Upper Klamath Lake Drainage
Total Maximum Daily Load (TMDL) and
Water Quality Management Plan (WQMP)

Response to Public Comments

Prepared by,

DEQ
State of Oregon
Department of
Environmental
Quality

May 2002

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Introduction

The Department appreciates the time and effort that the commentors put into reviewing the Upper Klamath Lake Drainage Total Daily Maximum Load (TMDL) and Water Quality Management Plan (WQMP) document. All comments have been considered by the Department and are addressed in the final documents that will be submitted to the Environmental Protection Agency (EPA) along with a copy of this responsiveness summary. EPA will then either approve the TMDL in its current form, or make changes prior to its approval. The WQMP is not subject to Federal approval.

A large scale TMDL and WQMP, like the one developed for the Upper Klamath Lake drainage, presents numerous challenges: different land management and ownership patterns, a mixture of nonpoint sources, various point sources, multiple water quality parameters of concern, numerous beneficial uses of water, endangered species, challenging and varied landscape, atmospheric and hydrologic parameters and layers of local, state and federal authorities. The Department recognizes that these and other challenges can create in the public a sense of confusion and concern when attempting to balance important ways of life, financial interests and water quality improvements.

The Draft Upper Klamath Lake Drainage TMDL and WQMP represents several years of data collection, multidisciplinary data analysis and research, and public participation. While considered large by any measure, the document is developed to be scientifically credible and offer practical water quality management strategies. The Department appreciates the assistance and cooperation by others. Over a decade of data collection, scientific investigations and public involvement have culminated in the completion of the Upper Klamath Lake Drainage TMDL and WQMP. The review of the TMDL and WQMP has been thorough and rigorous. Comments received by the Department can be characterized as numerous, thoughtful and informed. The involvement of others, by local experts in the drainage and academics renowned nationally, has led to improvements in the underlying science that will likely lead to better implementation of the TMDL and the ultimate attainment of water quality standards.

This response to comments only addresses comments received for the Draft Upper Klamath Lake Drainage TMDL and WQMP. Many of the comments received from different individuals and organizations overlap. The comments that are similar have been combined where appropriate for efficiency and to reduce duplication in our responses. Grammatical, editorial and formatting errors are not addressed here, but corrections have been made to the TMDL document. The general format of this document is a listing of comments and questions sorted by topic, followed by the Department's response.

The range and depth of comments that the Department received from local, state and federal agencies, environmental groups, industrial organizations, stakeholder organizations, researchers and individuals reflects a high level of interest in this TMDL effort. In some cases, the comments are competing and represent different views of the Clean Water Act, State authority, scientific literature, and the ability of designated management agencies to implement the TMDL. There is no question that the depth and rigor of the TMDL review and comments has resulted in improvements in the document.

The public comment period on the proposed submittal of the Upper Klamath Lake Drainage TMDL and WQMP opened December 6, 2001. The Department received several request to extend the comment period beyond the normal 30 day period. In response, the Department extended the comment period to March 28, 2002, making a total 112 days available for public comment. Both a public information open house and a public hearing were held at the Oregon Institute of Technology in Klamath Falls on December 20, 2001 and January 24, 2002, respectively. The majority of comments receive by the Department were in written or electronic

form; however, oral testimony has also been summarized and included in out response to comments.

Hardcopies of the Draft Upper Klamath Lake Drainage TMDL, WQMP and attachments were available upon request and in a downloadable format on the Departments website throughout the length of the comment period. Hardcopies of the documents were also made available to the public at the Klamath County Soil and Water Conservation District, the Klamath Tribes Department of Natural Resources and the Klamath Fall Public Library, and at the Department offices in Klamath Falls, Bend and Portland. In addition, approximately 200 hard copies (either printed or compact disk) were sent individuals requesting them.

List of Commentors

The following individuals provided comments on the TMDL during the Public Comment Period.

Comments Received From	Date Received	Media
City of Klamath Falls	1-24-02	mail
Wes Maurer	1-24-02	Oral
Edward Bartell	1-24-02	Oral
Gail Hildreth Whitsett	1-24-02	Oral
Doug Whitsett	1-24-02	Oral
Tracy Liskey	1-24-02	Oral
Don Haggland	1-24-02	Oral
Brad Harper	1-24-02	Oral
Steve Harper	1-24-02	Oral
Glen Barrett	1-24-02	Oral
Karl Scrone	1-24-02	Oral
James Palmer	1-24-02	Oral
Water for Life	1-25-02	Mail
Pat Larson	1-25-02	e-mail
Paul Measels	1-28-02	Mail
Dr. Kenneth Rykbost	1-28-02	Mail
David G.Potter	1-28-02	e-mail
Lillian Hill	1-30-02	mail
Robert Hawthorne	2-1-02	mail
Stan Geiger	2-7-02	e-mail
Mike Turaski	2-7-02	mail
Karl Havens - SFWMD	3-12-02	e-mail
USEPA	3-24-02	e-mail
Gail Hildreth Whitsett	3-18-02	mail
Northwest Environmental Defense Center	3-21-02	mail
Doug Whitsett	3-21-02	mail
Klamath Tribes	3-21-02	mail
Edward Bartell	3-27-02	mail
US Fish and Wildlife Service	3-28-02	mail
Water for Life	3-28-02	mail
California WQ Control Board	3-28-02	mail
Klamath Tribes	3-21-02	mail
USEPA	3-28-02	e-mail
Dick Siemens	3-28-02	e-mail
Pat Larson	3-28-02	e-mail

Overview of Concerns and Questions

Prior to responding to specific comments, the Department needs to make a few general statements that address common concerns and questions raised by commentors in the review of the Upper Klamath Lake Drainage TMDL and WQMP.

1. **Oregon is on a schedule to complete TMDLs by the end of 2007 as part of a court ordered consent decree and agreement with the EPA.** The Upper Klamath Lake Drainage TMDL is part of this statewide schedule.

2. **The water quality conditions in the Upper Klamath Lake, and the streams that drain to the lake, range from high quality to seriously impaired.** There is no question that water quality standards are being violated and that beneficial uses are compromised in the 303(d) listed portions of the drainage and in the lake itself. The TMDL and WQMP offer avenues and tools to start on a path of improving water quality and satisfy a requirement of the Clean Water Act, Oregon law, and more importantly, a necessity if we are to protect this valuable resource and save imperiled fish in the Upper Klamath Lake drainage.

3. **The science and data used to develop the TMDL is well established, peer reviewed and represents the best available information to base water quality management decisions**. The Department is dedicated to maintaining a high level of scientific rigor and credibility in all of our TMDL efforts. We also recognize that with any scientific endeavor, there are uncertainties and issues that still need to be studied and resolved. In time, we hope to work with local and academic experts to look for ways to further advancements in the collective knowledge base as it relates to the unique water quality problems in Upper Klamath Lake drainage.

4. **On the ground management activities need to change if we are to meet water quality goals of the Clean Water Act and State water quality standards in the Upper Klamath Lake drainage.** Land management such as forestry, agriculture, urban, rural residential, as well as point sources, are affected by the TMDL. The Department recognizes that this causes tremendous concerns for those that live on and use the land, especially those on or near streams, wetlands and other water bodies. The TMDL and WQMP will function as a tool that provides a foundation for reasonable and logical approaches to the changes necessary to improve water quality. Finally, the Department recognizes the water quality improvements resulting from current restoration projects and supports future restoration efforts in the drainage.

5. **Local, State and Federal agencies responsible for implementing the TMDL need to be able to adjust their programs over time.** The Department is relying on an adaptive management approach that is science based and changes over time to allow convergence on the appropriate solutions for water quality problems. We have expanded the adaptive management language in the TMDL and WQMP to make it clear that there is a mechanism for change and periodic review.

6. **Upper Klamath Lake has always been eutrophic and some consider it a dying lake, but settlement of the drainage and modern land uses have pushed the lake into a hypereutrophic state that creates poor water quality and harms aquatic species.** Watershed development, beginning in the late-1800's and accelerated through the 1900's, is strongly implicated as the cause of its current hypereutrophic character and poor water quality conditions. The Department feels that the current state of the lake is not natural, and consequently the TMDL and WQMP can make significant progress towards restoring water quality.

