, which includes comments from USEPA (2000) about the limitations of these trophic state categories. Regional Water Board staff agree that the methods used to create the trophic categories in Dodds et al. (1998) limit the utility of this information. Thus TP and TN levels in section 2.5.2 are evaluated against the USEPA (1986) national criteria and USEPA (2000) Ecoregion II critieria.

Comment:
2.5.2 Shasta River Watershed Nutrient Conditions
2.5.2.1 Total Phosphorus
On page 2-28, the following statement is made:

> "Downstream of the headwaters, Beaughton and Boles Creeks enter the Shasta River from the west and flow through the phosphorus rich volcanic soils flanking Mount Shasta. This is reflected in the high total phosphorous values in these creeks with averages of 0.192 and 0.119 mg/L respectively."

The land use map (Figure 1.12) clearly indicates that the watersheds of Beaughton and Boles Creek contain an urbanized area around Weed that may also be a substantial contributor to phosphorus concentrations. Development is widely recognized to increase nutrient concentrations in streams (U.S. EPA, 2000). While we agree that the high phosphorus concentrations in Beaughton and Boles Creek are likely due in part to natural geology, they are also likely exacerbated by land use, and this should be acknowledged in the TMDL.

Response: The commenter is correct that Beaughton and Boles Creek flow through an urbanized area, and it is well documented that urbanized areas contribute to nutrient loading in streams. Appropriately, the Action Plan includes actions associated with nutrient controls in urban and suburban runoff.

Comment:
2.5.2.2 Total Nitrogen
As noted above in comments on Section 2.5.1, Shasta River nutrient data should not be compared to Dodds et al. (1998), but to USEPA (2002).

Response: Regional Water Board staff agree that the methods used to create the trophic categories in Dodds et al. (1998) limit the utility of this information. Thus TP and TN levels in section 2.5.2 are only evaluated against the USEPA (1986) national criteria and USEPA (2000) Ecoregion II criteria.

Comment:
In regard to Beaughton and Boles Creek, page 2-29 of the TMDL states "Although total phosphorus levels are high in these tributaries, total nitrogen levels are generally low." We disagree with this assertion; nitrogen concentrations in Boles Creek are high. The TMDL should also recognize that the form of nitrogen is also important (as inorganic forms of nitrogen such as ammonia and nitrate are available to immediately stimulate plant growth). While total nitrogen at Boles does lie slightly below Dodds et al.'s oligotrophic-mesotrophic boundary, nitrate plus nitrite concentrations are very high. We suggest the following revision. Replace "Data from Boles creek generally reflect oligotrophic conditions, with average total nitrogen measuring 0.69 mg/L." with "Data from Boles creek indicate that total nitrogen there are higher than Beaughton Creek, with average total nitrogen measuring 0.69 mg/L, far above USEPA (2002) recommended nutrient criteria of 0.12 mg/L. Additionally, inorganic forms of nitrogen were high, with nitrate plus nitrite nitrogen ranging from 0.360 to 0.560 and an average of 0.493."

Response: The text in section 2.5.2.2 has been modified, incorporating the suggested language.

Comment:
The statement "Total nitrogen values in springs are generally within the mesotrophic boundary" (p 2-30) is inconsistent with the rest of the nutrient discussion. The statement should be changed to "Total nitrogen values in springs are several times higher than the USEPA (2002) recommended ecoregional criteria."

Response: The text in section 2.5.2.2 has been modified to reflect this point.

Comment:
Little evidence is provided to support the statement that "Maximum total nitrogen levels in the mainstem Shasta River increase in a downstream direction." Table 2.8 provides total nitrogen data on the Shasta River near the headwaters, Shasta River above Dwinnell, and then lumps all mainstem sites below that as "Shasta River below Dwinnell Dam." To support that statement, the sites below Dwinnell Dam should be analyzed individually. Appendix B of the TMDL contains USGS and RWB data from 2002-2003 indicating that the patterns at sites below Dwinnell Dam are complex and that analysis of the data is confounded due to the use of a laboratory with inadequate detection limits for Kjeldahl nitrogen.

Response: The text in section 2.5.2.2 has been modified to reflect this point.

Comment:
2.6.3 Potential Municipal and Domestic Water Supply and Contact Recreation Impairment
Discussions of Dwinnell Reservoir in Section 2.5.2 note increased nutrients as compared to reaches of the Shasta River above, but do not mention the role of the nitrogen-fixing blue green algae *Anabaena flos-aquae* as one of the sources of nutrient pollution (though it is later in the document in Chapter 4). *Anabaena flos-aquae* is correctly noted in the text to be a producer of anatoxins.

Response: This point the commenter makes is addressed in section 4.4.3.

Comment:
3.1.1 Stream Heating Processes
This section presents a good description of how the Shasta River warms.

Response: Thank you for your comment.

Comment:
3.3 Stream Heating Processes Affected by Human Activities in the Shasta River Watershed
3.3.2 Shade
On page 3-6, there is discussion of a reach at river mile 37.3 shown in Figure 3.2 where the riparian vegetation noticeably changes from sparsely vegetated to densely vegetated, coincident with a 4 degree drop in temperature. It seems unlikely that riparian vegetation would rapidly cool temperatures by 4 degrees C. As Dr. Coutant points out in the peer-review (Appendix I) another possibility is that hyporheic exchange cooled the water. For details, see our comments under 3.3.7, a new section that we request be added to the TMDL.

Response: Regional Water Board staff agree the 4 ^{o}C reduction in temperature may be due to more factors than just the increase in shade. However, we believe that hyporheic exchange is an unlikely explanation, given our experiences in the Scott River where heat losses due to hyporheic processes were modeled. A more likely explanation is groundwater accretion. Regardless, the drop in temperature does, in fact, coincide with the presence of dense vegetation. The text in section 3.3.2 has been modified to reflect these points.

Comment:
3.3.3 Tailwater Return Flows
The attribution of warming in Big Springs Creek to diversion and agricultural return water is correct, although less than optimally illustrated by the TIR image presented (Figure 3.6). Page 3-8 states that "…Big Springs Creek, where a tailwater return flow was 9.2^{o}C warmer than the creek and caused a plume of hot water that extended for

hundreds of meters (Figure 3.6)." We have examined this figure closely, and do not see the effect described. We are unable to determine if the effect does not exist, or if it is problem with image quality.

Response: The plume of hot water shown in Figure 3.6 is not obvious for two reasons. First, the arrows in the picture are not pointing to the correct tailwater discharge. Secondly, the tailwater is so hot that it shows up grey in the image and is hard to distinguish from the surrounding grasses. Figure 3.6 has been revised to make the tailwater plume more visible.

Comment:
3.3.4 Flow and Surface Water Diversions
The Shasta TMDL does not present the thermal evidence (Watershed Sciences 2004) that flow depletion is causing stream warming in tributaries Parks Creek and the Little Shasta River. Data and TIR images show temperature oscillations in Parks Creek and the Little Shasta River that indicate these streams warm as their flows are depleted (Figure 6). Kier Associates (2005b) described a similar effect on Shackleford Creek in the Scott River. Diversion also completely dries up reaches that would otherwise be suitable habitat for salmonids (Figure 7). Changing patterns of diversion on lower Parks Creek would provide a cold water reach connected to the mainstem Shasta River that could serve as a refugia for juvenile salmonids.

Response: Regional Water Board staff agree that flow depletion contributes to stream warming in Parks Creek and the Little Shasta River, and the text in section 3.3.4 has been modified to reflect this.

Comment:
U.S. EPA (2003) points out the need to protect and restore well distributed refugia when other factors confound meeting temperature requirements of salmonids in mainstem environments. Hydrologic connectivity of Parks Creek is also needed for spawning gravel recruitment in the Shasta River below Dwinnell Dam. Kier Associates (1999) noted that: "Without a change in winter flow regimes to allow increased gravel supply from Parks Creek to enter the Shasta River, long-term depletion of spawning gravels for salmon and steelhead is inevitable."

Response: Regional Water Board staff agree with these statements.

Comment:
3.3.5 Groundwater Accretion / Spring Inflows
This section of the TMDL contains good discussions of why groundwater accretions and spring inflows are important to water temperatures in the Shasta River; however, it does not note that groundwater accretions and spring inflows are not included in the TMDL's water quality model.

Table 6 in Appendix D shows the "Hydrodynamic input locations and types" (e.g. the locations of types of inflows and outflows included in the models). The only specific inputs included were Parks Creek (rm 34.94), Big Springs (rm 33.71), and Yreka Creek (rm 7.88). Other inflows are included as distributed inflows. As noted in Appendix D, temperatures for "all accretions between GID and Anderson Grade" (that reach covers most of the mainstem Shasta below Dwinnell Dam) were assigned the temperature of the Shasta River at Anderson Grade. In other words, it appears as though all springs and groundwater accretions, such as the spring shown in figure 3.9, were assigned Shasta River water temperatures. This seems problematic as the springs are much cooler than the Shasta River water.

Response: A water quality model is a tool for understanding the water quality dynamics of a waterbody. Any model is limited by the amount of data available to describe the boundary conditions in the model. The locations and amount of groundwater accretions and spring inflows in the Shasta River watershed are not well documented. The Shasta River water quality model used the available hydrodynamic and water quality data. Regional Water Board staff point out that the model generally calibrated/validated well. Regional Water Board staff agree that the model could be improved with additional hydrodynamic and water quality data to better define the model boundary conditions. See also response to Comment Category 7- Water Temperature, Flow and Allocations.

Comment:
3.3.7 Hyporheic function
We propose that a short section on hyporheic function be added here.

Connection of surface water to these sub-surface waters is recognized as having a potential cooling influence (Poole and Berman, 2001; U.S. EPA 2003). It is important to note that this is a different mechanism than springs or groundwater accretion. It is not "new" cool water that dilutes the warm river water, but rather that warm river water enters the sand/gravels of the hyporheic zone and then re-emerges cooler, with no net effect on the amount of water in the stream. While magnitude and distribution of this effect in the Shasta River is unknown, it may be significant (and likely the cause of the cooling described in section 3.3.2 and shown in Figure 3.2). As Dr. Coutant mentioned in his review, the model could potentially simulate this effect:

> "For hyporheic flow, if you have some idea of the rate of flux in and out of the gravel, you could treat the flux into the gravel as withdrawal from the stream (water of ambient quality) and replace it downstream with distributed inflow representing the flux out of gravel (with water quality of the hyporheic flow)"

As noted by Dr. Coutant, failing to include this mechanism in the model may result in an over-estimation of the effect of shade. We recognize that the Regional Water Board will

be reticent to conduct additional modeling work at this stage of TMDL development, but as research in the Shasta River continues this should be conducted in the future.

A major problem in the Shasta River that may have disrupted hyporheic function is the mining of hundreds of thousands of yards of gravel from the Shasta River when highway Interstate 5 was built (Kier Associates 1991). Virtually all alluvium was removed and replenishment is blocked by Dwinnell Dam and by de-watering of tributaries that formerly contributed both water and gravel to the mainstem (Kier Associates, 1999). Restoring connectivity of tributaries with the mainstem could increase spawning gravel supply and ultimately recreate some hyporheic function as well.

Response: Regional Water Board staff agree that there is an element of hyporheic function in most streams, including the Shasta River, and has a potential cooling influence. In addition, we agree that there is currently not a lot of gravel in the Shasta River, particularly downstream of Dwinnell Dam. The Shasta River water quality model does not specifically account for hyporheic function. Regional Water Board staff believe incorporation of this factor would be a valuable component of future modeling efforts on the Shasta River.

Comment:
3.3.8 Timber harvest
We propose that a short section on timber harvest be added here.

Timber harvest activity in upper Parks Creek (Figure 7) is likely having similar effects as in the Scott River, described by Kier Associates (2005b). Logging in rain-on-snow prone watersheds leads to increased sediment yield and peak discharge that in turn widen stream channels and contribute to increased water temperature. Although the introduction of the *Shasta TMDL* mentions logging as an historic activity, it appears active in upper Parks Creek. Lingering cumulative effects, such as high road densities, skid roads and early seral forests, are likely triggering increase sediment yield, increased flood flows and decreased summer base flows. Kier Associates (2005b) pointed out that dry upland forest sites may require decades for recovery due to slow tree regeneration, causing an extended window of cumulative watershed effects related to flow.

Response: The revised Shasta River TMDL Action Plan addresses timber harvest activities on both federal and non-federal lands.

Comment:
4.3 Processes Affecting Dissolved Oxygen Concentrations in the Shasta River Watershed
The third paragraph of section 4.3 on page 4-3 (beginning with "Though…") should be revised. Characterizing Shasta River biological oxygen demand (BOD_5) as "relatively low" in comparison to raw sewage and hyper-eutrophic Upper Klamath Lake is not at all appropriate. As coldwater salmonid habitat they are much higher than optimal. We do

agree that Shasta BOD_5 concentrations are low in the sense that they are not the major factor driving D.O. dynamics in the Shasta River. We suggest that paragraph should be replaced with the following revision:

> "Though the data are limited, BOD5 concentrations (a measure of carbonaceous deoxygenation in the water column) in the Shasta River indicate that carbonaceous oxygen demand exerted in the water column is only a minor component of the total oxygen demand in the Shasta River. BOD_5 concentrations in the Shasta River range from 1.0 to 15.0 mg/L, with an average of 2.1 mg/L. For comparison, biochemical oxygen demand concentrations in the Klamath River near the outlet of hyper-eutrophic Upper Klamath Lake range from approximately 5 to 25 mg/L. Also for comparison, a typical biochemical oxygen demand concentration of untreated domestic sewage in the United States is 220 mg/L (Chapra 1997, p. 358)."

Response: The text in section 4.3 has been modified in response to this comment.

Comment:
4.3.3.2 Factors Affecting Aquatic Vegetation Productivity in the Shasta River
Biggs (2000) is the best reference regarding periphyton growth, and should be cited in this section. The following sentence should be added to the end of the first paragraph of this section on page 4-11: "Biggs (2000) provides a comprehensive review of the factors affecting periphyton growth."

Response: The text in section 4.3.3.2 has been modified to include the suggested reference.

Comment: (Comment only submitted by QVIR)
Flow and Current Velocity
The statement on page 4-12 "In addition, when a scour-event washes the vegetative material out of the Shasta system, there is a decrease in the oxygen demand exerted on the river" should be followed by a mention of how this might affect the Klamath River. We suggest the following: "However; it should be noted that this material could potentially have negative consequences downstream in the mainstem Klamath River, depending upon the time of year and if it settled out or kept moving out to the Pacific Ocean."

Response: The text in section 4.3.3.2 has been modified, acknowledging potential increased oxygen demand on the Klamath River from scour of aquatic vegetation in the Shasta River.