Comments, Concerns and Questions

I. General Comments and Questions

The Department needs to slow down the process and "get it right".

Response - Oregon is on a schedule to complete TMDLs by the end of 2007. The schedule is part of a Memorandum of Agreement (MOA) the Department has with the EPA. That MOA was developed, in part, to settle a lawsuit where certain groups filed suit against the EPA for Oregon's failure to complete TMDLs. The settlement was captured in a Federal Court Consent Order that directs EPA to establish TMDLs within a very short period of time if DEQ does not meet the Court Ordered Schedule. The Upper Klamath Lake Drainage TMDL is part of this statewide schedule, and must be completed by court order at this time.

The term 'statistically significant' or any reference to any quantification of data are generally absent.

Response - The TMDL document relies heavily on the statistical analysis of data. Examples of statistical analysis presented in the TMDL document are listed below:

- Presentation and discussion of the statistical relationships between pH, chlorophyll-a and lake total phosphorus concentration (p. 27-29)
- Water quality compliance statistics (p. 33)
- Spring/Groundwater total phosphorus concentration statistical summary (p. 53)
- Statistical peak flow quantification (p. 53)
- Statistically significant shifts in annual water yields (p. 56)
- Statistically significant water quality trends (p. 64, Attachment 2 – p. 107-110)
- Statistical accuracy of channel measurements (p. 103, Attachment 1 p. 138-143, 145-146)
- Sprague River dissolved oxygen model validation statistics (p. 133)
- Stream temperature data summary statistics (Attachment 1 - p. 30)
- Land cover physical attribute summary statistics (Attachment 1 - p. 158)
- Statistical validation – defined (Attachment 1 - p. 188)
- Effective shade simulation - statistical validation (Attachment 1 - p. 203)
- Stream temperature simulation - statistical validation (Attachment 1 - p. 228-230)

The definition used for SOD in this TMDL is more appropriate as a definition for chemical oxygen demand (COD) or even biological oxygen demand (BOD).

Response - As stated in Section 4.3.1.1 Sediment Oxygen Demand (SOD), "Sediment Oxygen Demand (SOD) is the oxygen demand exerted by the aerobic decomposition of sediments on the stream bottom." This, in our opinion, is an accurate description of SOD.

The TMDL related to other water issues in the basin

- The TMDL will help all Basin interests to begin halting and reversing the decline in water quality that has exacerbated the recent water shortages here.
- TMDL incorporated multiple lines of evidence to develop a comprehensive description of water quality conditions. Analytical efforts utilized to evaluate proposed management measures are well supported by current lake management techniques.

Response – The Department concurs and is hopeful that through continuing constructive dialogue we will continue to be a partner in the effort to improve water quality in the lakes and streams in the drainage.

II. Data Quality and Accuracy

Data is biased and inaccurate

- Data collected and analyzed by the Klamath Tribes cannot be considered independent and unbiased.
- Cited data was primarily collected and analyzed by employees of the Tribes that have repeatedly voiced strongly biased support of the Tribal socioeconomic interests.
- The Department should collect independent data and not rely solely on data collected by the Klamath Tribes for development of the Upper Klamath Lake TMDLs.
- Results from a Quality Assurance review of the Tribal data should be included in the TMDL document.
- The Department had predetermined conclusions in the TMDLs and using all the available data would have negated that conclusion.

Response – The concern for improper use of data is treated seriously by the Department. We are dedicated to maintaining a high level of scientific rigor and credibility in all of our TMDL efforts. With this said, the Department respectfully disagrees with the comments. The data in question have been reviewed by the Department and we believe that all of the data used in the TMDL, including the data collected by the Klamath Tribes, is presented without bias and was collected in accordance with monitoring protocols. Further, the data set for the lake is without question the best lake database of its kind in the region.

The extensive amount of water quality data collected in the Upper Klamath Lake Drainage is presented in Attachment 2 of the TMDL report. The data review presented in Attachment 2 is the first of its kind performed for Klamath Lake. The Department hopes that the high technical rigor and quality of the technical work presented in the TMDL speaks for itself, especially in terms of scientific objectivity.

Flow data used in loading calculations is inaccurate

- Inappropriate use of flow data for characterizing present loads to Upper Klamath Lake.
- Flow data are questionable for Sevenmile Canal and Wood River Dike Road that provides a basis for estimates of loading.

Response - Flow data for Sevenmile Canal and Wood River were collected following USGS flow measurement protocols. The field notes used for the data collection were reviewed by the Department and they met monitoring protocols. Further, the Department could not find inconsistencies between data measurements. For these reasons, the Department believes that the data in question are accurate.

The two locations noted by the commenter are important sources of nutrient loading to the lake. The Department feels that it is important to expand existing data sets and to adjust data collection methods to address local concerns. Therefore, the TMDL document has been modified to recognize the need for monitoring that improves accuracy and efficiencies in water flow measurements at these two sites. The following text was added to Section 6.2 Adaptive Management, page 156:

Install continuous flow gages at the mouth of Sevenmile Canal and Wood River at Dike Road*. Gaps in flow data occur in the lower Wood River and Sevenmile Canal monitoring sites during the 1991 to 1998 period of record. While it is recognized that these are difficult sampling environments, the installation and operation of Doppler gages will allow accurate quantification of flows and nutrient loading. These sites justify the monitoring expense due to their high rates of nutrient loading, the increased accuracy will translate to more accurate loading calculations, and due to the current and future restoration efforts there is a need for measurement of the potential loading reductions.*

Concerns over discussion of mass balances and water yields

- Conclusions estimating upstream and downstream impacts from stream diversions are not supported by existing scientific data.
- Presentation of mass balance using FLIR data is confusing. It is not clear what is implied by the equations.

Response – The TMDL addresses the issue of annual water yields in Chapter II Upper Klamath Lake TMDL. Instream flow volume is presented in Attachment 1 Upper Klamath Lake Drainage Stream Temperature Analysis. In summary, the lake TMDL presents a discussion of statistically significant increases in annual water yield since the 1950's and attributes these increases to channelization and reduction in evapotranspiration that accompanies land cover removal and disturbance. The stream temperature TMDL limits discussion of flow volume to mass balance derivations for the seasonal low flow period (i.e. late summer). The methods employed for mass balance development combine thermal infrared imagery, water right information and ground level gage data to develop mass balances that reflect all measurable water withdrawals, return flows, tributaries and ground water mass transfer processes. The mass balance is straightforward and innovative. While the hydrology of mass transfer processes is in some cases complex, the quantification of these mass transfer processes via gage data and FLIR imagery relies on algebraic relationships that are a function of temperature and flow rates.

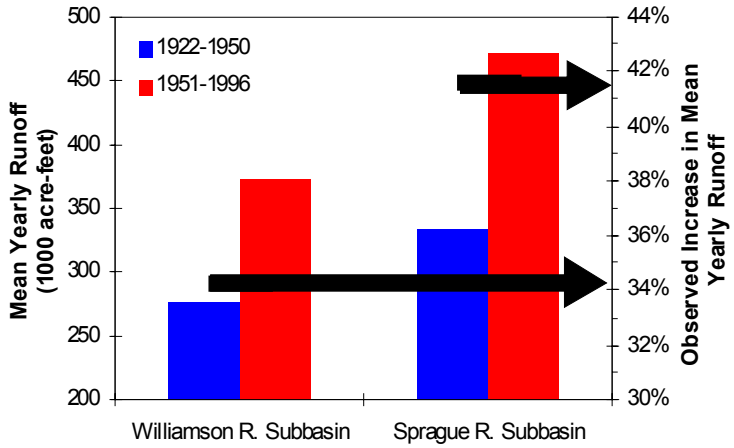
It is the position of the Department that annual water yields have increased since the 1950's in the Williamson and Sprague drainages, and that irrigation diversions can reduce instream flows during low flow periods. Both of these positions are supported by the scientific literature and data presented in the TMDL document. The discussion of instream flow and annual water yields taken directly from the TMDL is presented below.

Chapter II Upper Klamath Lake TMDL, Section 2.5.3.2 Upland Sources of External Phosphorus discusses the relationship between historic stream flows and development in the Williamson and Sprague Drainages as follows:

Historical flow data from the Williamson River and Sprague River drainages suggest that runoff patterns have changed as a result of human land use patterns (Riseley and Laenen 1998). Long-term climate data (precipitation and air temperature) were included in the analysis to account for the influence of climate on historical runoff data. Annual runoff in the Williamson River has been measured below the confluence and at the mouth of the Sprague River near Chiloquin. As depicted in Figure 2-19, the average yearly water yields have increased by 34% in the Williamson River subbasin and 42% in the Sprague River subbasin (Riseley and Laenen 1998).

Riseley and Laenen (1998) suggest that the statistically significant shifts in annual runoff are caused by human development and land use. The bulk of the irrigated acreage in the Williamson and Sprague drainages were developed between 1950 and 1980. While irrigated acreage cannot explain the increase in water yields, other associated landscape modification that accompany crop cultivation and livestock grazing may decrease summertime evapotranspiration and decrease the retention times of surface and subsurface water drainage. Timber harvest can accelerate the snow melt and decrease evapotranspiration, causing increased water yields (Rothacher, 1970). However, Figure 2-15 shows a significant decrease in timber harvests in the post-1950's period. Therefore, it is more probable that the combined effects of channelization and land cover removal/disturbance have increased water yields in the Williamson and Sprague River subbasins.

Two Sample Tests for Differences in Williamson and Sprague River Annual Runoff (1922-1950 and 1951-1996) (Risley and Laenen, 1998)

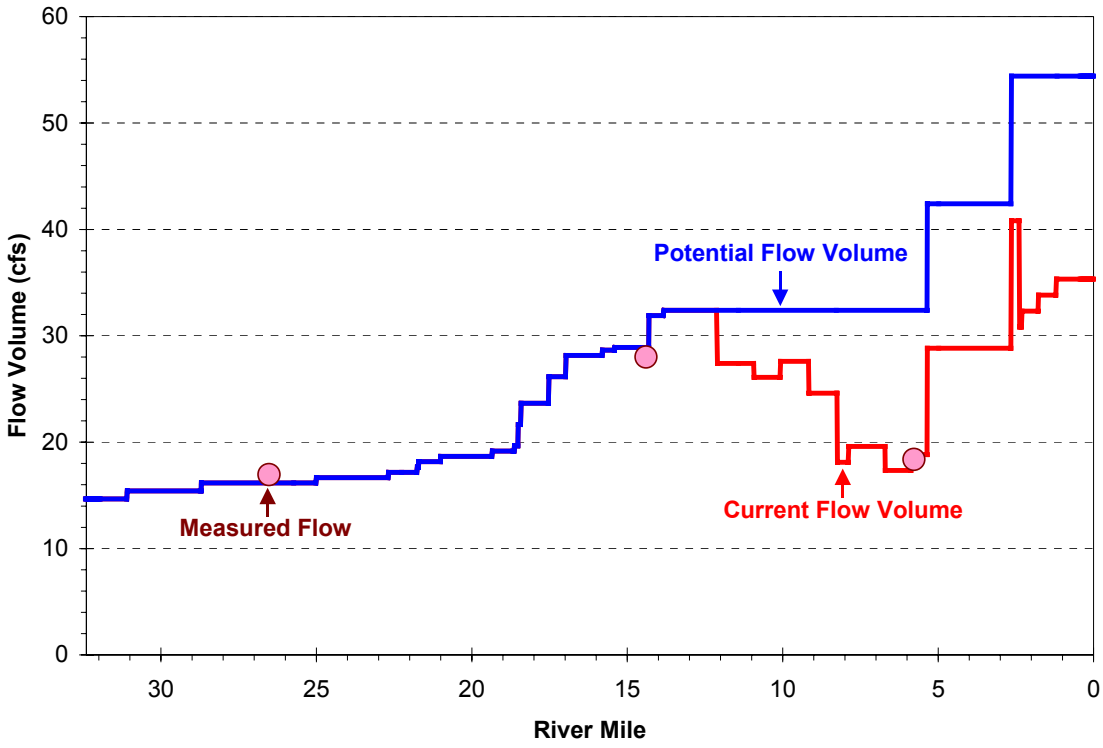


Attachment 1 Upper Klamath Lake Drainage Stream Temperature Analysis, Section 3.6 Hydrology presents a methodology for mass balance determination as follows:

FLIR sampled stream temperature data can be used to develop a mass balance for stream flow using minimal ground level data collection points. Simply identifying mass transfer areas is an important step in quantifying heat transfer within a stream network. For example, using FLIR temperature data, the Department identified thirty-one mass transfer areas occurring in the North Fork Sprague River. Several of the subsurface mass transfer areas were unmapped and the relative thermal and hydrologic impact to the stream system was not previously quantified. Further, surface returns from agriculture irrigation were not quantified in terms of flow rates or temperatures.

Water volume losses are often visible in FLIR imagery since diversions and water withdrawals usually contrast with the surrounding thermal signature of landscape features. Highly managed stream flow regimes can become complicated where multiple diversions and return flows mix or where flow diversions and returns are unmapped and undocumented. In such cases, it becomes important to establish the direction of flow (i.e. influent or effluent). With the precision afforded by FLIR sampled stream temperatures, effluent flows can be determined when temperatures are the same. Temperature differences indicate that the flow is influent. This holds true even when observed temperature differences are very small. The rate of water loss from diversions or withdrawals cannot be easily calculated. The Department estimates water withdrawal flow rates from the water right information maintained by Oregon Water Resources Department (OWRD).

Example of a mass balance developed for the North Fork Sprague River using instream gage data, FLIR temperature data and water rights data.



The draft TMDL and Kann reports conveniently leaves empirical erosional data out of their models.

Response - The Department does not know what specific empirical erosional data has been excluded since we do not have data that describes lake erosion in a statistical manner. We are willing to review such data when it is provided through the TMDL's adaptive management process.

III. Scientific Literature and Peer Review

There is a need to further review the TMDL

- The phosphorus TMDL cannot be accepted until a team of truly independent scientists conduct an unbiased study of Upper Klamath Lake Drainage.
- The draft TMDL must be extensively peer reviewed by an appropriate panel of impartial scientists prior to adoption.

Response - The Department believes that the multidisciplinary literature citations utilized in the TMDL are unbiased and sufficient to reasonably identify the causes of pollution that contribute to water quality standards violations. Further, the body of science is adequate to construct water quality models that quantify controlling mechanisms that affect water quality, allow pollutant loading analysis and facilitate accurate water quality analysis. In short, the Department feels that there is adequate data and research to complete this TMDL and satisfy technical and legal mandates required by the Clean Water Act. The data and science are likely sufficient for Federal acceptance of the TMDL document.

However, in order for this TMDL to be a successful effort that leads to water quality improvements, those that work and/or reside in the drainage must also accept the science underlying the TMDL. So while the Department is confident in the analytical work presented in the TMDL, we also acknowledge that additional studies will continue to improve the understanding of Upper Klamath Lake and the drainage. We welcome any future studies that investigate water quality in Upper Klamath Lake, and sincerely hope that any such effort is independent and unbiased. As new research becomes available, the Department is committed to updating the TMDL as needed.

The TMDL fails to recognize scientific literature published by OSU Extension Service

- Science presented in the TMDL conflicts with work by OSU resulting in inconclusive evidence.
- Research conducted by Rykbost, Hathaway and Todd with OSU Extension Service needs to be included in the TMDL.

Response - Many of the results and conclusions from Rykbost and Charleton (2001) and Hathaway and Todd (1993) are acknowledged and included in the TMDL. References from these two OSU publications are used in the Upper Klamath Lake Drainage TMDL for the following purposes (along with the page number of the actual TMDL citation):

- Discussion of water quality data availability (p. 33).
- Annual variations in lake total phosphorus concentrations (p. 37)
- Nutrient loading from the drainage of irrigation water from agricultural lands (p. 40)
- Reclaimed wetlands as nutrient sources (p. 43)
- Spring and groundwater total phosphorus concentrations (p. 51)
- Potential loading reductions that result from irrigation withdrawals (p. 55)
- Need for future research that quantifies nutrient loading from waterfowl and fish – personal communication (p. 56)

Four of the five research papers of Kann and Associates delineating phosphorus loading of Upper Klamath Lake were not peer reviewed prior to this draft TMDL.