Comment: (Comment only submitted by QVIR)
Nutrient Concentrations
The last paragraph in this section (beginning with "Section 2.5 provides an overview of trophic status boundaries associated with nutrients…") contains numerous references to trophic boundaries based (apparently) on the Dodds et al. (1998) reference. As explained above in comments on section 2.5.1s, the trophic boundaries presented in Dodds et al. are arbitrary and do not have much relevance to the Shasta River, so this section should be revised to reference ecoregional criteria from USEPA (2002) instead of Dodds et al.

Response:
Regional Water Board staff agree that the methods used to create the trophic categories in Dodds et al. (1998) limit the utility of this information. Thus in section 4.3.3.2, TP and TN levels are now only evaluated against the USEPA (1986) national criteria and USEPA (2000) Ecoregion II criteria.

Comment:
4.4 Anthropogenic Effects on Shasta River Dissolved Oxygen Conditions
4.4.1 Tailwater Return Flow Quality
The most important mechanism by which tailwater returns affect D.O. is not included in the bullets on page 4-15, an omission which deserves correction. Tailwater returns are increasing nitrogen levels in the Shasta River, which can increase growth of aquatic plants. As shown in Chapter 7, respiration of aquatic plants, stimulated by high nutrient levels, is by far the largest contributor to dissolved oxygen demand in the Shasta River. While it is worthwhile to mention that tailwater returns do increase nitrogenous oxygen demand of the Shasta River, the most significant effect of tailwater on oxygen demand is to increase total nitrogen levels and stimulate aquatic plant growth. We recommend that a new second bullet be added:

> "The average total nitrogen concentration of tailwater return flows is over two times that of the average Shasta River concentration during the irrigation season (*XX and XX [fill in the appropriate values]* mg/L, respectively). This increase in nitrogen stimulates the growth of aquatic plants, substantially contributing to oxygen demand by increasing respiration."

Also, table 4.3 should also include total nitrogen calculated from individual samples as NO3+NO2 + TKN.

Response: The text in section 4.4.1 has been modified to acknowledge that the average concentration of ammonia in tailwater return flows is four times that of the average Shasta River ammonia concentration, thereby contributing to respiratory oxygen demand.

Comment:
4.4.3 Lake Shastina and Minor Impoundments
This section does not mention two of Lake Shastina's most important effects on oxygen demand in the Shasta River:

> 1. Shastina reduces peak flows, allowing organic matter and fine sediments to accumulate in the channel, contributing to oxygen demand via macrophyte respiration, and
> 2. Shastina increases nitrogen concentrations, stimulating aquatic plant growth and hence contributing to oxygen demand via macrophyte respiration.

We recommend the following text be added in a new paragraph at the bottom of page 4-19 (after "…may occur in the Reservoir"):

> "As discussed above in section 4.3.3.2, Lake Shastina substantially reduces scouring peak flows. This allows organic matter and fine sediments to accumulate in the channel. These are the preferred substrates for aquatic macrophytes, so this effect expands the area of suitable habitat for macrophytes, increasing the amount of macrophyte photosynthesis and respiration in the Shasta River."

We recommend the following text be added in a new paragraph near the bottom of page 4-19 (above "The regular occurrence of algal blooms…"):

> This increase in total nitrogen concentrations fuels the growth of aquatic plants, which in turn contributes to oxygen demand by increasing aquatic plant photosynthesis and respiration.

Also, because not all blue green algae can fix nitrogen (i.e. *Microcystis aeruginosa* cannot), the statement "Blue green algae are capable of sequestering atmospheric nitrogen." should be changed to "Like many blue green algae, *Anabaena flos-aquae* is capable of sequestering atmospheric nitrogen, resulting in the potential for additional nutrient pollution."

Response: The text in section 4.4.3 has been modified in response to these comments.

Comment:
4.4.5 Flow
This section does not mention a third important way in which flow affects dissolved oxygen. We recommend that the following text be added to the last sentence in this section (after "…caused by photosynthesis and respiration.") on page 4-21:

> Third, flow can affect dissolved oxygen through its effects on water temperature. For instance, larger volumes of water have a higher thermal mass are more resistant to heating and cooling. So if a large volume of

> water is cool (i.e. from a spring-fed creek such as Big Springs) it can travel downstream and retain its low temperature. Low temperatures allow water to water hold more dissolved oxygen. Through this mechanism, flow can affect dissolved oxygen.

Response: The text in section 4.4.5 has been modified to reflect the role that flow can play on dissolved oxygen through its effect on temperature.

Comment:
5.2 Analytic Approach and Model Selection
For reasons discussed above in our comments on section 4.4.5, the following sentence should have "water temperature, " inserted after "sediment oxygen demand rates, ":

> Further, as outlined in Chapter 4, dissolved oxygen concentrations of the Shasta River depend on photosynthetic and respiration rates of aquatic vegetation, sediment oxygen demand rates, consumption of oxygen via nitrification and biochemical oxygen demand, and flow.

Response: The text in section 5.2 has been modified, adding "water temperature".

Comment:
5.6 RMS Sensitivity Analysis
We recommend the following addition to the section (extracted from Appendix D, with some edits):

> With respect to dissolved oxygen, CBOD, and NBOD decay rates were largely insensitive (meaning they had little effect on model outputs), as was the SOD rate. The driving factor for dissolved oxygen was maximum photosynthetic and respiration rate. These values were adjusted during calibration to fit the model to measured data. Reaeration rate, a calculated term within the model, played a pivotal role, particularly in the steep canyon reach where mechanical reaeration would be expected to occur.

Response: The text in section 5.6 has been modified with the suggested addition.

Comment: (Comment only submitted by QVIR)
Overall, this chapter appears to be based on sound analyses. We applaud the Regional Water Board for including flow increases from Big Springs in its Water Quality Compliance Scenario, as flow depletion is a long recognized problem in the Shasta River Basin, and good evidence is provided as to how this flow increase would affect water quality.

6.2 Water Quality Compliance Scenario Conditions

6.2.3 Tributary Temperatures
6.2.3.1 Big Springs Creek
The discussion of how 4^{O}C lower than baseline was chosen for the Water Quality Compliance Scenario should be explained more clearly (we cannot make sense of it in its current form).

Response: The text in section 6.2.3.1 has been modified to clarify Regional Water Board staff's approach to selecting the boundary condition temperature of Big Springs Creek for the water quality compliance scenario.

Comment:
6.6 Margin of Safety
On page 6-19, the following statement is made:

> Some improvements in stream temperature that may result from reduced sedimentation are not quantified. Reduced sediment loads could lead to increased frequency and depth of pools, independent of changes in solar radiation input. These changes tend to result in lower stream temperatures overall and tends to increase the amount of lower-temperature pool habitat. These expected changes are not directly accounted for in the TMDL.

While it is true that reducing sediment loads would likely decrease stream temperatures (and it should be noted that increased rates of hyporheic exchange are another mechanism by which this would occur), it is not clear what basis the Regional Water Board has for stating that sediment load are going to decrease. If this statement is to remain in the TMDL, it should be specified *why* sediment loads are going to decrease, otherwise this is not a margin of safety, it is theoretical statement.

Response: The Shasta River TMDL Action Plan includes actions for those activities that have the potential to contribute sediment loads, including range and riparian land management, tailwater return flows, urban and suburban stormwater runoff, and timber harvest activities on federal and nonfederal lands. Regional Water Board staff believe that when implemented these actions would reduce sediment loads, particularly reducing inputs of fine sediments.

Comment:
7.2 Algae Box Model Application and Results
7.2.2 Summary and Conclusions (Comment only submitted by QVIR)
We agree with the statement on page 7-4 that "If TIN concentrations in the Shasta River were maintained at levels comparable to those concentrations measured in the headwaters of the Shasta River, aquatic vegetation biomass would likely be reduced."

7.3 RMS Model Application

7.3.2 Photosynthetic and Respiration Rates
On page 7-5, the TMDL states:

> The photosynthetic and respiration rates assigned for the water quality compliance scenario were 50% of those for the existing (baseline) condition, as shown in Table 7.3. These reductions in photosynthetic and respiration rates assume a 50% reduction in aquatic vegetation standing crop during the simulation periods. Regional Water Board staff believe that such reductions in aquatic vegetation standing crop, and associated reductions in photosynthetic and respiration rates, are achievable in the Shasta River.

No reason is stated for why a 50% reduction in photosynthetic and respiration rates was chosen. With no reason provided, the decisions seems arbitrary. The TMDL then states: "In practice, the mechanisms that would result in these reductions include:

- Decreased light availability to aquatic vegetation via increased riparian shade, as outlined in Section 6.2.1;
- Reduced concentrations of biostimulatory nutrients in the Shasta River achieved via controls targeting NBOD reductions from Lake Shastina outflow, irrigation return flows, and Yreka Creek, as outlined in Section 7.3.3;
- Reduced fine sediment inputs from irrigation return flows that can be achieved via controls targeting NBOD reductions, as outlined in Section 7.3.3; and
- Increased flushing flows to scour the channel of accumulated fine sediments that promote the establishment and proliferation of rooted aquatic macrophytes.
- Reduced stream temperatures, as outlined in Chapter 6."

While we agree that these mechanisms would indeed reduce the photosynthetic/respiration rates, it is unknown how much each of these factors would need to change in order to result in a 50% reduction in the photosynthetic/respiration rates. The quantitative relationships between each of these factors and the photosynthetic/respiration rates is not known. This uncertainty should be acknowledged in the text.

Response: The assumed reduction in photosynthetic/respiration rates by 50% is based on Regional Water Board's best professional judgement. We acknowledge uncertainty in quantifying the contribution of the various factors in achieving this reduction.

Comment:
As we have stated above several times, it is not NBOD that causes dissolved oxygen problems in the Shasta River, it is total nitrogen. As shown in table 7.7, NBOD is only 7.9% of the oxygen load for the baseline condition; respiration of aquatic plants is 73.9%.

Therefore, "NBOD" in the bullet points above should be replaced with "NBOD and total nitrogen"

Response: Regional Water Board staff agree that respiration of aquatic plants accounts for much greater proportion of the total oxygen demand compared with nitrogenous oxygen demand. The second bullet in section 7.3.2 states that reduced respiration rates will be achieved in part by reducing the concentrations of biostimulatory nutrients, and this includes ammonia and nitrate. As described in section 5.3.2.2, the RMS model simulates dissolved oxygen conditions in response to biochemical oxygen demand (BOD), nitrogenous biochemical oxygen demand (NBOD), sediment oxygen demand (SOD), mechanical reaeration, and photosynthesis and respiration of aquatic vegetation growing on or in the bed (as periphyton or macrophytes). The water quality compliance scenario includes these parameters that effect dissolved oxygen, including NBOD. As discussed in section 7.3.4, NBOD boundary conditions were based on Total Kjeldahl Nitrogen concentrations, which is a measure of organic nitrogen plus ammonia-nitrogen. In addition, we note that Section 5.7 describes that the RMS model does not simulate the effect of nutrient concentrations on aquatic plant productivity. In other words, the RMS model does not "grow" aquatic plants in response to ambient conditions including nutrient concentrations, and therefore photosynthetic and respiration rates do not change in response to nutrient concentrations. Therefore, a separate analysis of the connection between nutrient concentrations and aquatic plant production was conducted using an algae box model, as presented in section 7.2. Finally, Regional Water Board staff point out that the implementation actions in the Action Plan address "fine sediment, nutrients, and other oxygen consuming materials", which includes all forms of nitrogen and phosphorus.

Comment:
While it is important to acknowledge scientific uncertainty, we also believe that since the factors causing D.O. problems are known, there is no need to wait until we have 100% certainty on the magnitude of land/water use changes that are required to bring the Shasta River into compliance with the water quality objectives. The best strategy is to continue with restoration efforts, and then evaluate progress along the way.

Response: Regional Water Board staff agree. The Action Plan requires monitoring, adaptive management, and evaluation of progress towards meeting water quality standards.

Comment:
Chapter 8:
The RWB has an obligation to make sure that the water quality objectives are met, and beneficial uses restored and protected, particularly because the final *Shasta TMDL Action Plan* will be amended to the *Basin Plan* (NCRWQCB, 2001). If there are multiple ways to meet the objectives, we support giving landowners the flexibility to decide how they want to meet those objectives. For example, <u>if</u> other regulatory and policy processes such

as the *Shasta Incidental Take Permit* (SRCD, In Draft), *Coho Recovery Plan* (CDFG, 2004), and Timber Harvest Plans will result in the attainment of water quality objectives, then further regulation by the RWB is not necessary.

Duplicative and overlapping regulation benefits no one. Unfortunately, these other processes often rely on voluntary measures that neither guarantee that water quality problems will be remedied nor that TMDL objectives will be achieved. When other policy approaches and voluntary landowner actions fail to achieve the TMDL objectives, then the RWB must use its considerable regulatory and enforcement authority to take necessary actions to ensure results.

Response: See response to Comment Category 9 – Volunteerism and Timelines.

Comment:
The implementation actions requested in these comments are summarized below as Table 1 (a revised version of Table 4 from the proposed Shasta TMDL Basin Plan amendment language).

8.1.1 Prioritization of Implementation Actions
Page 8-6 states "Where reaches of the Shasta River and its tributaries are providing suitable freshwater salmonid habitat, protection of these areas should be a priority for restoration efforts." While this is a step in the right direction, it could be improved by specifically mentioning coho salmon, coldwater refugia needs and connectivity.

Response: Comment noted. This additional clarifying language will be added to page 8-6 of the Staff Report.

Comment:
The Shasta TMDL should follow the approach of Bradbury et al. (1995), which is to identify the most intact habitat patches and to begin restoration by making sure that these areas are protected and enhanced as a top priority. In the Shasta River basin, these would be the stream reaches with coho salmon or those that provide coldwater refugia for other Pacific salmon species. The *Shasta TMDL* needs to add specific reference to lower Parks Creek and the need to restore riparian there and change diversion to provide a refugia and to improve spawning gravel supply to the mainstem Shasta River.

Response: Temperature allocations for riparian shade apply to the Shasta River and its Class I and II tributaries. Regional Water Board staff agree that attaining site potential riparian shade conditions in lower Parks Creek is an integral component of the TMDL. We note that water quality standards must be achieved at all locations of the Shasta River watershed at all times.

Comment:
8.3 Tailwater
We recognize that tailwater returns are a substantial contributor to water quality problems, and we support the recommendations in this section.

Response: Support for recommended measures noted.

Comment:
8.4 Water Use and Flow
The water quality compliance scenario in Chapter 6 includes a 50% increase in flow from Big Springs Creek. We strongly support that decision; however the TMDL implementation does not lay out a clear path for how such a substantial increase in flow could be achieved. To be realistic, it will also have associated cost factors for assisting water conservation to offset the current demand for groundwater. Some language should likely be added to reflect this long term need.

The RWB proposes to take no firm action to increase flows to improve water quality for five years, which seems like a long wait given the stock status of Klamath River salmon (Kier Associates, 2006). We support the RWB in taking action, and think that two years would be a more reasonable amount of time to wait. (The following portion of this comment was submitted only by QVIR.) A quote from the *Long Range Plan for Klamath River Basin Fishery Restoration Program* (Kier Associates, 1991) gives a sense of long term perspective:

> "In the year 2000, if adequate progress towards improving flow conditions for salmonids has not been made …. then investigate the option of reallocation of water rights under the public trust doctrine for protection of fish habitat."

Response: While it is true that the water quality compliance schedule used a parameter of 50% increase in flow from Big Springs, it was simply one of a multitude of possibilities for increasing cold water flow in the Shasta River. To clarify concerns raised by a number of commenters, revisions to the TMDL Action Plan, Table 4, have been made to clarify the need for irrigators to develop and implement measures to increase dedicated cold water flows, and to report on the progress being made within two years and again at four years after TMDL approval. Costs are adequately addressed in chapter 13 of the Staff Report.

Comment:
While many of the ideas proposed in the *Coho Recovery Plan* are positive, they are also voluntary. It is important for the Regional Water Board to remember that it has a responsibility to protect public trust resources and ensure results. If voluntary measures work, that would be great, but they are often insufficient and further action is required.

Response: See response to Comment Category 9 – Volunteerism and Timelines.

Comment:
Chapter 8 states that: "Other management measures recommend the leasing, purchasing, or donations of water rights from willing water rights holders in the Shasta River watershed."
While purchasing or donations could provide long-term benefits to fish and water quality, leases would be unwise because they provide no long-term benefits. A major hurdle for success, if water rights are acquired, is that riparian water users are likely to exploit any water not used by those contributing water. The original Shasta River adjudication (CDPW, 1932) recognized that problem and it still has not been remedied. today. Before water rights are purchased, restrictions on water withdrawal under riparian rights must be disallowed, which likely requires another adjudication. Legality of some water rights also needs to be explored because ground water diversions that are linked to surface flow depletion require an Appropriative Water Right and diversions from the underflow of Big Springs have not obtained such rights (Kier Associates, 1999). The TMDL should also note that water rights holders may designate temporarily their water right to instream flow under California law SB-301, without penalty of losing that right at a future date (Kier Associates, 1999).

Response: Two paragraphs have been added to Chapter 8 of the Staff Report to better describe water right legal issues as it relates to dedicated cold in stream flow measures. See Response 5 for the full text. For issues with the Shasta River adjudication, see response to Flow and Water Use Comment Group 1 – Shasta River Adjudication.

Comment:
8.5 Irrigation Control Structures and Impoundments
8.5.1 Implementation Actions for Irrigation Control Structures and Minor Impoundments
The reference "(Great Northern Corp. 2001)" should be added after "1996" to the statement "The Shasta CRMP, working with cooperative landowners, has removed one impoundment in 1996, the farthest downstream…"

Response: Reference will be added to Section 8.5.1 of the Staff Report.

Comment:
8.6 Lake Shastina
This statement on page 8-25 has several problems and needs correction:

> "Additionally, nutrient inflows (Chapter 4) from natural sources to the reservoir appear to be significant, but nutrient loads from the outflow of Shastina exceed inflow loads, on an annual basis, suggesting that Lake Shastina is an additional source capable of generating its own nitrogenous oxygen demanding substances."

First, the TMDL does not contain any data/analysis regarding Lake Shastina nutrients loads (loads are mass per time, e.g. kg/year), only concentrations (e.g. mg/L). The sentence should be corrected by replacing "loads" with "concentration" (or if the Regional Water Board does have information about loads, it should be presented). Second, as we have stated above several times, it is not NBOD that causes dissolved oxygen problems in the Shasta River, it is total nitrogen. Therefore, "nitrogenous oxygen demanding substances" in the sentence above should be replaced with "nitrogen, affecting dissolved oxygen conditions downstream by increasing nitrogenous oxygen demanding substances and stimulating growth of aquatic plants."

The statement on page 8-25 that "10) appropriate actions, based on the investigation's results, to reduce nitrogenous oxygen demand, thereby, increasing dissolved oxygen concentrations in Lake Shastina and, thus, discharges from Dwinnell Dam to the Shasta River." we recommend that "nitrogenous oxygen demand," should be replaced by "total nitrogen and nitrogenous oxygen demand"

Two other statements on the same page should be similarly revised by replacing "nitrogenous oxygen demand" with "total nitrogen and nitrogenous oxygen demand":

> "Initiate, complete, and submit to the Regional Water Board the results of an investigation characterizing, quantifying, and analyzing the sources of nitrogenous oxygen demanding substances contributing to low dissolved oxygen levels affecting the beneficial uses of water in Lake Shastina and to waters of the Shasta River downstream from Dwinnell Dam.
>
> Based on the results of the investigation, the Regional Water Board shall determine appropriate implementation actions necessary to reduce the nitrogenous oxygen demand that is lowering dissolved oxygen concentrations in Lake Shastina and affected areas downstream from Dwinnell Dam."

Response: The text in section 8.6 has been modified significantly, and the revised Action Plan includes new requirements pertaining to Dwinnell Dam and Lake Shastina water quality. These revisions make the above comments moot.

Comment: (Comment only submitted by QVIR)
Lake Shastina has substantially changed the hydrology of the Shasta River, decreasing peak stormflows and reducing the frequency of high flows that can scour fine sediments and aquatic plants. For this reason, we request that the following language be added to this section "The Regional Water Board shall study the possibility of using pulse flows from Lake Shastina to clean out accumulated organic matter and macrophytes from the Shasta River. The study will also consider the effects of such pulse flows on the Klamath River downstream."

Response: The Action Plan includes actions to reduce fine sediment and organic matter in the Shasta River. Should these actions not be sufficient to meet water quality standards, the Regional Water Board will consider additional actions, including use of pulse flows from Lake Shastina, during TMDL implementation.

Comment:
8.8 Urban and Suburban Runoff
This section neglects to mention planning and design as important means to manage urban and suburban runoff. Runoff pollution is much easier to minimize and manage if stormwater is considered during the design phase. We recommended the addition of the following language:

> "New developments should be designed to minimize stormwater runoff and maximum infiltration by minimizing impervious surface area, minimizing hydrologic connection between impervious surfaces and watercourses, and constructing stormwater retention basins. Existing developments should be retrofitted to minimize stormwater runoff."

Response: While this language was not incorporated exactly as suggested, Table 4 of the Action Plan has been revised to include a number of appendices that list examples of measures to be undertaken to aid in compliance with water quality standards, the TMDL and the NPS Policy.

Comment:
8.10 United States Bureau of Land Management (Comment only submitted by QVIR)
This section should specifically reference staff for enforcement. BLM lands in the Shasta River canyon include extremely important Chinook salmon spawning habitat and juvenile salmon and steelhead rearing habitat. Grazing in violation of BLM policies has taken place illegally in the past and may recur if occasional enforcement presence is not in evidence. Illegal residences on BLM land off Hudson Road have not been removed and residents are harvesting firewood from the riparian zone on public land.

Response: Comment noted. The TMDL Action Plan has been revised to make it clear that Regional Water Board will take appropriate enforcement actions for all sources of waste discharge into Shasta River waters regardless of responsible party. See section VI (Enforcement) of the revised Action Plan for additional information.

Comment:
If the RWB staff are not prepared to present a monitoring plan with the *Shasta River TMDL*, they should at least specifically mention on-going monitoring that should be continued for long term trend monitoring. The CRMP gauge at Montague-Grenada Road, USFWS multi-channel data recorder, USGS flow monitoring and annual deployment of automated temperature sensing probes. The TMDL should specifically

reference need to store and share data in a way that supports TMDL implementation and adaptive management. (The following portion of this comment was submitted only by QVIR.) The Klamath Resource Information System (TCRCD, 2003) is available for use by the community and the major expense of populating the database has been paid by previous grants. Cooperative efforts between the RWB, Tribes, agencies and stakeholders would not cost much if each partner dedicated a few days of staff time a year.

Response: As stated in section 9.2.2 of the Staff Report, Regional Water Board staff will complete a compliance and trend monitoring plan for Shasta River TMDL implementation within one year from the date that US EPA approves the TMDL. In the meantime, we fully support continuation of on-going water quality monitoring efforts in the Shasta River watershed. Regional Water Board staff agree that cooperative efforts between all stakeholders conducting monitoring in the watershed is essential to attaining and maintaining water quality standards.

Comment:
The Shasta TMDL comes at a time when Klamath River fall Chinook salmon stocks are collapsing, due to water quality problems and consequent disease epidemics (Kier Associates, 2006). Unlike other mountains throughout the West, snowpack on Mt Shasta is increasing with the onset of global warming, making the Shasta River an even more important tributary for Klamath Basin salmonids. NRC (2004) calls for restoring the Shasta River as a necessity in ensuring the salmon survival. The switch in the PDO looms. Speedy implementation is needed.

Response: Comment noted.

Comment: See "Recommended Alternative Action" column below.

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
Range and Riparian Land Management	• **Parties Conducting Grazing Activities.** • Parties Responsible for Vegetation that Shades Water Bodies. • Parties Responsible for Bank Stabilization Activities. • Regional Water Board.	**Landowners should employ land stewardship practices and activities that minimize, control, and, preferably, prevent discharges of fine sediment, nutrients and other oxygen consuming materials, as well as elevated solar radiation loads from affecting waters of the Shasta River and tributaries.** Those that oversee and manage grazing and range land activities in the Shasta River watershed should implement grazing and rangeland management practices listed in Table 8.1 of the TMDL Implementation Plan, and in the Shasta Restoration Plan. The Shasta CRMP should, (1) implement the strategic actions specified in the Strategic Action Plan, and (2) assist landowners in developing and implementing management practices that are adequate and effective at preventing, minimizing, and controlling discharges of nutrients and other oxygen consuming wastes, and elevated water temperatures. The Regional Water Board will work cooperatively with the Shasta CRMP to provide technical support and information to willing individuals, landowners, and community members in the Shasta River watershed, coordinate educational and outreach efforts, and monitor the implementation and effectiveness of the Shasta	Proposed action is sufficient.

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
		Watershed Restoration Plan. Should voluntary efforts fail to be implemented or effective at preventing, minimizing, and controlling discharges of sediment, nutrients and other dissolved oxygen consuming materials, and increasing solar radiation loads, the Regional Water Board's Executive Officer shall require the appropriate responsible parties to develop, submit, and implement a RRWMP on an as-needed, site-specific basis. Any landowner may be subject to this requirement if livestock grazing activities on their property are discharging, or threatening to discharge oxygen consuming materials and/or elevated solar radiation loads to a water body in the Shasta River watershed. The RRWMP shall describe in detail: Locations discharging and/or with the potential to discharge nutrients and other oxygen consuming materials, and increased solar radiation loads to watercourses which are caused by livestock grazing, How and when those sites are to be controlled and monitored, and management practices that will prevent and reduce, future discharges of nutrient and other oxygen consuming materials, and increases in solar radiation loads.	

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
		Group and/or individual RRWMPs shall be implemented upon review, comment, and approval by Regional Water Board staff and their Executive Officer for compliance with Regional Board directives, the Basin Plan, and also with the management measures in the Nonpoint Source PCP. The Regional Water Board shall address the removal and suppression of vegetation that provides shade to a water body through its Wetland and Riparian Protection Policy, a comprehensive, region-wide riparian policy that will address the importance of shade on instream water temperatures and will potentially propose riparian setbacks and buffer widths. The Policy will likely propose new rules and regulations, and will therefore take the form of an amendment to the Basin Plan. Other actions under this section may be modified for consistency with this policy, once adopted. With funding already available through a grant from the U.S. EPA, Regional Water Board staff are scheduled to develop this Policy by the end of 2007. Permitting and Enforcement: The Regional Water Board shall take appropriate permitting and enforcement actions if necessary to address the removal and suppression of vegetation that provides shade to a water body in the Shasta River watershed. Such actions may include, but	

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
		are not limited to, general waste discharge requirements (WDRs) or waivers of WDRs for grazing and rangeland activities, farming activities near water bodies, stream bank stabilization activities, and other land uses that may remove and/or suppress vegetation that provides shade to a water body. Should prohibitions or general WDRs be developed, they may apply to the entire North Coast Region or just to the Shasta River watershed. If necessary, Regional Water Board staff shall propose to the Board appropriate enforcement actions for human activities that result in the removal or suppression of vegetation that provides shade to a water body in the Shasta River watershed. Such actions may include, but are not limited to, cleanup and abatement orders, cease and desist orders, and administrative civil liabilities (fines) in accordance with California Water Code sections 13304, 13301, and 3350, respectively. Enforcement actions for violations of the California Water Code shall be taken when and where appropriate. Enforcement activities should be consistent with the State Water Board's *Water Quality Enforcement Policy* (SWRCB Resolution No. 2002-0040), adopted February 19, 2002, and as it may be amended from time to time. This enforcement policy promotes a fair, firm, and	

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
		consistent enforcement approach appropriate to the nature and severity of a violation. Within two years of the date that the TMDL Action Plan takes effect the Regional Water Board's Executive Officer shall report to the Board on the status of the preparation and development of appropriate permitting actions. Enforcement implementation is ongoing and effective the date that the TMDL Action Plan is adopted.	
Tailwater Return Flows	• Parties Responsible for Tailwater Management and Use • Shasta CRMP • Shasta RCD • CDFG • Regional Water Board	Parties responsible for tailwater discharges from irrigated lands, which may include landowners, lessees, and land managers, should implement the management practices presented in the CDF&G's Coho Recovery Strategy, the Shasta CRMP's Shasta Watershed Restoration Plan and the Shasta RCD's Incidental Take Permit Application. Regional Water Board staff will evaluate the effectiveness of these voluntary actions and develop recommendations for the most effective	Proposed action is sufficient.

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
		regulatory vehicle to bring tailwater discharges into compliance with the TMDL and the Basin Plan. Information gathered during the evaluation phase will be used to formulate final recommendation(s) to the Regional Water Board. This evaluation phase shall be completed within 12 months after the TMDL is approved by the U.S. EPA. Based on Regional Water Board staff recommendation(s) derived from the evaluation phase for tailwater management, the Regional Water Board shall adopt prohibitions, Waste Discharge Requirements, Waivers of Waste Discharge Requirements, or any combination, thereof, as appropriate. To assure compliance if prohibitions, WDRs, Waivers of WDRs, or any combination of the latter are adopted, a tiered tailwater management program may be instituted for tailwater management that may include various elements such as discharge and receiving water sampling, monitoring, and reassessment. Additional management practices to assure that tailwater discharges to receiving waters comply with the TMDL and the Basin Plan may also be based on results from the tailwater management program.	