Response - All of the reports used in the TMDL are peer reviewed and are deemed adequate for use in TMDL development. We look forward to resolving specific outstanding issues as they arise through the adaptive management process. It is also important to recognize that these, and other literature used in the TMDL, have limitations and flaws that generally accompany all scientific endeavors. The Department recognizes that there are limitations to the science and data used in the TMDL. With this acknowledgement, the Department maintains that the best available scientific information is used in the TMDL.

Kann's conclusion regarding lake levels and degraded water quality are not supported by the facts.

Response - The draft TMDL does not quote or refer to the statement in question. The relationship of lake levels to water quality is outside the scope of the TMDL.

The TMDL/WQMP needs to be rewritten to avoid misquoted references and the inclusion of articles that do not include data collection and experimental results. ODEQ must properly quote whole paragraphs within the context of their meaning from outside sources and not selectively use sentences, partial sentences or additions or quotes that are taken out of context to suggest a different meaning than the author intended.

Response – The Department has reviewed the text and made changes to reflect the comment. For example, the Draft TMDL stated on Page 44, Section 2.5.3.1, External Phosphorus Sources, referencing that "nutrient loading in Klamath Lake is unquestionably enhanced by the drainage irrigation water from agricultural properties adjacent to the lake" (Rykbost and Charlton 2001). The text has been changed to reflect the comment by including the entire paragraph as a quotation:

"Nutrient loading in Klamath Lake is unquestionably enhanced by the drainage of irrigation water from agricultural properties adjacent to the lake. Prior to reclamation, all of these properties were either permanent or seasonal wetlands. Following construction of dikes and drainage systems, the properties were managed for pastures and/or crop production. Soils are high in organic matter content and native fertility; therefore pastures and hay crops on these lands are generally not fertilized. Natural processes associated with mineralization of these soils release nutrients subject to transport in drainage water."

-Rykbost and Charlton, 2001

IV. TMDL Legal Mandates/Questions

The TMDL as written is not legal

- DEQ is acting outside the Clean Water Act by entering into an agreement with the U.S. EPA to set Non Point Source TMDLs.
- TMDLs for Nonpoint Sources are not legal under the Clean Water Act.

Response – Both the Department and the Environmental Protection Agency believe that the Clean Water Act and EPA's regulations require TMDLs to be established for water quality impaired water bodies regardless of whether the source of the pollutants is point sources, nonpoint sources or both. See CWA Section 303; 40 CFR 130.7; ORS 468B.035; ORS 468B.110. In addition, the Clean Water Act does not limit a state's efforts with respect to the establishing TMDLs, it merely establishes certain minimum requirements. CWA Section 510. By

statute, DEQ is authorized to take actions that are necessary or desirable to prevent water pollution or protect water quality. ORS 468B.010 to 468B.020."

An exception to the CWA is warranted

- Phosphorus levels in Upper Klamath Lake prehistorically exceeded federal standards and guidelines. Consequently, the conditions in Upper Klamath Lake demonstrate an exception to the CWA regulations for violations by natural source.
- CWA does not require load reductions for temperature where violations are due to natural cases.

Response - The TMDL was developed for Upper Klamath Lake to address both internal and external nutrient pollutant loads. As stated in Section 2.5.3.1 External Phosphorus Sources that despite high background phosphorus levels in Upper Klamath Lake drainage tributaries, data exists from numerous studies to indicate that phosphorus loading and concentration in Upper Klamath Lake are elevated substantially above background levels (Miler and Tash 1967;USACE 1982: Campbell et al. 1993; USGS Water Resources Data 1992-1997: EPA Storet Data 1959-1997). Further, a TMDL is required whenever the applicable standard is not attained regardless of historical or natural background levels. If naturally occurring background levels of a pollutant are prevent in a WQ standard from being attained, generally the standard may be changed. But until the standard is changed, the water body remains impaired for CWA purposes and a TMDL is required. With this in mind, we are proposing to reduce phosphorus loading where possible based on the analysis presented in the TMDL that demonstrates substantial benefits to lake water quality. Allocations and surrogate measures developed in the TMDL will result in substantial compliance with water quality standards.

The analysis of field data indicates that both anthropogenic and natural background sources of heating cause excessively warm stream temperatures. The analysis of stream temperature presented in the TMDL indicates that roughly 25% of the heat pollutants in the Upper Klamath Lake Drainage originate from anthropogenic nonpoint sources. The TMDL targets Oregon's stream temperature standard through allocations and surrogate measures that are based on meeting a condition where human sources of heating are minimized.

For the Upper Klamath Lake TMDL the natural condition provision OAR 340-41-965 (3) should be included on page 34 and referenced on page 72, Loading Capacity.

Response - The water quality objectives of the Upper Klamath Lake Drainage TMDL are to meet water quality standards and do not include reducing nutrient pollutant loading to "natural conditions." The Department feels that inadequate information exist to quantify "natural" nutrient pollutant loading rates and that Lake nutrient loading targets should be water quality based.

Since there are tribal lands in the basin, a statement needs to added which specifies that the TMDL only applies to State waters.

Response - The document has been modified to reflect the comment.

Not clear why some point discharges are not addressed.

Response - The Department has addressed all point sources potentially contributing phosphorus to Upper Klamath Lake and temperature to the Sprague and Williamson stream network. Those sources not specifically cited will be considered to have a zero waste load allocation. If the source has an NPDES permit (industrial, WWTP, MS4, etc.) then it's a point source and a waste load allocation (WLA) is developed in the TMDL and the permit will be updated accordingly. This doesn't necessarily mean that the permit will have numerical effluent limits.

Compliance with TMDL for storm water should be through an Implementation Plan not numeric limits.

Response - The Department agrees. Loads allocated for storm water are considered as part of the nonpoint source allocations and addressed with implementation plans by the appropriate designated management agencies (DMAs).

Executive Summary, Water Quality Summary – notes listings for flow modification. Clarification is needed.

Response - The document was edited to reflect the comment. The Executive Summary now states that:

Habitat and flow modification concerns are identified under biological criteria[1] standard exceedance and will be addressed in management plans to be developed by designated management agencies (DMAs). As they are not pollutants, TMDLs will not be developed for habitat and flow modification. Chlorophyll-a is listed in the Oregon Administrative Rules (OAR) as a "nuisance criteria" and will be addressed in the Water Quality Management Plan (WQMP). Though phosphorus is not listed as a pollutant, elevated levels of phosphorus are of concern and are associated with the increase in algal growth, decrease in DO and increase in ammonia levels.

Flow is also addressed in Section 1.2.2 Parameters not being addressed by a TMDL Habitat Modification: "Factors that were identified which affect fish assemblages include water quality, flow and habitat modification. TMDLs are being developed for temperature and dissolved oxygen throughout the subbasin which should address the water quality pollutants of concern and improve the water quality for the fish assemblages. Other factors such as habitat and flow improvements are not pollutants and a TMDL will not be developed. However, these factors will need to be addressed in management plans in order to have substantial improvements in the fish assemblages.

V. Natural Background and Sources of Pollutants

Upper Klamath Lake is dying through natural geologic processes that human interference can do nothing to halt.

Response – The TMDL demonstrates that significant improvement in water quality can be made through reduction of phosphorus loads to Upper Klamath and Agency Lakes. Upper Klamath and Agency Lakes have undergone dramatic changes in water quality concurrent with development within the Klamath basin. The TMDL documents this change as discussed in Section 2.5.3.2 Upland Sources of External Phosphorus.

[1] Biological criteria 303(d) listings do not have a pollutant identified, and thus, cannot have a TMDL pollutant loading limit. Instead, biological criteria listing (i.e. flow and habitat modifications) will be addressed in water quality management plans (Chapter VI).

The view of the lake as a naturally hypereutrophic system (Johnson et al. 1985) is consistent with its shallow morphology, deep organic-rich sediments, and a large watershed with phosphorus-enriched soils. However, watershed development, beginning in the late-1800's and accelerated through the 1900's, is strongly implicated as the cause of its current hypereutrophic character (Bortleson and Fretwell 1993)."