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
Water Use and Flow	• Water Rights Holders and other Stakeholders • Shasta Coordinated Resource Management and Planning Committee (Shasta CRMP) • Shasta Valley Resource Conservation District (Shasta RCD) • California Department of Fish and Game (CDFG) • Regional Water Board	Water diverters should participate in the CDFG's Coho Recovery Strategy (CDFG 2004a) and Incidental Take Permit Program (CDFG 2004b). The Regional Board shall work with DFG to establish monitoring and reporting elements of these programs in order to gage their effectiveness. Water diverters should participate in and implement flow-related measures outlined in the Shasta CRMP's Shasta Watershed Restoration Plan. The Regional Board shall work with the Shasta CRMP to establish monitoring and reporting elements in order to gage the Plan's implementation and effectiveness. If after five years, the Regional Board Executive Officer finds that the above-measures have failed to be implemented or are otherwise ineffective, the Regional Board may recommend that the SWRCB consider seeking modifications to the decree, conducting proceedings under the public trust doctrine, and/or conducting proceedings under the waste and unreasonable use provisions of the California Constitution and the California Water Code.	Water diverters should participate in the CDFG's Coho Recovery Strategy (CDFG 2004a) and Incidental Take Permit Program (CDFG 2004b). The Regional Board shall work with DFG to establish monitoring and reporting elements of these programs in order to gage their effectiveness. Water diverters should participate in and implement flow-related measures outlined in the Shasta CRMP's Shasta Watershed Restoration Plan. The Regional Board shall work with the Shasta CRMP to establish monitoring and reporting elements in order to gage the Plan's implementation and effectiveness. **The Regional Water Board shall actively encourage the purchase of water rights for the purpose of maintaining adequate streamflows.** **Recommend revisiting adjudication to stop riparian appropriation of water purchased for instream flows and fish. (The previous two paragraphs were only submitted by QVIR.)** If after **two** years, the Regional Board Executive Officer finds that the above-measures have failed to be implemented or are otherwise ineffective, the Regional Board will recommend that the SWRCB consider seeking modifications to the decree, conducting proceedings under the public trust doctrine, and/or conducting proceedings under the

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
			waste and unreasonable use provisions of the California Constitution and the California Water Code.
Irrigation Control Structures, Weirs, Flashboard Dams, and other Minor Impoundments (Collectively referred to as minor impoundments)	• Individual Irrigators • Irrigation districts • Other Stakeholders owning, operating, managing, or anticipating construction of minor impoundments	Irrigations districts, individual irrigators, and other stakeholders that own, operate, manage, or anticipate construction of instream impoundments such as flashboard dams, or other structures capable of blocking, impounding, or otherwise impeding the free flow of water in the Shasta River system shall comply with the following measure: Within one year of TMDL approval by the U.S. EPA, report to the Regional Water Board methods and management practices they shall implement that will reduce sediment oxygen demand rates by 50% from baseline behind all minor impoundments. Options may include, but are not limited to: 1) permanently removing impoundments in the Shasta River mainstem as a mechanism to provide for flushing flows capable of scouring fine sediment from the stream-river channel on which aquatic plants grow; 2) re-engineering existing impoundments to decrease their surface area; and 3) not undertaking the construction of new impoundments unless they can be shown to have positive effects to the beneficial uses of water relative to water quality compliance and the	Proposed action is sufficient.

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
		support of beneficial uses, including the salmonid fishery, in the Shasta Valley.	
Lake Shastina	• Montague Water Conservation District (NWCD) • Other Appropriate Stakeholders • Regional Water Board	The Montague Water Conservation District shall take the following actions: Initiate within two years, complete and submit to the Regional Water Board within five years, the results of an investigation characterizing, quantifying, and analyzing the sources of, and ways to reduce, nitrogenous oxygen demanding substances contributing to low dissolved oxygen levels affecting the beneficial uses of water in Lake Shastina and to waters of the Shasta River downstream from Dwinnell Dam. Based on the results of the investigation, the Regional Water Board shall determine appropriate implementation actions necessary to reduce the nitrogenous oxygen demand that is lowering dissolved oxygen concentrations in Lake Shastina and affected areas downstream from Dwinnell Dam.	The Montague Water Conservation District shall take the following actions: Initiate within two years, complete and submit to the Regional Water Board within five years, the results of an investigation characterizing, quantifying, and analyzing the sources of, and ways to reduce, **nutrients and** nitrogenous oxygen demanding substances contributing to low dissolved oxygen levels affecting the beneficial uses of water in Lake Shastina and to waters of the Shasta River downstream from Dwinnell Dam. Based on the results of the investigation, the Regional Water Board shall determine appropriate implementation actions necessary to reduce the **nutrients and** nitrogenous oxygen demand that is lowering dissolved oxygen concentrations in Lake Shastina and affected areas downstream from Dwinnell Dam. (The following portion of this comment was submitted only by QVIR.) **The Regional Water Board shall study the possibility of using pulse flows from Lake Shastina to clean out accumulated organic matter and macrophytes from the Shasta River.**

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
City of Yreka Wastewater Treatment Facility (Yreka WWTF)	• City of Yreka • Regional Water Board	The Regional Water Board staff shall pursue aggressive compliance with Order No 96-69, and CAO No.R1-2004-0037. To ensure timely submittal of sampling and analytical results from the operators of the Yreka WWTF, the Regional Water Board staff shall also continue vigorous oversight and enforcement of Monitoring and Reporting Program No. R1-2003-0047.	Proposed action is sufficient.
Urban and Suburban Runoff	• Cities of Yreka, Weed, the Lake Shastina Development • Other Stakeholders • Regional Water Board	The cities of Yreka, Weed, the Lake Shastina Development and other stakeholders should identify possible pollutants, their sources, and volumes of polluted runoff from urban and suburban sources within their spheres of influence that may discharge, directly or indirectly, to waters of the Shasta Valley watershed. Cities and other stakeholders responsible for urban and suburban runoff should implement the following measures: Seasonal scheduling of construction activities to prevent unnecessary waste loads in stormwater runoff. Seasonal scheduling for the application to lawns and gardens, municipal facilities, and agricultural areas of fertilizers, pesticides and herbicides, and other oxygen consuming materials that may contribute to dissolved oxygen impairments to watercourses in the Shasta River hydrologic system from cities, towns, developments and other	The cities of Yreka, Weed, the Lake Shastina Development and other stakeholders should identify possible pollutants, their sources, and volumes of polluted runoff from urban and suburban sources within their spheres of influence that may discharge, directly or indirectly, to waters of the Shasta Valley watershed. Cities and other stakeholders responsible for urban and suburban runoff should implement the following measures: Seasonal scheduling of construction activities to prevent unnecessary waste loads in stormwater runoff. Seasonal scheduling for the application to lawns and gardens, municipal facilities, and agricultural areas of fertilizers, pesticides and herbicides, and other oxygen consuming materials that may contribute to dissolved oxygen impairments to watercourses in the Shasta River hydrologic system from cities, towns, developments and other

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
		concentrations of urban and suburban populations. When, and if, pollutant sources are identified that discharge, or threaten to discharge, oxygen consuming materials, fine sediment, and other polluting constituents to nearby watercourses from existing runoff control facilities, the Regional Water Board will work cooperatively with responsible parties to ascribe appropriate management measures and reasonable time schedules to control and eliminate said pollutant discharges.	concentrations of urban and suburban populations. **New developments should be designed to minimize stormwater runoff and maximum infiltration by minimizing impervious surface area, minimizing hydrologic connection between impervious surfaces and watercourses, and constructing stormwater retention basins. Existing developments should be retrofitted to minimize stormwater runoff.** When, and if, pollutant sources are identified that discharge, or threaten to discharge, **nutrients,** oxygen consuming materials, fine sediment, and other polluting constituents to nearby watercourses from existing runoff control facilities, the Regional Water Board will work cooperatively with responsible parties to ascribe appropriate management measures and reasonable time schedules to control and eliminate said pollutant discharges.

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
Activities on Federal Lands	• U.S. Forest Service (USFS) • Regional Water Board	The USFS shall consistently implement the best management practices included in *Riparian Area Management 1997* (USDA/USDI 1997), and *Water Quality Management for Forest System Lands in California, Best Management Practices* (USFS 2000). The Regional Water Board staff will continue its involvement with the USFS to periodically reassess the mutually agreed upon goals of the Management Agency Agreement between the SWRCB and the USFS. Additionally, the Regional Water Board shall work with the USFS to draft and finalize a Memorandum of Understanding (MOU). The MOU shall be drafted and ready for consideration by the appropriate decision-making body of the USFS within two years of the date the TMDL Action Plan takes effect. The MOU shall include buffer width requirements and other management practices as detailed in the Implementation chapter of the TMDL.	Proposed action is sufficient.

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
	• U.S. Bureau of Land Management • Regional Water Board	BLM shall implement best management grazing strategies that are detailed in a joint management agency document titled: *Riparian Area Management 1997* (USDA/USDI 1997). The Regional Water Board shall work with the BLM to draft and finalize a Memorandum of Understanding (MOU). The MOU shall be drafted and ready for consideration by the appropriate decision-making body of the BLM within two years of the date the Shasta River TMDL Action Plan takes effect. The MOU shall include buffer width requirements and other management practices as detailed in the Implementation chapter of the TMDL.	Proposed action is sufficient.
Timber Harvest Activities on Non-federal Lands	• **California Department of Forestry (CDF)** • **Regional Water Board**	[discussed in chapter 8 but not in Basin Plan amendment language]	**The Regional Water Board shall rely on applicable current regulations, existing permitting and enforcement tools, and other ongoing staff involvement, summarized in the listed below, associated with timber harvest activities. As such, no new regulations or actions are being proposed in association with this TMDL:** **- Z'Berg-Nejedly Forest Practice Act and the California Environmental Quality Act (CEQA)** **-Management Agency Agreement between the CDF and the State Water Resources Control Board to oversee water quality protection on timber operations on non-federal lands in California.** **- Senate Bill 810, enacted in 2003, provides that**

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
			a Timber Harvest Plan (THP) may not be approved if the Regional Water Board finds that the proposed timber operations will result in discharges to a water body impaired by sediment and/or is in violation of the Basin Plan. **- Regional Water Board Timber Harvest General Waste Discharge Requirements (Order No. R1-2004-0030) and Categorical Waiver of Report of Waste Discharge (Order No. R1-2004-106) for timber activities on private lands. Both the Categorical Waiver and the General Waste Discharge Requirements programs use the CDF timber harvest, functional equivalent review process for THPs and Non-industrial Timber Management Plans (NTMP) to ensure compliance with the CEQA.** **- Active and continuous oversight by Regional Water Board staff of the timber harvest review and inspection process.** **- Habitat Conservation Plans and Sustained Yield Plan review.** **- U.S. Forest Service activities (discussed in Section 8.1.17) and CDF and Board of Forestry meetings and review.**
Caltrans Activities	• California Department of Transportation (Caltrans) • Regional Water Board.	Regional Water Board staff shall complete an initial evaluation of the Caltrans Stormwater Program within two years of the date the TMDL Action Plan takes effect. After the initial two-year evaluation is completed, the Regional Water Board staff shall continue periodic reviews of the Caltrans Storm Water Program to assure ongoing	Proposed action is sufficient.

Table 4. Proposed TMDL Implementation Actions and Recommended Alternative Actions

Source or Land Use Activity	Responsible Parties	Action Proposed in Public Draft TMDL	Recommended Alternative Action
		compliance with the Shasta River TMDL.	

Response: Table 4 in the Action Plan has been completely revised. Please see the revised version.

References used by Quartz Valley Indian Reservation and Karuk Tribe

Biggs, B.J.F. 2000. New Zealand Periphyton Guideline: Detection, Monitoring, and Managing Enrichment of Streams. Prepared for Ministry of Environment. NIWA, Christchurch.

Bradbury, W., W. Nehlsen, T.E. Nickelson, K. Moore, R.M. Hughes, D. Heller, J. Nicholas, D. L. Bottom, W.E. Weaver and R. L. Beschta. 1995 Handbook for Prioritizing Watershed Protection and Restoration to Aid Recovery of Pacific Salmon. Published by Pacific Rivers Council, Eugene, OR. 56 p. Available online at: <http://ww.krisweb.com/biblio/gen_xxxx_bradburyetal_1995.pdf> Accessed 2006 10 March.

California Department of Public Works. 1932. Appropriation of Water Rights in the Shasta Basin. California Department of Public Works, Sacramento, CA.

California Department of Water Resources. 1981. Klamath and Shasta River spawning gravel enhancement study. CDWR, Northern District, Red Bluff, Calif.

Chapra, S.C. 1997. Surface Water-Quality Modeling. San Francisco, CA. McGraw-Hill.

Companies, Inc.Collison, A., W. Emmingham, F. Everest, W. Hanneberg, R. Martston, D. Tarboton, R. Twiss. 2003. Phase II Report: Independent Scientific Review Panel on Sediment Impairment and Effects on Beneficial Uses of the Elk River and Stitz, Bear, Jordan and Freshwater Creeks. Independent Science Review Panel performed analysis on retainer to the North Coast Regional water Quality Control Board, Santa Rosa, CA.

Dodds, W. K., J. R. Jones, and E. B. Welch. 1998. Suggested classification of stream trophic state: Distributions of temperate stream types by chlorophyll, total nitrogen, and phosphorus. Water Res. 32:1455-1462.

Gilpin, M.E. and M.E. Soule. 1990. Minimum Viable Populations: Processes of Species Extinction. In: M. Soule (ed) Conservation Biology: The Science of Scarcity and Diversity University of Michigan Press. pp 19-36.

Goldman, C.R. and A.J. Horne. 1983. Limnology. McGraw-Hill, Inc. New York. 464 pp.

Great Northern Corp. 2001. Final report - Fiock dam removal - June 2001. Submitted to U.S. Fish and Wildlife Service by GNC. Weed, CA. 16 pp. Available online at: <http://www.krisweb.com/biblio/shasta_gnc_webb_2001_fiockdamremoval.pdf> Accessed 2006 10 March.

Hare, S. R.; Mantua, N. J.; Francis, R. C. 1999. Inverse production regimes: Alaska and the west coast Pacific salmon. Fisheries, Vol. 24 (1): 6-14.

Kier Associates. 1991. Long Range Plan for the Klamath River Basin Conservation Area Fishery Restoration Program. U.S. Fish and Wildlife Service, Klamath River Fishery Resource Office. Yreka, CA. 403 pp.

Kier Associates. 1999. Mid-term evaluation of the Klamath River Basin Fisheries Restoration Program. Sausalito, CA. Prepared for the Klamath River Basin Fisheries Task Force. 303 pp.

Kier Associates. 2005a. Draft Nutrient Criteria for the Klamath River on the Hoopa Valley Indian Reservation. Prepared for the Hoopa Valley Tribal Environmental Protection Agency. Kier Associates, Mill Valley and Arcata, California.

Kier Associates. 2005b. Review of the public draft of the Scott River Watershed TMDL. Performed under contract to the Klamath Basin Tribal Water Quality Work Group. Kier Associates, Mill Valley, CA. 49 p.

Kier Associates. 2006. Draft terms and conditions to be recommended to the Federal Energy Regulatory Commission (FERC) for application to the Klamath Hydroelectric Project, FERC project license 2082-027, operated by PacifiCorp. Kier Associates, Mill Valley and Arcata, California. 60p.