Concerns over spring nutrient data and how it is used in the TMDL

- The draft TMDL concludes that the normal background concentrations of phosphorus in all tributaries to Upper Klamath Lake were historically the same as phosphorus concentrations found in the spring at the headwaters of these tributaries. The assumption is neither logical nor reasonable.
- TMDL should include additional data collected from springs for determining phosphorus loads from natural springs.

Response – Phosphorus data collected by various organizations is summarized in Attachment 2. The Department agrees that background conditions for all areas of Upper Klamath Lake drainage are not equivalent to spring concentrations. The Upper Klamath Lake TMDL does not make any conclusions about the natural background condition of nutrient loading. The Department feels that inadequate information exist to quantify "natural" pollutant loading rates and that Lake nutrient loading targets should be water quality based. Information regarding the total phosphorus levels in springs is provided in Section 2.5.3.2 Upland Sources of External Phosphorus as "Water quality samples from fourteen springs are summarized in Attachment 2 and presented in Figure 2-16. Summary statistics were calculated for springs having at least seven samples. For comparison purposes, the average, median, geomean and standard deviation about the mean were calculated for each spring. Results indicate that for the 118 spring samples the average concentration of total phosphorus is 77 μg/L with a standard deviation of 22 μg/L about the mean."

Water quality compliance and anthropogenic pollutant loads

- The TMDL concludes that even with maximum reduction of anthropogenic load i.e. man made load water quality standards will not be achieved.
- The proposed 100% elimination of anthropogenic sources to Upper Klamath system is not a reasonable starting point for the TMDL and is not achievable.

Response – The Department is not targeting natural background loads or the elimination of all anthropogenic sources of total phosphorous. Section 2.6.1 Water Quality Attainment Analysis recognizes the variability of attaining water quality targets by stating that general compliance with water quality standards does not necessarily require that all measurements are below a specific number value at all locations (and depths) throughout all times of a year. A recognized reality is that water quality conditions are driven by variables (i.e. climate, hydrology, biochemical reactions, biological processes, etc.) that vary via human manipulations and natural forces over a space and time to the extent that 100% compliance is theoretically unattainable under any loading regime.

Given the monitoring and analytical limitations and the complexity of the lake and drainages, the selection of a TMDL targeted loading condition and compliance frequency ultimately becomes a decision the Department must make. The Department is targeting a 40% reduction in external total phosphorus loading. To address the feasibility issue raised by this comment and to be consistent with the overall reduction of external load by 40%, the point source waste load allocations have been modified to reflect a 40% reduction. This target acknowledges external load reductions that range from 33% to 47% that are documented in the literature (from Kann and

Walker, 2001). Other potential external loading reductions highlighted in Section 2.5.3 External Sources of Phosphorus demonstrate a potential 29% reduction in external total phosphorus loading from near-lake wetland restoration and an additional 18% reduction in external total phosphorus loading will result from upland hydrology and land cover restoration".

Upper Klamath Lake pH Response at Various External Total Phosphorus Load Reductions

	Frequency of pH Values > 9.0	
Reduction in External Loading	Year Round Mean	Summertime Mean June-July
0%	29%	75%
25%	16%	28%
30%	15%	19%
35%	5%	11%
40%	4%	6%
45%	0%	3%
50%	0%	0%
55%	0%	0%

TP Load Reduction ↓

↓ Improvement in pH

Phosphorus from natural background causes most or all of the external and internal phosphorus load to Upper Klamath Lake.

Response - Increased external loads from anthropogenic sources of phosphorus have driven the lake from eutrophic to hypereuthophoc condition over the past century. Section 2.5.2 Lake Response discusses the results of sediment core analysis related to historic water quality conditions in Upper Klamath Lake (Eilers et al , 2001). Sediment cores collected from UKL indicate water quality conditions in Upper Klamath Lake have changed dramatically as development of the surrounding watershed progressed. The National Research Council (NRC, February 2002) concluded that the water quality of Upper Klamath Lake has changed substantially over the last several decades. Further, the NRC noted that "mobilization of phosphorus from agriculture and other nonpoint sources, however, appears to have pushed the lake into an exaggerated state of eutrophication that involves algal blooms approaching the theoretical maximum abundances."

TMDLs should include a clause that if the targets to reduce phosphorus levels or temperature is below the proven background levels that the target can and will be changed to reflect the natural conditions beyond control.

Response - Section 6.2 Adaptive Management describes the conditions for review of the progress of the TMDLs and WQMP. In employing an adaptive management approach to the TMDLs and WQMP, the Department has the following expectations and intentions:

When ODEQ, in consultation with the DMAs, concludes that all feasible steps have been taken to meet the TMDL and its associated surrogates and attainment of water quality standards, the TMDL, or the associated surrogates is not practicable, it will reopen the TMDL and revise it as appropriate. ODEQ would also consider reopening the TMDL should new information become available indicating that the TMDL or its associated surrogates should be modified.

TMDL does not consider the loads from fish, waterfowl and other wildlife.

Response - The Department recognizes that wildlife will also excrete feces containing phosphorus. The TMDL for Upper Klamath Lake proposes that phosphorus loads into the lake be reduced by about 40%. It is not our expectation, however, that a portion of the reduction be obtained by removing wildlife from the lake or its tributaries.

The Department should include the results by Miller and Tash that the top one inch of UKL sediments contains enough nutrients to support algal blooms for decades.

Response – The TMDL clearly documents that the lake sediments are nutrient rich and offer an average of 61% of the total phosphorus loading to the lake (see Section 2.5.4 Internal Lake Sources of Phosphorus). Regardless of lake management, the lake sediments will continue to be a source of total phosphorus to the lake. Increases in the phosphorus flux to the water column accompany higher pH values since iron-bound phosphorus in both bottom and resuspended sediments causes increased competition between hydoxyl ions and phosphate ions decreasing the sorption of phosphate on iron. Evidence for this exists in Upper Klamath Lake where it was shown that the phosphorus associated with hydrated iron oxides in the sediment was the principle source of phosphorus to the overlying water, and that iron-phosphorus reaction decrease from May to June and July. Therefore, reduced external nutrient loading that helps prevent high lake pH values will also serve to reduce the flux of phosphorus from the lake sediments to the water column.

The Lake TMDL should consider the effects of natural erosion along the lake shore as a cause of increased sedimentation.

Response - Data regarding erosion along the lake shore was not used in the TMDL and has not been made available to the Department. Section 6.2 Adaptive Management recommends a science review team address future data collection needs. This certainly could be one of the data collection objectives.

The discussion of internal loads or natural background, is too brief.

Response – The TMDL has been modified to include an additional discussion and graphics in Section 2.5.4 Internal Lake Sources of Phosphorus.

VI. Modeling Approach

Concerns over model input data and calibration

- Models are only as accurate as the information parameters entered into the program. And in this case, the complete scientific information is lacking therefore the TMDL model outlined in this draft are without basis or accuracy.
- In reading the documents it is obvious to us that someone has “fiddled” with the model input and we suspect that the model validation is the result of his/her “fiddling” rather than any true validation that could be found on the ground.

Response –The Department agrees that accurate input data is necessary to simulate water quality parameters. A significant effort has been made to collect accurate and robust stream and lake information that can be used for modeling purposes. In the case of the lake, over ten years of water quality and hydrologic data is available. This data has been reviewed by several researchers, along with the Department, and is deemed accurate and consistent. When compared to other water quality samples reported by other researchers, there is no evidence that suggests errors (Rykbost and Charlton, 2001). And, data collection continues in both the lake

and streams that drain to the lake. As is the case with all modeling, more data leads to improve model development and calibration.

Simply put, the TMDL models are based on data, statistics and modeling that is firmly rooted in the best available science. While the Department feels that the TMDL models are accurate and helpful in TMDL target development, we also expected that modeling efforts will continue and that model performance will improve in the near future. The Department is committed to including new information or analysis as it becomes available.

The Department exclusively developed nutrient lake water models throughout the draft TMDL. Kann has previously stated that the available data precluded the use of a dynamic water quality model.

Response – The Department assumes that the comment reflects a misunderstanding of the statement that the available data was not sufficient to calibrate and validate a biochemical dissolved oxygen deterministic water quality model. No such model was used to develop TMDLs in UKLD.

Temperature TMDL is based on incorrect assumptions with compounded errors and relies too much on modeling instead of science.

Response - The science used to develop the temperature TMDL is well established and supported in the scientific literature. Modeling and mathematical analysis is a fundamental analytical approach to advanced water quality assessments. Failure to recognize modeling as an accepted scientific method is inconsistent with the literature and out of step with scientific consensus. As with any analysis, there is some uncertainty, regardless of data quantity/quality and analytical methods. As time goes on, scientist will continue to investigate stream temperature and reduce analytical uncertainties.

VII. Agricultural Lands as a Nutrient Source and Sump

The TMDL fails to recognize agriculture land uses as nutrient sumps

- TMDL does not consider the fact that phosphorus is removed from the system as water (containing natural phosphorus) is drawn from the UKL and tributaries and utilized by irrigating crops.
- The draft TMDL excludes data by Rykbost that clearly shows that the entire Klamath reclamation project acts as a huge phosphorus sump.
- Irrigators have created a phosphorus sump but are not being afforded credit for this phenomenon.
- The TMDL does not consider the fact that phosphorus is exported from the system as beef production from rangeland grazing.

Response – The draft TMDL acknowledges the potential to reduce phosphorus from irrigated agricultural lands. The Department states in Section 2.5.3.2 Upland Sources of External Phosphorus that some researchers and local stakeholders have speculated that water diverted out of streams for cultivated agriculture, irrigating crops and use by livestock result in reduction of phosphorus loads to surface waters that drain to Upper Klamath Lake (Rykbost and Charleton, 2001; Shappiro and Associates, 2001; Hathaway and Todd, 1993). Additionally, Section 2.5.3.1 External Phosphorus Sources, page 51, states that the adsorption to soils and suspended

sediments, ground water sinks, and bio-uptake, may reduce dissolved phosphorus before reaching the lake system.

Upper Klamath Lake Drainage TMDL was developed for the Upper Klamath Lake, Williamson, and Sprague Subbasins. The irrigated agricultural lands within the Klamath reclamation project lie within the Lost River and Upper Klamath River Subbasins. Analysis of water quality issues for these areas is outside the geographic scope of the UKLD TMDL.

The Department agrees that, to some degree, the production of forage and other vegetative crops with irrigation will consume some amount of phosphorus. The Department also believes, however, that some irrigation practices and use of reclaimed wetlands (flood irrigation, in particular) will contribute to phosphorus loading to the lake. The Department is willing to consider credit for phosphorus attenuation due to irrigation as long as it is part of an overall phosphorus mass balance analysis. This could be done under a Senate Bill 1010 agricultural management plan.

Cattle production obviously exports phosphorus from the basin in the form of meat. The problem posed by cattle, however, is that they also produce manure. They consume phosphorus in vegetation, some of which is converted to biomass (tissue or meat); another portion is excreted on to the land in the form of manure. The phosphorus in the manure is much more mobile (subject to dissolution in storm and irrigation runoff) than the phosphorus in the vegetation.

The Department is on the right track: overgrazing, removal of overhanging vegetation and irrigation effluent are major contributors to the lousy water quality.

Response – The Department agrees that some agricultural practices do contribute to poorer water quality. Agriculture, however, is not the sole contributor.

The TMDL singles out agriculture unfairly

- The draft TMDL concludes that man and domestic animals through the agrarian life style, farming is causing a significant phosphorus loading of Upper Klamath Lake. This is simply not true and cannot be substantiated in the report as presently written.
- The draft TMDL seemingly predetermined focus on irrigated agriculture as the primary cause of phosphorus loading.

Response -The Department is not targeting any specific land uses, including agriculture, in the Klamath Basin. Sources of phosphorus are from a variety of internal and external sources, as discussed in Section 2.5 Source Assessment. The TMDL is based on independent and unbiased research that can not be termed “predetermined.” Land uses only are included in the analysis where or when they specifically relate to water quality. As stated in the TMDL, an average annual load of internal load of phosphorus is the primary cause of phosphorus loading (i.e. 61% of the total phosphorus load to the lake). Agriculture does have a role to play in the reduction of external phosphorus loading to the lake since it is a dominant activity in the drainage and has been shown to be a source of pollutants.

Implementation plans rely too heavily on taking private agricultural lands out of production and if the TMDL is finalized, there will be no more agriculture in Upper Klamath Basin.

Response – The Department is not targeting any particular land use in the Klamath Basin. The development of the TMDLs analyzed pollutant loads from both natural and anthropogenic sources. Section 6.2 Adaptive Management states:

"In the UKL TMDLs, pollutant surrogate (total phosphorus) has been defined as alternative targets for meeting the TMDLs for pH and dissolved oxygen. The purpose of a surrogate is not to bar or eliminate human activity in the basin. It is the expectation, however, that this WQMP and the associated DMA-specific Implementation Plans will address how human activities will be managed to achieve the surrogate. It is also recognized that full attainment of pollutant surrogate (target load reduction) at all locations may not be feasible due to physical, legal or other regulatory constraints. To the extent possible, the Implementation Plans should identify potential constraints, but should also provide the ability to mitigate those constraints should the opportunity arise."

Kann's conclusion that animal waste is stored on the land during dry years is not supported.

Response – The TMDL does not quote or refer to the statement in question.

Estimates of cattle in the area covered by the Upper Klamath Lake Drainage are grossly overestimated.

Response – The comment has been noted and text was added to Figure 2-14, Historical timber harvest and total head of cattle for Klamath County that indicates that the head of cattle does not apply to Upper Klamath Lake drainage and that the drainage area comprises 55% of Klamath County. It is impossible to know the historical distribution of cattle within the county relative to the drainage. The figure is not used to depict exact numbers of cattle grazing and timber harvesting in the Upper Klamath Lake drainage, but instead, this figure is intended to convey the relative levels of cattle grazing and timber harvesting that has occurred in the past century.

VIII. Reclaimed Wetlands and Wetland Restoration Projects

Many comments focused on the water quality effects resulting from the restoration of the Wood River Ranch and similar restoration projects

- Estimates of phosphorus loading do not account for the fact that the Wood River Ranch, Agency Ranch, Agency Lake Ranch and parts of the Williamson River ranch are no longer in agricultural use.
- TMDL does not consider the fact that concentration of phosphorus coming off of Wood River Ranch is now the same or higher than it was previous to the five years ago when it was redeveloped for wetland.
- TMDL does not give credit for early actions taken since 1992 to reduce anthropogenic loading to UKL.
- Nutrient concentration and pump rates in the Wood River Wetlands indicate significant improvement in nutrient loading from this restored wetland.

Response - Data used to develop the Upper Klamath Lake nutrient loading analysis spans the period between 1991 and 1998. Since then, major restoration efforts have been started on the Wood River Ranch, Agency Ranch, Agency Lake Ranch and parts of the Williamson River Ranch. The TMDL does not account for current and future reductions that are likely taking place due to these restoration efforts, largely because the overall nutrient reductions associated with all of these projects is not yet known. However, quantification of the nutrient reductions from the Wood River and Sevenmile Canal restoration projects suggests that there has been significant progress towards nutrient reduction targets (see Table below). Calculation of nutrient loads from

Wood River Ranch using data collected by Snyder and Morace (1997) and Rykbost and Charlton (2001) indicate that delivery of total phosphorus to the Wood River has been reduced between 82% and 100% (BLM 2002). The Upper Klamath Lake TMDL document demonstrates that reclaimed wetlands are a large source of nutrient loading to the lake. Accordingly, the Department supports these restoration projects and looks forward to the acknowledgement of nutrient load reductions and water quality improvements.