National Research Council (NRC). 2004. Endangered and threatened fishes in the Klamath River basin: causes of decline and strategies for recovery. Committee on endangered and threatened fishes in the Klamath River Basin, Board of Environmental Toxicology, Division on Earth and Life Studies, Washington D.C. 424 pp. Available online at: <http://www.krisweb.com/biblio/klamath_nsa_nrc_2003.pdf> Accessed 2006 12 February.

North Coast Regional Water Quality Control Board. 2001. Water Quality Control Plan for the North Coast Region. Staff report adopted by the North Coast Regional Water Quality Control Board on June 28, 2001. Santa Rosa, CA. 124 p. Available online at: <http://www.waterboards.ca.gov/northcoast/programs/basinplan/083105-bp/basin-plan.pdf> Accessed 2006 12 February.

Poole, G.C. and C.H. Berman. 2001. An ecological perspective on in-stream temperature: natural heat dynamics and mechanisms of human-caused thermal degradation. Environmental Management 27: 787-802. Available online at: <http://69.36.169.49/orightml/BasePages/Publications/PooleandBerman2001.pdf> Accessed 2006 10 March.

Snyder, J. O. 1931. Salmon of the Klamath River, California. California Division of Fish and Game, Fish Bulletin No. 34. Sacramento, CA. 121 pp. Available online at: <http://www.krisweb.com/biblio/klamath_cdfg_snyder_1931.pdf> Accessed 2006 10 March.

Tetra Tech, Inc. 2004. Progress Report Development of Nutrient Criteria in California: 2003-2004. Prepared for US EPA Region IX. Tetra Tech, Lafayette, CA.

Trinity County Resource Conservation District. 2003. Klamath Resource Information System database Version 3.0. April 2003. Performed under contract to the Trinity River Restoration Program. TCRCD, Weaverville, CA. See www.kirsweb.com.

U.S. Environmental Protection Agency (USEPA). 1999. 1999 update of Ambient water quality criteria for ammonia. EPA 822/R-99-014. U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (USEPA). 2000. Nutrient Criteria Technical Guidance Manual: Rivers and Streams. Office of Water and Office of Science and Technology , Washington D.C. EPA-822-B-00-002.

U.S. Environmental Protection Agency (USEPA). 2002. National Recommended Water Quality Criteria: 2002. Office of Water. Office of Science and Technology. EPA-822-R-02-047. 30 pp. + appendices.

Watershed Sciences LLC. 2004. Aerial Surveys using Thermal Infrared and Color Videography Scott River and Shasta River Sub-Basins. Performed under contract for U.C. Davis and the NCRWQCB. Watershed Sciences, Corvallis, OR. 59 p.

Wilkie, M.P and C.M. Wood. 1995. The adaptation of fish to extremely alkaline environments. Comparative Biochemical Physiology. Vol 113B, No. 4, p 665-673.

Appendix A: Quartz Valley Indian Reservation Comments

Typographic/grammar errors and other less significant comments

General comment
Many of the tables and charts in this document are formatted as images, not text/lines. This makes them harder to read (fuzzy and pixilated) and makes it impossible to copy/paste data from tables into spreadsheets. If possible, the Regional Water Board should try in future TMDLs to properly format the tables and charts.

Page 2-25
This statement is based on a total of 6 data points: "Total phosphorus levels are low in the headwaters of the watershed at the North North Fork Shasta River and Shasta River near the headwaters monitoring locations, with values of 0.025 mg/L"
Hence, a qualifying statement is necessary (also note that the word North is repeated). We suggest the following: "Existing limited data (6 samples) indicate that total phosphorus levels are low in the headwaters of the watershed at the North Fork Shasta River and Shasta River near the headwaters monitoring locations, with values of 0.025 mg/L"

Page 2-28
This statement is based on a total of 6 data points: "Total phosphorus concentrations of the headwaters of the Shasta River are generally oligotrophic, with TP concentrations at levels that do not promote nuisance aquatic growth."
Hence, a qualifying statement is necessary. We suggest the following: "Existing limited data (6 samples) indicate that total phosphorus concentrations of the headwaters of the Shasta River are generally oligotrophic, with TP concentrations at levels that do not promote nuisance aquatic growth."

Page 2-29
This statement is based on a total of 6 data points: "Existing limited data (6 samples) indicate that" to the beginning of "The headwaters of the Shasta River generally have low total nitrogen levels, indicative of conditions that do not promote aquatic plant growth."
Hence, a qualifying statement is necessary. We suggest the following: "Existing limited data (6 samples) indicate that the headwaters of the Shasta River generally have low total nitrogen levels, indicative of conditions that do not promote aquatic plant growth."

Page 3-9
In Figure 3.5, the Y-scale on graph is too large. It would be more legible if scale was from +1 to -4, rather than current scale of +4 to -4. If this would be easy to do, it should be redone.

Page 3-16
There is a bunch of irrelevant words on this page (delete).

Page 4-2
The statement that "The organic matter thus produced then serves as an energy source for bacteria and animals in the reverse process of *respiration*…" should be revised to include the fact that plants also respire (could be fixed by adding "plants, " before "bacteria").

Page 4-5
The statement "At this average TKN concentration, approximately 2.3 mg/L of oxygen is consumed, representing a moderate component of the total oxygen demand exerted in the Shasta River." should be revised to read "At this average TKN concentration, approximately 2.3 mg/L of oxygen would be consumed. This 2.3 mg/L of oxygen consumption occurs spread over an unknown period that is likely at least five days long, thus representing only a moderate component of the total oxygen demand exerted in the Shasta River."

Page 4-6
This statement on page 4-6 is ambiguous as to whether the conditions occurred in the Shasta River or elsewhere: "USGS reports document cases of supersaturated conditions attributed to aquatic plant growth persisting for several days or more, with saturations as high as 250 percent (Flint et al. 2005, p. 60)." We recommend changing it to:
"USGS reports from Oregon document cases of supersaturated conditions attributed to aquatic plant growth persisting for several days or more, with saturations as high as 250 percent (Flint et al. 2005, p. 60)."

Page 8-7
On this page there are several mentions of the Scott River that should instead be the Shasta River. It appears as though this language was ported over from the Scott TMDL. Also, there is mention of the "Strategic Action Plan", another relic from the Scott River TMDL.

Page 8-8
Change "timewith" to "time with"

Page 8-9
"Grazing on federal land is addressed separately in sections 8.8 (Forest Service) and 8.9 (BLM) of the Staff Report." This apparently references an outdated numbering system; it should be sections 8.9 and 8.10.

Page 8-11
This language is contained twice in the same paragraph. One should be deleted.

> "Irrigation water would be applied uniformly based on an accurate measurement of cropwater needs and the volume of irrigation water applied, considering limitations raised by such issues as water rights, pollutant concentrations, water delivery restrictions, salt control, wetland, water supply and frost/freeze temperature management. Additional precautions would apply when chemicals are applied through irrigation."

Page 8-13
This statement is out of place, and it is unclear what the point is:

> "The Dissolved Oxygen TMDL (Chapter 7), using the water quality compliance scenario of the RMS model, shows that photosynthetic and respiration rates approaches 50% of existing baseline conditions when assuming a 50% reduction in the standing crop of aquatic plants."

This does not make any sense. The photosynthetic/respiration rates are essentially the same things (just different units) as the standing crop.

Page 8-18
Change “dry wet water plan” to “dry year water plan”
Change “dissolver” to “dissolved”

Page 8-34
Change "Contol" to "Control"
Change "Dsicharge" to "Discharge"
Change "nd" to "nd"

Response: The appropriate changes have been made.

4. Greg Frantz and Michael Buckman – State Water Resources Control Board Comments

Comments:
Would be helpful to know when items are defined in the glossary via bolding or * indication.

Page 1, Part I, first paragraph: “Water temperature conditions are regularly too high…” Because the temperature objectives in the Basin Plan are narrative and the TMDL is interpreting the narrative in order to protect beneficial uses, staff recommend you say …”because they exceed temperature protective of salmonids…” or just leave out “too high” and say, “Water temperature conditions regularly exceed temperature thresholds protective of salmonids.” Would be much more clear and concise.

Page 2, Part III. Section B: Last paragraph: “The Shasta River Watershed”…,no net increase in receiving water temperature”. Could add clarity to the regulation to leave off the “no” because you define this to be a net increase of zero later.

Page 2. Part III, Section B: Was not clear how the Maximum daily temperatures of 1.5°C, 1.2°C, and 2.1°C were derived in the Staff report. Since these are regulatory numbers, it’s important to show in the staff report how they were determined. The Maximum daily temperatures of 1.5°C, 1.2°C, and 2.1°C were also sited Page 3 Part III, Section C before table 1. And again sited in table 2 on page 5.

Page 3. Part III, Section B: “TMDL=…+ no Net increase in Temp…” Just a suggestion, to leave off the “no” because the actual equation includes the Net Increase which you explain to be a zero net increase in temperature from tailwater return flows in Section C.

Page 4, Figure 1: It appears that both right and left banks have the same TMDLs for average percent transmittance although the baseline values are different. Please standardize the y-axes on these two graphs so the reader can readily see this.

Page 5, Table 2: Under “Change in Riparian Vegetation” there’s a reference to Tables 6.2 and 6.4, which do not appear in the amendment language (they’re found in the staff report). This reference should be removed. The amendment language has to stand on its own. If tables are necessary add them to the amendment. Also, Table 6.4 does not seem to apply here, since it refers to Brazie Ranch air temperatures, and the context in the amendment language refers to Shasta River solar radiation transmittance.

Page 5, Part III Section C should be Section D. Also, there’s reference to a “water quality compliance model scenario,” which is not explained. Please add explanation.

Page 5 Part IV, Section A. Consider adding carbonaceous deoxygenation, nitrogenous deoxygenation, and reaeration to the glossary of terms.

Page 6. Part IV, Section C: The value of 0.91 mg/L for NBOD is not explained. Where does this number come from? Could not find TKN in Appendix E to calculate .91mg/L. It says to refer to 5.1.2 in Appendix E but I could not find that section…possibly left out or in wrong location.

In Table 4 numerous acronyms are used before defining their meaning such as CRMP (p8) RRWMP (p9) PCP (p9) RCD (p10) WWTF (p12) BLM (p13) etc

Page 8, In Table 4, Paragraph 2. It appears that 8.2 is suppose to be referred to instead of table 8.1.

Part V. Implementation is lacking a specific time frame for certain events, i.e. page 8 last paragraph. How long is the time period for notice of failure of voluntary actions if that scenario does happen? It's not clear when the various implementation actions are to take place, or when they are to be initiated. Some sort of timeline is needed so the regulated community can know what is expected.

Page 13. Part VI. First paragraph "…nitrates and nitrates…" Should read "nitrates and nitrites" ?

Table 4: On page 9, the second and third paragraphs do not resolve. Something has clearly been left out.

Page 14, Part VIII. The first sentence is unclear. "The Regional Water Board shall take enforcement actions for violations of the Shasta River TMDL Action Plan where elements of the TMDL Action Plan are made (thru?) enforceable restrictions in a specific permit or order, as appropriate. Should be more specific on how items in the implementation plan will be made enforceable per the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program which emphasizes that any discharge must be regulated using waste discharge requirements, waivers, or prohibitions as appropriate. Staff recommends adding language to be clear that discharges will be regulated.

Page 15, Part IX. Tailwater Return Flow should all be bold and not just Tailwater.

Part IX, Glossary: We recommend you include a definition for "nitrification" or NBOD, since these terms are used in the amendment language. If these terms are the same as nitrogenous oxygen demand, which does appear in the glossary, then only this latter terms should be used in the amendment language.

Staff Report:

Chapter II. Page 8. Table 2.5 Has no unit of measure.

All equations, units, and conversion factors have to be shown in the staff report.

Response: All of the suggested edits/revisions have been incorporated into the revised Staff Report and Basin Plan Amendment.

5. Jim Cook – Siskiyou County Supervisor Comments

Supervisor Cook's comment document is included here in its entirety. This is the format in which it was received by Regional Water Board staff.

(Begin comment document):

Note: This document was recreated by scanning hard copies of the posted .pdf basin plan language. It contains many minor spelling and optical character recognition (ocr) errors which I have not attempted to correct in the interests of time. Changes are indicated by strikethrough where text was deleted, and by blue print where text was inserted.

North Coast Regional Water Quality Control Board

2122/2006 Draft

[Add a new sub-section to the Water Quality Control Plan for the North Coast Region implementation chapter (Chapter 4) with the following Action Plan for the Shasta River. This section will be added after the "Action Plan for the Scott River Watershed Sediment and Temperature TMDL." In addition to adding the following language, several editorial revisions will be made, including appropriate changes to the Title Page, Table of Contents, Summary of Basin Plan Amendments (Appendix 1), page numbers, table and figure numbers, footnote numbers, and headers and footers to reflect the new language. The final locations of tables and figures in relation to the text may also be changed to accommodate the existing formatting of the Basin Plan.]

ACTION PLAN FOR THE SHASTA RIVER WATERSHED TEMPERATURE AND DISSOLVED OXYGEN TOTAL MAXIMYMDAILY1.0ADS 1

The Shasta River watershed (CalWater Hydrolog–ic Area 105.50), which includes all tributaries and Lake Shastina, comprises approximately 508,734 acres (795 mi) in Siskiyou County. The Shasta River is tributary to the Klamath River. This *Action Plan for the Shasta River Temperature and Dissolved Oxygen Total Maximum Daily Loads,* hereinafter known as the Shasta River TMDL Action Plan, includes temperature and dissolved oxygen total maximum daily loads (TMDLs) and describes the implementation actions that presently appear necessary to achieve the TMDLs and attain water quality standards in the Shasta River watershed. The goal of the Shasta River TMDL Action Plan is to achieve the TMDLs, and thereby achieve dissolved oxygen and temperature related water quality standards, including the protection of the beneficial uses of water in the Shasta River watershed.

The Shasta River TMDL Action Plan sets out the loads and directs conditions to be considered and incorporated into regulatory and non-regulatory actions in the Shasta River watershed. The Shasta River TMDL Action Plan is not directly and independently enforceable, except as incorporated into appropriate permitting or enforcement orders. The ability to make timely progress shall be dependent, at least in part by funding availability. (Need further discussion on this.)

The Regional Water Board shall take enforcement actions for violations of the Shasta River

TMDL Action Plan where elements of the TMDL Action Plan are made enforceable restrictions in a specific permit or order, as appropriate. Nothing in this TMDL Action Plan precludes actions to enforce any directly applicable prohibition found elsewhere in the Basin Plan or to require cleanup and abatement of existing sources of pollution where appropriate.

~~See VIII., Enforcement, on pp. 14~~

A glossary defining key terms is located at Part IX of this Action Plan. **I. Problem Statement**

The Shasta River watershed was listed as impaired for organic enrichment/dissolved oxygen in 1992, and as impaired for temperature in 1994, pursuant to Section 303(d) of the Clean Water Act. These listings were confirmed in the TMDL analysis. Dissolved oxygen concentrations are regularly too low to comply with the Basin Plan dissolved oxygen objectives. Water temperature conditions are regularly too high and exceed temperature thresholds protective of salmonids.