Nutrient Concentrations and Annual Loading at Two Pump Sites in the Wood River Wetland (BLM 2002, data from Rykbost and Charlton 2001, Snyder and Morace 1997)

	Period	Samples (n)	Average Pumping Rate (cms)	Duration of Pumping (days)	Total Phosphorus		
					Concentration (µg/l)	Load (kg)	Reduction in Load
Sevenmile Canal	1993-1995	6	0.57	60	93	563.0	100%
	1999-2000	22	0.00	0	49	0.0	
Wood River	1993-1995	6	0.57	60	98	593.2	82%
	1999-2000	10	0.71	10	86	108.5	

The TMDL omits the benefits to assimilative capacity from the marshes surrounding UKL.

Response – The TMDL acknowledges the benefits of wetlands in sequestering nutrients. The last paragraph of Section 2.5.3.1 External Phosphorus Sources states that the results of the wetland studies suggest that a strategy for nutrient loading reductions to Upper Klamath Lake should include land use considerations, wetland restoration, re-inundation and reconnection to the lake. Quantification of nutrient reduction from reconnected wetlands is not possible using the available data. Section 6.2 Adaptive Management identifies a critical issue for continued data collection and research to "quantify phosphorus loads associated with reconnected wetlands."

The mechanism for phosphorus mobilization described in the TMDL involves oxidation of organic material and subsequent mobilization of phosphorus, but it is unclear whether this is the result of P becoming liberated from organic material or moving with the sediment.

Response – The Department assumes that this comment is in reference to reclaimed wetlands. The mechanism for phosphorus mobilization occurs when the peat decomposition in reclaimed wetland soils "introduces nutrients, namely nitrogen and phosphorus, into surface waters and shallow groundwater. The transport of nutrient rich water occurs rapidly via drainage ditches and pumping to the lake or tributaries to the lake (see Section 2.5.3.1 Reclaimed Wetlands as an External Source of Phosphorus).

It is not clear in the TMDL that changes in land use, including cattle grazing, are responsible for P loading in the Wood River reach.

Response - Total phosphorus loading in the lower Wood River (i.e. lower 5 river miles) is largely caused by the pumped and gravity drained return flows of nutrient rich water leached from peat soils associated with wetland reclamation. The specific land use is more of a secondary factor when considering nutrient loading associated with reclaimed wetlands near Upper Klamath Lake. The primary source of nutrients is aerobic decomposition of the peat soils themselves, not traditional human sources such as loading from livestock or fertilizers. While these and other land use related source of nutrients likely play a role in loading to the lake, the leaching of nutrients from peat soils is the largest source of nutrients coming from these reclaimed wetlands.

The TMDL does not account for the natural loading from wetlands, prior to reclamation.

Response - The TMDL quantifies nutrient loading that is derived from the decomposition of peat soils in reclaimed wetlands (see 2.5.3.1 Reclaimed Wetlands as an External Source of Phosphorus). This source of nutrients considers the nutrient leaching from peat soils that result from the drainage and use of wetlands that did not occur prior to reclamation. While the wetlands seasonally cycle nutrients they are often a nutrient sink due to bio-uptake and settling of organic material. There is not evidence in the literature that wetlands naturally were significant sources of nutrient loading to the lake.

IX. Springs/Seeps and Groundwater Phosphorus Concentrations

Phosphorus levels detected in water from artesian wells should be considered characteristic of groundwater discharging from springs and seeps.

Response - The Department has reviewed data from artesian wells and found that phosphorus levels measured in these wells are at least an order of magnitude higher than data collected from springs in the Upper Klamath Lake Drainage. Consequently, the Department believes that data collected from artesian wells is not considered representative of water discharging from springs and seeps in Klamath Lake. At this time, there is no direct evidence that groundwater from the confined aquifer tapped by the artesian wells is hydraulically connected to the springs and seeps in Upper Klamath Lake. Additional data, including water quality sampling of the springs in Upper Klamath Lake would be necessary to support this hypothesis.

Geologically speaking, it seems evident that seepage of undetermined springs and subterranean geothermal seepage through the phosphorus rich formation underline the lake are primary sources of lake nutrient phosphorus.

Response - Phosphorus loads from springs are presented in Figure 2-8 Annual external Total Phosphorus Loads. The available data indicate that springs, ungaged tributaries and miscellaneous sources account for a maximum of 18.1 metric tons of total phosphorus per year, or about 3.8% of the annual total phosphorus loading to the lake.

X. Lake TMDL – General

The Upper Klamath Lake TMDL should consider other measures in addition to reduction of phosphorus loading

- The TMDL is too narrow by using phosphorus reductions alone to improve water quality. Need additional control measures approach in accordance with EPA guidance.
- It is uncertain, based on information to date, whether external phosphorus load reductions alone can achieve water quality standards. DEQ should incorporate additional strategies including lake oxygenation and alternate reservoir operations.
- TMDL should consider the benefits to decreasing internal loads other than reduction of external loads, including higher lake levels, oxygenation, chemical amendments …etc.

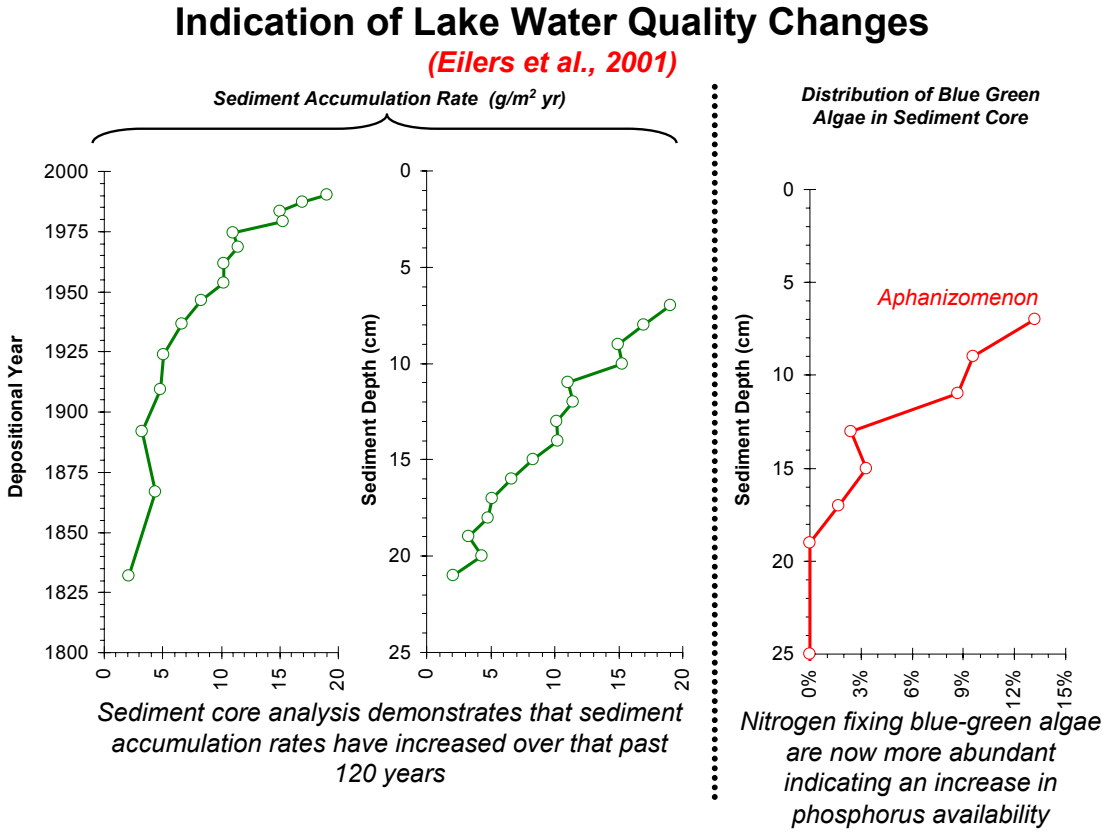
Response - The Department feels there are sufficient data, analytical rigor and literature to justify the total phosphorus loading limits developed in the TMDL. As required by the Clean Water Act Section 303(d)(1) and the Code of Federal Regulations (40 CFR 13.2(F-H), loading limits are

developed for the identified pollutant causing the water quality violations. Total phosphorus is the identified pollutant and loading reductions are developed that will result in meeting water quality standards.