Low dissolved oxygen concentrations and elevated water temperatures in the Shasta River, its tributaries, and Lake Shastina have resulted in degraded water quality conditions that do not meet applicable water quality objectives and that impair designated beneficial uses. The designated beneficial uses that are not fully supported include: cold freshwater habitat (COLD); rare, threatened, and endangered species (RARE); migration of aquatic organisms (MIGR); and spawning, reproduction, and/or early development of fish (SPWN), commercial and sport fishing (COMM); and contact and non-contact water recreation (REC-1 and REC-2).. The designated beneficial uses associated with the cold freshwater salmonid fishery (COMM, COLD, RARE, MIGR, SPWN, CUL) are the designated beneficial uses most sensitive to the dissolved oxygen and water temperature impairments.

The Klamath River, to which the Shasta River is tributary, is also listed as impaired for low dissolved oxygen, high water temperature, and high nutrient levels. The Klamath River has additional beneficial uses that are not designated for the Shasta River that may be adversely affected by inputs from the Shasta River. These beneficial uses include the Native American cultural use (CUL) that supports cultural and traditional rights of indigenous people, such as ceremonial uses, and the subsistence fishing use (FISH).

Adopted by the North Coast Regional Water Quality Control Board on (insert date}. Adopted by the State Water Resources Control Board on (insert date}. Approved by the State Office of Administrative Law on (insert date}. Approved by the United States Environmental Protection Aoencv on !insert datel.

II. Watershed Restoration Efforts

Throughout the Shasta River watershed, many individuals, groups, and agencies have been working to enhance and restore fish habitat and water quality. These groups include, but are not limited to, the Shasta Valley Resource Conservation District, the Shasta River Coordinated Resources Management Program, private timber companies, the Natural Resource Conservation Service, Siskiyou County and the Five Counties Salmon Conservation Program, the California Department of Fish and Game, the California Department of Water Resources, the United States Forest Service, and the Klamath River Basin Fisheries Task Force. The past and present efforts of these stakeholders have improved water quality conditions in the Shasta River and its tributaries.

III. Tefmper!1oerature

A. Shasta River Temperature Source Analysis

The Shasta River temperature source analysis identifies the sources (or factors) that affect the temperature of the Shasta River watershed. Five primary factors have been identified as affecting stream temperatures in the Shasta River watershed. Human activities have affected, or have a potential to affect, each of tl1ese factors. The factors include:

. Reduced Sstream shade from agricultural practices including grazing and livestock activities;
. Tailwater return flows;
. Flow regulation and modification;
. Groundwater accretion /-/ spring inflow; and
. Lake Shastina and minor channel impoundments.

In addition, microclimate alterations resulting from near-stream vegetation removal may increase temperatures, where microclimates exist. Further, changes in channel geometry from natural conditions can also negatively affect water temperatures. Higher summer flows than historical may be affecting cold water refugia and functions of the cold water fishery. However, these factors have not been quantified for the Shasta River temperature TMDL.

B. Shasta River Temperature TMDL

The "loading capacity" refers to the total loading of a pollutant that a water body can assimilate and still meet water quality objectives so as to protect beneficial uses. For the temperature TMDL the water quality objective of concern is the temperature objective, which prohibits the alteration of the natural receiving water temperature unless such alteration does not adversely affect beneficial uses. The loading capacity provides a reference for calculating the amount of pollutant load reduction needed to bring a water body into compliance with standards. The starting point for the load allocation analysis is the equation that describes the Total Maximum Daily Load or

loading capacity:

TMDL = Loading Capacity = 1:.WLAs + 1:.LAs + Natural Background

where 1:. = the sum, WLAs = waste load allocations, and LAs = load allocations. Waste load allocations are contributions of a pollutant from point sources, while load allocations are contributions from management-related non-point sources. There are no point source heat loads in the Shasta River watershed, and therefore no waste load allocations apply.

The Shasta River watershed temperature TMDL loading capacity is equal to the potential achievable percent solar radiation transmittance for the mainstem Shasta River, potential achievable effective riparian shade for the Shasta River tributaries, no net increase over a 24-hour time period in receiving water temperature from tailwater return flows, and an appropriate instream flow regime. An appropriate combination of these factors is ~~that~~ projected to result~~s~~ in a reduction~~s~~ in maximum daily temperature ~~of~~ down to 18~~1~~.0~~.SOC~~℃, 1._C, and 2.1℃ ~~C~~ for compliance at~~points at~~ river mile~~s~~ 24.1~~, 15.5, and 5.6, respectively~~. Downstream of river mile 24.1 all protective measures as described above shall be employed and temperature targets established as adequate information accrues to allow that to be done.

~~The Shasta River watershed temperature TMDL: loading capacity is equal to _____% of the potential percent solar radiation transmittance for the mainstem Shasta River, _____% of the potential effective riparian shade for the Shasta River Tributaries, no net increase (should we agree \that this is the objective considering the above changes?) in receiving water temperature from tailwater return flows, and a combination of water management, shade, and other actions that result in maintaining temperatures of 18 degrees Celsius for compliance points at river miles 24.1, 15.5, and 5.6. (Do we want to engage DFG and comment about having compliance points? Will DFG be able to delete these points? We could delete points 15.5 and 5.6, or we could suggest language that calls for studies on compliance points and a decision to be made later.) Comment: As written the loading capacity only permits the natural background and makes no provision for agriculture as a beneficial use. If this change is accepted, the formula at the top of BPL pp. 3 should be changed accordingly.~~

TMDL = Loading Capacity =
Potential Percent Solar Radiation Transmittance of the Shasta River
+ Potential Effective Shade of the Tributaries
+ No Net Increase in Temperature from Tailwater Return Flows
+ Instream Flow ~~IRegime ncreases that Achieved Specific Temperature Reductions at Compliance Locations.~~

C. Shasta River Temperature Load Allocations

In accordance with the Clean Water Act, the Shasta River temperature TMDL is allocated to sources of elevated water temperature in the watershed. As there are no known point source heat loads to the Shasta River watershed, the TMDL is allocated among the non-point source heat loads in the watershed. The non-point sources include (1) solar heat load (Le., sunlight) at streamside (riparian) locations in the watershed, (2) heat load from tail water return flows, and (3) heat load from surface water flow reductions.

In order to quantify the part of the TMDL focused on solar heat loads that arise from changes in streamside vegetation, and to be able to compare it to current conditions, two surrogate measures are used: (1) potential percent solar radiation transmittance at locations along the mainstem Shasta River, and (2) adjusted potential effective riparian shade at locations along tributary streams (see Glossary). Landowners and operators in the mainstem Shasta River are allocated loads equal to potential percent solar radiation transmittance, as depicted in Figure 1 and tabulated in Table 1. Landowners and operators in tributaries are allocated loads equal to ~~adjusted potential effective riparian shade, which is equal to 90%~~achievable ~~of~~ site potential shade, ~~to~~ allowing for natural riparian disturbances such as floods, wind throw, disease, landslides, and fire.

~~riparian shade, which is equal to ____% of site potential shade, to allow for...landslides, and fire and for a load allocation to agriculture as a beneficial use.~~

The load allocation for tailwater return flow sources within the Shasta River watershed is a zero net increase in receiving water temperature over a 24-hour time period.~~.~~
~~watershed is a ___degree net increase in receiving water temperature.~~

The load allocation ~~for flow~~ is projected to result in a reduction~~s~~ in the maximum daily stream temperature~~s~~ to 18.0~~of 1.5~~°C ~~, 1.2°C, and 2.1°C from baseline at RM 24.1, RM 15.5, and RM 5.6, the temperature compliance~~at ~~locations for the TMDL~~river mile 24.1.

~~Table 2 summarizes the temperature load allocations for the Shasta River watershed.~~

Table 1. Solar heat load allocations for the mainstem Shasta River, expressed as the potential

~~Table 1, and Table 2, pp. 5: Comment: These tables and the paragraph should be corrected to correspond to the above changes in shade.~~

River Reach	Upstream River Mile	Downstream River Mile	Potential Reach Average Percent Transmittance[1]
Dwinnell Dam to Riverside Road	40.6	39.9	30
Riverside Road to uIs of A 12	39.9	28.3	50
VIS of A12 to near DeSoza Lane	28.3	22.0	85
Near DeSoza Lane to *uls* of Montague-Grenada Road	22.0	16.1	30
Near Montague-Grenada Road	16.1	14.6	10
D/S Montague-Grenada Road to Hwv 263	14.6	7.3	30
Hwv 263 to mouth	7.3	0	30 to 50"

[1]Daylight-hour average percent transmittance for given reach.
2 Alternate between 30 and *500k* every 10 percent of reach length.

Figure 1: Existing (baseline) and potential solar radiation transmittance for the left bank (A) and right bank (8) of the Shasta River

No Solar Passage (Full Shade)

Note—graphic deleted due to ~~ocr~~ problem scanning document. ~~problems~~

2/2212006 Draft

Source	Allocation
Change in Riparian Veaetation	*Shasta River.* Reach average potential solar radiation transmittance, as presented in Table 62 and Figure 6.4. *Tributaries:* Potential effective rioarian shade = 90% of site ootential shade.
Irrigation Return Flow	No net increase in receiving water temperature.
Surface Water Flow	Reductions in the maximum daily stream temperatures of 1.5°C, 1.C, and 2.1°C from baseline at RM 24.1, RM 15.5, and RM 5.6

C. Shasta River Temperature Margin of Safety, Seasonal Variations, and Critical Conditions

The temperature TMOL TMDL includes an implicit margin of safety, based on conservative assumptions and uncertainties. The water quality compliance model scenario incorporated temperature reductions from Big Springs Creek and Parks Creek to account for improvements associated with riparian shade and tailwater management, but did not incorporate temperature reductions from Yreka Creek and other small tributaries to the Shasta River, and provides a margin of safety. Topographic shade was not considered in the temperature model and is likely a non-negligible factor in the Shasta canyon, and provides a margin of safety. Some improvements in stream temperature that may result from reduced sedimentation are not quantified. Reduced sediment loads could lead to increased frequency and depth of pools, independent of changes in solar radiation input. These changes tend to result in lower stream temperatures overall and tends to increase the amount of lower-temperature pool habitat. These expected changes are not directly accounted for in the TMOLTMDL. Finally, the effects of changes to streamside riparian areas toward mature trees will tend to create microclimates that will lead to improvements in stream temperatures. These effects were not accounted for in the temperature analysis and provide a margin of safety.

Comment: "C" should probably be changed to D. Also, it's not clear how a margin of safety is or would be applied. Are the temperature reductions higher than need be in order to provide a margin of safety? And for what purpose is there a margin of safety? Is it for the beneficial use or for the those parties allocated a temperature loading?

To account for annual and seasonal variability, the Shasta River temperature TMOL TMDL analysis evaluated temperatures and thermal processes during mid- to late-summer, considered the most critical time period for the most sensitive beneficial uses (i.e., the hottest time of the year corresponding with the lowest surface water flows). The critical period accounts for seasonal variation and provides an implicit margin of safety because at this point the air temperature is elevated, the flow is below average, and the most sensitive beneficial use - salmonid juvenile rearing - is present. Sensitive life stages exist in Shasta River watershed throughout the year, but summer water temperatures represent the most critical conditions with respect to temperature and the most sensitive beneficial uses.

IV. Dissolved OxvaenOxygen

A. Shasta River Dissolved Oxygen Source Analysis

Dissolved oxygen levels in surface waters are controlled by a number of interacting processes including: photosynthesis, respiration, carbonaceous deoxygenation, nitrogenous deoxygenation and nitrification, reaeration, sediment oxygen demand, water temperature, salinity, and atmospheric pressure. The primary processes affecting dissolved oxygen concentrations in the Shasta River watershed are photosynthesis and respiration of aquatic plants, nitrification (termed ~~NBOO~~NBOD), and sediment oxygen demand (SOD). The following anthropogenic sources or factors, in no special order, adversely affect dissolved oxygen conditions in the Shasta River:

. T-ailwater return flows;
. City of Yreka nonpoint and wastewater infiltration sources;
. Lake Shastina and minor impoundments;
. ~~Agricultural practices including grazing and livestock activities that r~~Reduced riparian shade; and
. Flow regulation and modification.

B. Shasta River Dissolved Oxygen TMDL

The dissolved oxygen "loading capacity" of the Shasta River is the total net daily oxygen demand that results in attainment of the dissolved oxygen objectives. For the dissolved oxygen TMDL the water quality objective of concern is the minimum dissolved oxygen objective of 7.0 mg/L for the Shasta River. There are no known point sources of oxygen-demanding constituents to the Shasta River and tributaries. Each of the components that exert an oxygen demand on the Shasta River is attributed to nonpoint sources, and includes respiration of aquatic plants, sediment oxygen demand (SOD), and nitrification (NBOD).

The dissolved oxygen loading capacity of the Shasta River is 12,353 pounds of oxygen demand per day, and is expressed as the following Shasta River dissolved oxygen TMDL equation:

TMDL = Loading Capacity = 12,353 lbs 02/day

C. Shasta River Dissolved Oxygen Load Allocations

In accordance with the ~~Crean~~ Clean Water Act, the Shasta River dissolved oxygen TMDL is allocated to the sources of oxygen demand in the watershed. There are no known point sources of oxygen-demanding constituents in the Shasta River watershed, and therefore the waste load allocation is set to zero. Therefore, the TMDL
includes oxygen demand from natural and non-point anthropogenic sources. The load allocations are assigned to reaches of the Shasta River as identified in Table 3, and account for the total net daily oxygen demand for the designated river reaches. Responsibility for meeting these river-reach allocations are assigned to the landowners whose operations contribute to water quality conditions within the specified reaches. In addition to these river reach load allocations, allocations are applied to several river inputs that require NBOD reductions in order to meet water quality compliance, including Dwinnell Dam outflow and Yreka Creek. These allocations are assigned as NBOD concentrations and equal 0.91 mg/L for both Dwinnell Dam outflow and Yreka Creek.

In order to meet the dissolved oxygen TMDL and load allocations, it is necessary to reduce oxygen demand and/or increase oxygen input. ~~the following needs to occur: . Fifty percent reduction in respiration rates of instream aquatic plants;~~
~~. Fifty percent reduction in SOD rates behind minor impoundments;~~
~~. Reduced NBOD input concentrations; and~~
~~. Increased surface water flow.~~

~~(are the fifty percent reductions reasonable or calculated properly?)~~

D. Shasta River Dissolved Oxygen Margin of Safety, Seasonal Variations, and Critical Conditions

The TMDL includes an implicit margin of safety to account for uncertainties in the analysis. The margin of safety is included because the TMDL is based on conservative assumptions in the TMDL analysis. The water quality compliance model scenario, which is the basis for the dissolved oxygen TMDL, includes a 50% reduction of sediment oxygen demand only at locations behind minor impoundments in the Shasta River. Fine sediment and organic material load reductions from irrigation return flows that can be achieved via controls targeting NBOD reductions would result in reductions in sediment oxygen demand in the entire river, not just behind impoundments. This represents a margin of safety. In addition, the water quality compliance model scenario does not include biochemical oxygen demand (~~CooD~~CBOD) concentration reductions. Controls targeting NBOD reductions from irrigation return flows, Dwinnell Dam outflow, and Yreka Creek would result in reductions in ~~CHaD~~ CBOD concentrations, and provides a margin of safety.

The dissolved oxygen analysis was conducted for a critical period of mid- to late-summer. The critical period accounts for seasonal variation and provides an implicit margin of safety, because at this point the air temperature is above average, the flow is below average, and the most sensitive beneficial use - salmonid juvenile rearing - is present. Sensitive life stages exist in the Shasta River watershed throughout the year, but summer conditions represent the most critical conditions with respect to dissolved oxygen. This critical period also corresponds to the time of greatest photoperiod and water temperature, both of which reduce the concentration of dissolved oxygen. To account for the possibility that excursions below the TMDL may occur during periods of time other than the mid- to late summer critical period, the TMDL is established as a year-round load.

Table 3: Shasta River TMDL river reach load allocations and total oxygen demand reductions needed to achieve water quality compliance

Note—graphic deleted due to ~~ocr~~ problem ~~s~~scanning

lion Plan for the Shasta River Watershed
:solved Oxygen and Temperature Total Maximum Daily Loads

7 Basin Plan Language

~~also corresponds to the time of greatest photoperiod and water temperature, both of which reduce the concentration of dissolved oxygen. To account for the possibility that excursions below the TMDl may occur during periods of time other than the mid- to late summer critical period, the TMDl is established as a yearround load.~~

V. **ImpR,lernmeontation**

Specific implementation actions that the Regional Water Board shall pursue to achieve the TMDLs and meet the dissolved oxygen and temperature related water quality standards in the Shasta River and tributaries are described in Table 4. Table 4 is organized by topic and/or source, impairment most affected, and responsible party(ies) considered appropriate to implement ~~TMDl~~ TMDL actions. Individual landowners and responsible parties may find that more than, one implementation action is applicable to their circumstances. The implementation actions are designed to encourage and build upon on-going, proactive restoration and enhancement efforts in the watershed. Additionally, the implementation actions described in Table 4 ~~are~~ may be necessary to comply with the Plan or California's Nonpoint Source Pollution Control Program (NPS Policy).[2] If the implementation actions identified in Table 4 fail to be implemented by the responsible party or if the implementation actions prove to be inadequate the Regional Water Board shall take additional permitting and/or enforcement actions, as necessary.

Table 4 Shasta River Dissolved Oxygen and Temperature ~~TMDl~~ TMDL Implementation Actions

Source or land Use Activitv	**Responsible Parties**	**Actions to Address Dissolved Oxygen and Water T-ernmperature**
		landowners should employ land stewardship practices and activities that reduce discharges of fine sediment, nitrogen and phosphorus and reduce solar radiation transmittance from affecting waters of the Shasta River and tributaries affecting the Shasta River. ~~activities that minimize, control, and, preferably, prevent discharges of fine sediment, nutrients and other oxygen consuming materials, as well as elevated solar radiation loads from affecting waters of the Shasta River and tributaries.~~ Those that oversee and manage grazing and range land activities in the Shasta River watershed should implement

grazing and rangeland ~~m~~management practices listed in Table 8.~~1~~ 2 of the ~~TMDl~~ TMDL Implementation Plan, and in the Shasta Watershed Restoration Plan.
And these changes to 8.2.

Manage grazing to provide adequate pasture residual vegetation for filtering of sediment and nutrients.

Use multiple pastures including upland pastures together to provide rest and pasture re-growth to attain residual vegetation.

Use number of cattle, sizes and grazing time that permits riparian vegetation to reach site potential.

Avoid grazing cattle with young calves near riparian areas.

Avoid providing hay raise on other property to cattle located on riparian areas.

Obtain and use hay from riparian field crops at other locations.

Harrow or otherwise mechanically breakdown cattle manure to facilitate natural incorporation into the soil prior to increasing rainfall or irrigation that results in overland flows.

Manage stock watering and livestock movement so that incursions into riparian areas and stream channels do not reduce the likelihood to attain site vegetation potential.

Use exclusionary fencing or other permanent structures when other management practices fail to achieve desired riparian goals due to livestock.

Stream crossings. Provide a stabilized area to control access for both livestock and machinery.

Herding and riding of livestock. If other grazing strategies fail to allow riparian vegetation to attain site potential, forcibly herd livestock.

~~Comment: Table 8.2 is the table with the listed management practices. Also, the "current edition" of the Shasta Watershed Restoration Plan should be referenced.~~

Range and Riparian land Management	.Parties Conducting Grazing Activities. .Parties Responsible for Vegetation that Shades Water Bodies. .Parties Responsible for Bank Stabilization Activities. Regional Water Board.	The Shasta CRMP should, (1) implement the strategic actions specified in the Shasta Watershed Restoration Plan ~~Strategic Action Plan,~~ ~~Comment: The Strategic Action Plan should be replaced with the Shasta Watershed Restoration Plan.~~ and (2) assist landowners in developing and implementing management practices that are adequate and effective at preventing, minimizing, and controlling discharges of nutrients and other oxygen consuming wastes, and elevated water temperatures. The Regional Water Board will work cooperatively with the Shasta CRMP to provide technical support and information to willing individuals, landowners, and community members in the Shasta River watershed, coordinate educational and outreach efforts, and monitor the implementation and effectiveness of the Shasta Watershed Restoration Plan. The RWB staff shall convene a meeting of Responsible Parties to develop standards to be used to gage adequacy, timing and effectiveness of voluntary actions. ~~Should voluntary efforts fail to be implemented or effective at preventing, minimizing, and controlling discharges of sediment, nutrients and other dissolved oxygen consuming materials, and increasing solar radiation loads, the Regional Water Board's Executive Officer shall reQuire the aoorooriate~~

2 The *Policy for the Implementation and Enforcement* of *the Nonpoint Source Pollution Control Program* (N PS Policv).

Table 4 Shasta River Dissolved Oxygen and Temperature TMDL Implementation Actions

Source or Land Use Activity	Responsible Parties	Actions to Address Dissolved Oxygen and Water Temperature
		~~responsible parties to develop, submit, and implement a RRWMP on an as-needed, site-specific basis. Any landowner may be subject to this requirement if livestock grazing activities on their property are discharging, or threatening to discharge *oxygen* consuming materials and/or elevated solar radiation loads to a water body in the Shasta River watershed.~~ Should the rate of implementation of voluntary efforts fail to be adequate or effective at preventing, minimizing, and/or controlling both discharges of sediment, nutrients and other dissolved oxygen consuming materials and solar radiation loads, the Regional Water Board's Executive Officer shall require the appropriate responsible parties to develop, submit~~-~~, and implement a Ranch Riparian Water Management Plan (RRWMP) on an as-needed, site-specific basis. Any landowner may be subject to this requirement if activities on their property result in discharging, or threatening to discharge ~~oxygen consuming materials~~nitrogen and phosphorus and/or result in failure to take adequate measures to decrease solar radiation loading to the Shasta River and tributaries that are affecting the Shasta River. ~~a water body in the Shasta River watershed.~~ The RRWMP shall describe in detail: ~~The RRWMP shall describe in .detail:~~

	"	Locations discharging and/or with the potential to discharge _nutrients and other oxygen consuming materials, and _increased solar radiation ~~loads to watercourses which are caused by livestock grazing,~~ to watercourses, which are caused by management activities. _How and when those sites are to be controlled and monitored, and management practices that will prevent and reduce, _future discharges of nutrient and other oxygen ~~c~~consuming _materials, and increases in solar radiation loads. _Group and/or individual RRWMPs shall be implemented upon _review, comment, and approval by Regional Water Board staff _and their Executive Officer for compliance with Regional Board _directives, the Basin Plan.~~, and also with the management measures in the Nonpoint Source PCP.~~ ~~Pollution Control Program (PCP).~~	
		~~The Regional Water Board shall address the removal and suppression of vegetation that provides shade to a water body through its Wetland and Riparian Protection Policy, a comprehensive, region-wide riparian policy that will address the importance of shade on instream water temperatures and will potentially propose riparian setbacks and buffer widths. The Policy will likely propose new rules and regulations, and will therefore take the form of an amendment to the Basin Plan. Other actions under this section may be modified for consistency with this policy, once adopted. With funding~~		

		~~already available through a grant from the U.S. EPA, Regional Water Board staff are scheduled to develop this Policy by the end of 2007.~~ Permitting and Enforcement: Should the rate of implementation of voluntary efforts fail to be timely, adequate, or effective, the Regional Water Board shall~~.~~ ~~The Regional Water Board shall~~ take appropriate permitting and enforcement actions if necessary to address the removal and suppression of vegetation that provides shade to a water body in the Shasta River watershed. Such actions may include, but are not limited to, general waste discharge requirements (WDRs) or waivers of WDRs *for* grazing and rangeland activities, farming activities near water bodies, stream bank stabilization activities, and other land uses that may remove and/or suppress vegetation that provides shade to a water body. Should prohibitions or general WDRs be developed, they may apply to the entire North Coast Region or just to the Shasta River watershed.

. .-..

Table 4 Shasta River Dissolved Oxygen and Temperature TMDl Implementation Actions

Source or land Use Activity	Responsible Parties	Actions to Address Dissolved Oxygen and Water Temperature
		If necessary, Regional Water Board staff shall propose to the Board appropriate enforcement actions *for* human activities that result in the removal or suppression of vegetation that provides shade to a water body in the Shasta River watershed. Such actions may include, but are not limited to, cleanup and abatement orders, cease and desist orders, and administrative civil liabilities (fines) in accordnce with California Water Code sections 13304, 13301, and 3350, respectively. ~~Enforcement actions for violations of the California Water Code shall be taken when and where appropriate. Enforcement activities should be consistent with the State Water Board's Water Quality Enforcement Policy (SWRCB Resolution No. 2002-0040), adopted February 19, 2002, and as it may be amended from time to time. This enforcement policy promotes a fair, firm, and consistent enforcement approach appropriate to the nature and severity of a violation. Within two years of the date that the TMDl Action Plan takes effect the Regional Water Board's Executive Officer shall report to the Board on the status of the preparation and development of appropriate permitting actions. Enforcement implementation is ongoing and effective the date~~

		~~that the~~ ~~TMDl Action Plan is adopted.~~ Following the two year review of voluntary actions, the Regional Water Board's Executive Officer shall report to the Board on the status of those efforts and, if necessary, initiate the preparation and development of appropriate permitting actions.
Tailwater Return Flows	. Parties Responsible for Tailwater Management and Use · Shasta CRMP . Shasta RCD . CDFG Regional Water · Board	Parties responsible *for* tailwater discharges from irrigated lands~~,~~ affecting temperature and dissolved oxygen of the Shasta River, which may include landowners, lessees, and land managers, should implement the management practices presented in the CDF&G's Coho Recovery Strategy, the Shasta CRMP's Shasta Watershed Restoration Plan and the Shasta RCD's Incidental Take Permit Application or permit once adopted. . ~~Regional Water Board staff will evaluate the effectiveness of these voluntary actions and develop recommendations~~ Regional Water Board staff will evaluate the effectiveness of these voluntary actions and, if the actions are found not to be timely, adequate, or effective, will develop recommendations for the most effective regulatory vehicle to bring tailwater

		discharges into compliance with the ~~TMDl~~ TMDL and the Basin Plan. Information gathered during the evaluation phase will be used to formulate final recommendation(s) to the Regional Water Board. This evaluation phase shall be completed within ~~12~~36 months after the ~~TMDl~~ TMDLis approved by the U.S. EPA. Based on Regional Water Board staff recommendation(s) derived from the evaluation phase for tailwater management, the Regional Water Board ~~shall~~ may ~~-~~adopt prohibitions, Waste Discharge Requirements, Waivers of Waste Discharge Requirements, or any combination, thereof, as appropriate. To assure compliance, if prohibitions, WDRs, Waivers of WDRs, or any combination of the latter are adopted, a ~~tiered~~ tailwater management evaluation program may be instituted that ~~define a "tiered tailwater management program".~~ ~~may be instituted for tailwater management that~~ may include various elements such as discharge and receiving water sampling, monitoring, and reassessment.

Table 4 Shasta River Dissolved Oxygen and Temperature TMDL Implementation Actions

2/22/2006 Draft

Source or Land Use Activity	Responsible Parties	Actions to Address Dissolved Oxygen and Water Temperature
		Additional management practices to assure that tailwater discharges to receiving waters comply with the TMDL and the Basin Plan may also be based on results from the tailwater management evalu program. ~~management croaram~~.
Water Use and Flow	Water Rights Holders and other Stakeholders Shasta Coordinated Resource Management and Planning Committee (Shasta CRMP) Shasta Valley Resource Conservation District (Shasta RCD) California Department of Fish and Game (CDFG) Regional Water Board	~~Water diverters should participate in the CDFG's Coho Recovery Strategy (CDFG 20048) and Incidental Take Permit Program (CDFG 2004b). The Regional Board shall work with DFG to establish monitoring and reporting elements of these programs in order to gage their effectiveness.~~ ~~Water diverters should participate in and implement flow-related measures outlined in the Shasta CRMP's Shasta Watershed Restoration Plan. The Regional Board shall work with the Shasta CRMP to establish monitoring and reporting elements in order to gage the Plan's implementation and effectiveness.~~ ~~If after five years, the Regional Board Executive Officer finds that the above-measures have failed to be implemented or are otherwise ineffective, the Regional Board may recommend that the SWRCB consider seeking modifications to the decree, conducting proceedings under the public trust doctrine, and/or conducting proceedings under the waste and unreasonable use provisions of the California Constitution and the California Water Code.~~ Those water related measures contained in the CDFG's Coho Recovery Strategy and Incidental Take Permit ~~and~~ application and in the Shasta CRMP's Shasta Watershed Restoration Plan will all contribute to achieving TMDL Goals, and participation in those programs is highly encouraged. Those water related measures are expected to form the core of anticipated voluntary efforts under Water

Use and Flow. The RWB shall work with the CRMP, RCD, and DFG to establish monitoring and reporting elements in order to gauge the effectiveness of those voluntary efforts. Those elements shall ~~bu~~ be used to evaluate those efforts of those formal participants and those not formally participating.

In order to accomplish water quality objectives any mix of legal actions is acceptable as long as specified results can be achieved. RWB shall assist SVRCD and CRMP in the use of the SVWQ model to investigate over time the effectiveness of proposed measures. After 5 years, RWB staff will evaluate the effectiveness of these vol~~o~~untary actions to determine if persons in the Shasta Valley are making reasonable progress ~~towaree~~ toward achieving water quality objectives considering the combined effect of all actions viewed as a whole.

An additional review shall occur at ~~(~~10 years. ~~review placemarker. Is there language about a 10 year review somewhere?)~~

At 20 years, if ~~either adequate~~ progress ~~along those paths chosen by the community or the opportunities for progress remaining on those paths are clearly~~is still not sufficient to accomplish water quality objectives, then water rights holders must, within 2 years, complete a good-faith effort to develop approaches and timelines to secure additional gains in water quality. An evaluation will be performed including a reevaluation of the target objectives and technical analysis. ~~Failing that, RWB staff may develop such a plan.~~

Enforcement actions for violations of the California Water Code shall be taken when and where appropriate. Enforcement activities should be consistent with the State Water Board's *Water Quality Enforcement Policy* (SWRCB Resolution No. 2002-0040), adopted February 19, 2002, and as it may be amended from time to time. This enforcement policy promotes a fair, firm, and consistent enforcement approach appropriate to the nature and severity of a violation.

Irrigation Control Structures, Weirs, Flashboard Dams, and other Minor Impoundments (Collectively referred to as minor impoundments)	. Individual Irrigators . Irrigation districts . Other Stakeholders owning, operating, managing, or anticipating construction of minor impoundments	Irrigations districts, individual irrigators, and other stakeholders that own, operate, manage, or anticipate construction of instream impoundments such as flashboard dams, or other structures capable of blocking, impounding, or otherwise impeding the free flow of water in the Shasta River system shall comply with the following measure: Within one year of TMDL approval by the U.S. EPA, Regional Board S assess and establish baseline sediment oxygen demand levels. Follow owners and operators of those structures shall identify methods and m practices to be used to reduce sediment oxygen demand. Options may include, but are not limited to: 1) removing impoundments Shasta River mainstem as a mechanism to provide for flushing flows c scouring fine sediment from the stream-river channel on which aquatic grow; 2) re-engineering existing impoundments to decrease their surfa and 3) not undertaking the construction of new impoundments that will beneficial uses of water relative to water quality compliance and the su beneficial uses, including the salmonid fishery, in the Shasta Valley.
Lake Shastina	Montague Water	~~. - jct s~~

n8n

Table 4 Shasta River Dissolved Oxygen and Temperature TMDlImplementation Actions

Source or Land Use Activity	Responsible Parties	Actions to Address Dissolved Oxygen and Water Temperature
	Conservation District (MWCD) City of Weed and the Lake Shastina CSD County of Siskiyou . Rancho Hills Community Association Lake Shastina .Property Owners Association Other Appropriate Stakeholders Regional Water Board	The Montague Water Conservation District in cooperation with the City of Weed and the Lake Shastina CSD shall develop within 1 year a timeline and approach to characterize, quantify, and analyze the sources of, and ways to reduce, nitrogenous oxygen demanding substances contributing to low dissolved oxygen levels affecting the beneficial uses of water in Lake Shastina and to waters of the Shasta River downstream from Dwinnell Dam. Based on the results of the investigation, the Regional Water Board shall determine appropriate implementation actions necessary to reduce the nitrogenous oxygen demand that is lowering dissolved oxygen concentrations in lake Shastina and affected areas downstream from Dwinnell Dam.
City of Yreka Wastewater Treatment Facility (Yreka WWTF)	.City of Yreka Regional Water .Board	The Regional Water Board staff shall pursue aggressive compliance with Order No 96-69, and CAO No.R1-2004-0037. To ensure timely submittal of sampl.ing and analytical results from the operators of the Yreka WWTF, the Regional Water Board staff shall also continue vigorous oversight and enforcement of Monitoring and Reporting Program No. R1-2003-0047.
		The cities of Yreka, Weed, the Lake Shastina Development and other stakeholders should identify possible pollutants, their sources, and volumes of polluted runoff from urban and suburban sources within their spheres of influence that may discharge, directly or indirectly, to waters of the Shasta Valley watershed. Cities and other stakeholders responsible for urban and

Urban and Suburban Runoff	Cities of Yreka, Weed, Montague, The Lake Shastina Development Other Stakeholders Regional Water Board	suburban runoff should implement the-following measures: Seasonal scheduling of construction activities to prevent unnecessary waste loads in stormwater runoff. Seasonal scheduling for the application to lawns and gardens, municipal facilities, and agricultural areas of fertilizers, pesticides and herbicides, and other oxygen consuming materials that may contribute to dissolved oxygen impairments to watercourses in the Shasta River hydrologic system from cities, towns, developments and other concentrations of urban and suburban populations. When, and it, pollutant sources are identified that discharge, or threaten to discharge, oxygen consuming materials, fine sediment, and other polluting constituents to nearby watercourses from existing runoff control facilities, the Regional Water Board will work cooperatively with responsible parties to ascribe appropriate management measures and reasonable time schedules to control and eliminate said pollutant discharges.

Table 4 Shasta River Dissolved Oxygen and Temperature TMDL Implementation Actions

Source or Land Use Activitv	Responsible Parties	Actions to Address Dissolved Oxygen and Water Temperature
Activities on Federal Lands	.U.S. Forest Service (USFS) . Regional Water Board	The USFS shall consistently implement the best management practices included in *Riparian Area Management* 1997 (USDNUSDI1997), and *Water Quality Management for Forest System Lands in California, Best Management Practices* (USFS 2000). The Regional Water Board staff will continue its involvement with the USFS to periodically reassess the mutually agreed upon goals of the Management Agency Agreement between the SWRCB and the USFS. Additionally, the Regional Water Board shall work with the USFS to draft and finalize a Memorandum of Understanding (MOU). The MOU shall be drafted and ready for consideration by the appropriate decision-making body of the USFS within two years of the date the TMDL Action Plan takes effect. The MOO shall include buffer width requirements and other management practices as detailed in the Implementation chapter of the TMDL.
	.U.S. Bureau of Land	BLM shall implement best management grazing strategies that are detailed in a joint management agency document titled: *Riparian Area Management* 1997 (USDNUSDI 1997). The Regional Water Board shall work with the BLM

	Management Regional Water Board	to draft and finalize a Memorandum of Understanding (MOU). The MOU shall be drafted and ready for consideration by the appropriate decision-making body of the BLM within two years of the date the Shasta River TMDL Action Plan takes effect. The MOU shall include buffer width requirements and other management practices as detailed in the Implementation chapter of the TMDL.
Caltrans Activities	California Department of Transportation (Caltrans) Regional Water Board.	Regional Water Board staff shall complete an initial evaluation of the Caltrans Storm water Program within two years of the date the TMDL Action Plan takes effect. After the initial two-year evaluation is completed, the Regional Water Board staff shall continue periodic reviews of the Caltrans Storm Water Program to assure ongoing compliance with the Shasta River TMDL.

VI. Monitoring

Monitoring is important for determining the success of the TMDL Action Plan in achieving dissolved oxygen and temperature water quality standards. Monitoring shall be conducted upon the request of the Regional Water Board's Executive Officer in conjunction with existing and/or proposed human activities that will likely result in increased dissolved oxygen and reduced water temperatures in the Shasta River watershed. Monitoring may involve implementation, upslope effectiveness, photo documentation, instream and near-stream effectiveness (e.g. riparian buffer establishment affecting nutrient discharges), and*lor* compliance and trend monitoring (e.g. temperature and dissolved oxygen, Potential Percent Solar Radiation Transmittance, time predicated dissolved oxygen sampling, nutrients, sediment oxygen demand, nitrates and nitrates, and any other parameters reflective of improvements toward achieving the TMDL). Monitoring of sampling parameters, frequency, numeric and

narrative objectives, and other appropriate metrics shall be based on locations consistent with those reaches representative of the TMDL. See the Glossary in Part IX of this Action Plan for definitions of these terms. The authority for such requirements is contained in Section 13267 of the California Water Code, which states that the Regional Water Board may require any discharger, suspected discharger, or future discharger to furnish, with input from the Regional Water Board, monitoring program reports.

The Executive Officer will base the decision to require monitoring on site-specific conditions, the size and location of the discharger's ownership, and/or the type and intensity of land uses being conducted or proposed by the discharger. If monitoring is required, the Executive Officer may direct the discharger to develop a monitoring plan and may describe specific monitoring requirements to include in the plan.

VII. Reassessment and AdaDtive Manaaement

The Regional Water Board will review, reassess, and possibly revise the Shasta River TMDL Action Plan. Reassessment is likely to occur every three years during the Basin Planning Triennial Review process. Regional Water Board staff will report to the Regional Water Board at least yearly on the status and progress of implementation activities, and on whether current efforts are reasonably calculated and on track to achieve water quality standards within 40 years. For activities that rely on encouragement as a first step, a formal assessment of effectiveness of these efforts will be completed within 5 years from the date of U.S. EPA approval. A more extensive reassessment will occur after a date that is 10 years from the date the TMDL Action Plan is effective, or sooner, if the Regional Water Board determines it necessary. During reassessment, the Regional Water Board is likely to consider how effective the requirements of the TMDL Action Plan are at meeting the TMDLs, achieving dissolved oxygen and temperature water quality objectives, and protecting the beneficial uses of water in the Shasta River watershed.

~~VIII. Enforcem_nt~~

~~The Regional Water Board shall take enforcement actions for violations of the Shasta River TMDL Action Plan where elements of the TMDL Action Plan are made enforceable restrictions in a specific permit or order, as appropriate. Nothing in this TMDL Action Plan precludes actions to enforce any directly applicable prohibition found elsewhere in the Basin Plan or to require cleanup and abatement of existing sources of pollution where appropriate.~~

IX. Glossary

Biochemical Oxygen Demand:
An analytical method used as an indicator for the concentration of biodegradable organic matter present in a sample of water. It measures the rate of uptake of oxygen by micro-organisms in the sample of water over a given period of time, and can be used to infer the general quality of the water and its degree of pollution.

Chemical Oxygen Demand:
An analytical method commonly used to indirectly measure the amount of organic compounds in water. Most generally used to determine the amount of organic pollutants found in surface water (e.g., lakes and rivers), making it a useful measure of water quality.

Compliance and Trend Monitoring:
Monitoring intended to determine, on a watershed scale, if water quality standards are being met, and to track progress towards meeting water quality standards.

Effective Shade:
The percentage of direct beam solar radiation attenuated and scattered before reaching the ground or stream surface from the natural potential vegetation conditions.

Groundwater Accretion:
The gradual increase in surface flow in a stream resulting from the influx of groundwater.

Implementation Monitoring:
Monitoring used to assess whether activities and control practices were carried out as planned. This type of monitoring can be as simple as photographic documentation, provided that the photographs are adequate to represent and substantiate the implementation of control practices.

Instream Effectiveness Monitoring:
Monitoring of instream conditions to assess whether pollution control practices are effective at keeping waste from being discharged to a water body. Instream effectiveness monitoring may be conducted upstream and downstream of the discharge point or before, during, and after the implementation of pollution control practices.

Irrigation Return Flows: Same as Tailwater Return Flow.

Natural Potential Vegetation Conditions:
The most advanced seral stage that nature is capable of developing and making actual at a site in the absence of human interference. Seral stages are the series of plant communities that develop during ecological succession from bare ground to the climax community (e.g., fully mature, old-growth).

Nitrogenous Oxygen Demand:
The conversion of organic nitrogen to ammonia by bacteria, a process that consumes oxygen.

Potential Effective Riparian Shade:
That shade resulting from topography and vegetation that reduces the heat load reaching the stream. *The difference between existing (baseline) and potential solar radiation transmittance reflects the amount of effective riparian shade increase (i.e. reduced solar transmittance) that is required to achieve natural receiving water temperatures.*

Potential Percent Solar Radiation Transmittance:
Potential percent solar radiation transmittance is the amount of solar radiation that passes through the tree canopy and reaches the water surface when vegetation is at the site's potential, where a value of 1.0 represents no shade, and a value of 0.0 would represent complete shade.

Road:
Any vehicle pathway, including, but not limited to: paved roads, dirt roads, gravel roads, public roads and highways, private roads, rural residential roads and driveways, permanent roads, temporary roads, seasonal roads, inactive roads,

trunk roads, spur roads, ranch roads, timber roads, skid trails, and landings which are located on or adjacent to a road.

Salmonids:
Fish species in the family *Salmonidae,* including but not limited to, salmon, trout, and char.

Sediment:
Any inorganic or organic earthen material, including, but not limited to: soil, silt, sand, clay, peat, and rock.

Sediment Oxygen Demand:
Sediment oxygen demand refers to the consumption of oxygen by sediment and organisms (such as bacteria and invertebrates) through both the decomposition of organic matter and respiration by plants, bacteria, and invertebrates.

Solar Radiation Transmittance:
Solar radiation transmittance is defined as the amount of solar radiation that passes through the tree canopy and reaches the water surface. A value of 1.0 represents no shade; a value of 0.0 would represent complete shade, as measured by ?????

Tailwater Return Flow:
Water applied to a field for irrigation at rates that exceed soil infiltration and evaporation rates, resulting in runoff of irrigation water to a surface water body. Same as Irrigation Return Flows.
(end comment document)

Response: Regional Water Board staff thank you for your thoughtful input into preparation of the TMDL Action Plan. Many changes have been made to the Public Review Draft Action Plan. A number of your comments have been incorporated. The following identifies those comments that we did not incorporate in the revised Action Plan, with reference to the section in which the comment was made:

III. Temperature A. Shasta River Temperature Source Analysis - We did not delete the sentence "Human activities have affected, or have a potential to affect, each of these factors", because this is a finding of the TMDL analysis.
III. Temperature A. Shasta River Temperature TMDL - We did not change the temperature allocation for flow, because identifying maximum temperature reductions at each of the temperature compliance locations achieved from increased dedicated cold water instream surface flow is an integral goal of the TMDL.
Table 2 - We did not delete Table 2, because it presents the temperature load allocations for each source category.

Table 4 – Range and Riparian Land Management - We did not delete the "minimize, control, and preferably prevent discharge" language, as this is a cornerstone of the TMDL implementation approach.
Table 4 – Range and Riparian Land Management - We did not delete the language regarding the Executive Officer reporting to the Regional Water Board on the status of the preparation and development of appropriate permitting actions within 2 years of EPA approval of the TMDL, because this action is required for compliance with the State Board's Policy for the Implementation and Enforcement of the Nonpoint Source Pollution Control Program.
Table 4 – Water Use and Flow – We did not include 10-year and 20-year milestones for review of the effectiveness of measures to increase dedicated cold water instream surface water flow because it would be inappropriate to rely on the collaborative efforts if such efforts fail to yield measurable results. Progress reports and a five-year evaluation period are appropriately incorporated into the Basin Plan to determine the adequacy of the collaborative approach and to provide an incentive for parties to participate.
VIII. Enforcement – We did not delete this section, because enforcement is part of the regulatory framework.