The TMDL determined that a reduction of total phosphorus to the lake of 40% is necessary to meet water quality standards. The Department anticipates that this reduction would come from external sources to the lake, but does not limit or prohibit potential reductions in the internal load that might be achieved by other processes. At this time, limited information is available concerning the potential means for reducing the internal load. Should a designated management agency or other entity wish to pursue a program to reduce internal loads, the Department is willing to consider such a proposal and to adjust the expected external phosphorus loads accordingly.

Sediment core work by Eilers et al. is invalid due to contradictions, apparent mixing in top 25 cm of core, one sample not representative of the entire Lake, moisture content of core K1 not indicative of lake sediments.

Response – The Department has reviewed the sediment core work by Eilers et al. (2001). The scientific techniques utilized by Eilers et al are: a) well documented, b) widely used by paleolimnologists in Europe and North America and c) represent best available science. Consequently, the Department believes that the sediment core results should be presented in the TMDL document. The TMDL document was edited to reflect the comment concerning contradictions and apparent mixing in surficial sediments. A revised Figure 2-6 (presented below) does not utilize data in the upper 7 cm, however, Eilers et al. 2001 indicates that mixing was not apparent in sediments below 7 cm for the core in question.



According to research conducted by Carpenter et al. 1998, shallow lakes with large quantities of P stored in sediments can not be restored by limiting P input. At high levels of P, the lake is already irreversibly eutrophic regardless of policy choice.

Response - The referenced journal article by Carpenter et al. 1998 is a cost-benefit analysis of alternatives used to restore lakes. Cost benefit analysis is outside the scope of the TMDL. The Department believes that such issues are best described when developing detailed implementation plans rather than in the TMDLs. The TMDL (see Section 2.5 Source Assessment) presents a detailed analysis that demonstrates that Upper Klamath Lake is not "irreversibly eutrophic" and that reductions of external loading of phosphorus will achieve pH reductions to levels that comply with water quality standards.

The Lake TMDL does not have a numeric margin of safety

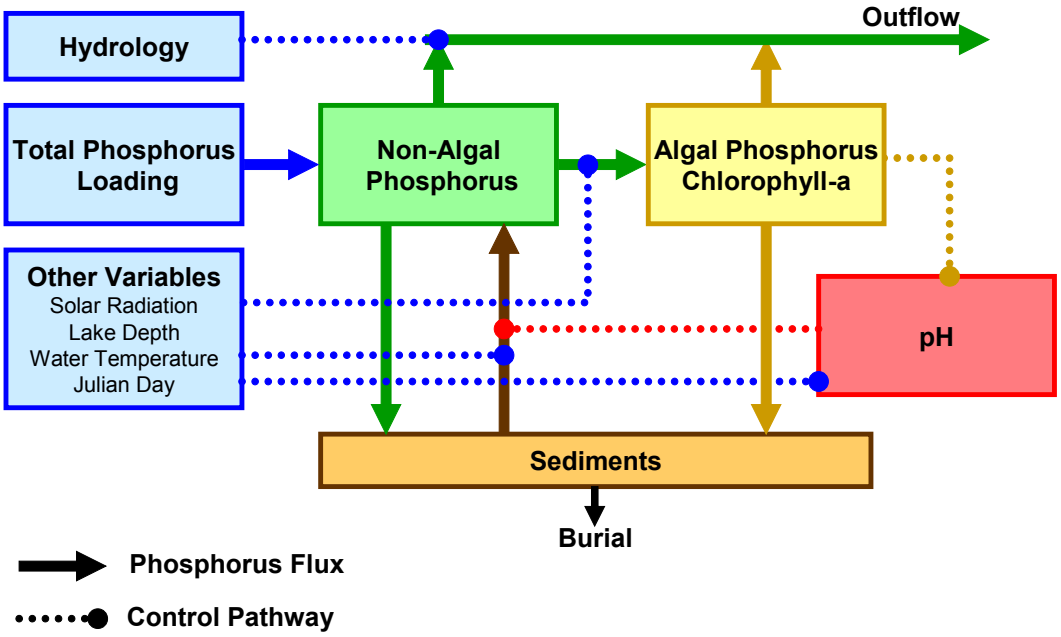
- For the Upper Klamath Lake TMDL the text implies that there is no margin of safety.
- Upper Klamath Lake TMDL does not specify a margin of safety.

Response - Section 2.9 Margins of Safety states that "a MOS has been incorporated into the calculation of waste load and load allocations. Specifically, an implicit margin of safety has been incorporated into the calculation of waste load and load allocations. Specifically, conservative assumptions are used in derivation of numeric targets and conservative assumptions are used when developing numeric model applications."

The Upper Klamath Lake TMDL does not consider secondary factors affecting water quality, including: nitrogen loading, light, water temperature.

Response – The lake pH model used in the TMDL (Walker 2001) includes the effects from light and water temperature (see diagram below)

Flow Chart of the pH Model (Walker, 2001)



Hathaway and Todd (1993) supports a load from external sources of zero to ten percent, depending on stream reach.

Response - The Department has reviewed the study by Hathaway and Todd (1993). The report does not seem to support the statement, "….load reduction for external phosphorus of zero to ten percent, depending on stream reach". Hathaway and Todd's (1993) quantification of phosphorus loads related to specific land use in the Annie Creek watershed is problematic for the following reasons:

- Transport of suspended solids is the predominate process affecting total phosphorus loading in Annie Creek.
- Annie Creek is a "flashy" stream with short duration, high flow events that carry phosphorus laden suspended solids from federally managed lands onto private agricultural lands. Consequently, sampling events may not capture the vast majority of the nutrient load.

The TMDL document acknowledges the work by Hathaway and Todd (1993) (see Response to Comment 10) and recommends further research to address this issue by the science review team as discussed in Section 6.2 Adaptive Management.

Upper Klamath Lake TMDL needs to specifically address dissolved oxygen and chlorophyll-a, in addition to pH

- For the Upper Klamath Lake TMDL, the Department should specifically address chlorophyll-a and DO, including Water Quality Standards Attainment Analysis.
- The TMDL focuses on the relationship of pH to phosphorus. The TMDL should place more emphasis on DO.

Response – The Department believes that lake pH, dissolved oxygen and chlorophyll-a water quality issues are addressed in the TMDL to the best extent that science currently allows.

For the Upper Klamath Lake TMDL add phosphorus, pH and DO to the condition of no allocation for future sources.

Response - Dissolved oxygen (DO) and pH are addressed in the TMDL through the control of phosphorus. The text of the TMDL was modified to indicate that there is no allocation for future sources of phosphorus unless a future load can be offset by the reduction of a load elsewhere in the system.

The Upper Klamath Lake TMDL should consider the loads from failed septic systems.

Response - A septic system that is failing and discharging raw sewage into any public water is violating state law. If the TMDL were to identify failing systems in the TMDL, the systems would be given a zero allocation (the discharge would be prohibited). Klamath County Environmental Health Department, under contract with ODEQ, has an on-going program to identify failing system and repair them.

It is not apparent if Upper Klamath Lake TMDLs apply to critical seasons.

Response – The lake TMDLs apply year round. Clarification was added to Section 2.4 Seasonal Variation - CWA §303(d)(1).

XI. Stream Temperature TMDL – General

The stream temperature standard (64°F) is too low, unrealistic, unattainable and overstates human contributions.

Response – Several numeric and qualitative trigger conditions invoke the temperature standard. Numeric triggers are based on temperatures that protect various salmonid life stages. Qualitative triggers specify conditions that deserve special attention, such as the presence of threatened and endangered cold water species, dissolved oxygen violations and/or discharge into natural lake systems. The occurrence of one or more of the stream temperature triggers will invoke the temperature standard. Once invoked for a water body the temperature standard specifically states that "*no measurable surface water temperature increase resulting from anthropogenic activities is allowed"* (OAR 340-41-0962(2)(b)(A)). Thermally impaired water bodies in the Upper Klamath Lake drainage are subject to the temperature standard that is based on a condition that minimizes human caused stream temperature increases.

Since stream temperature results from cumulative interactions between upstream and local sources, the TMDL considers all surface waters that affect the temperatures of 303(d) listed water bodies. For example, the Williamson River is water quality limited for temperature. To address this listing in the TMDL, the Williamson River and all major tributaries are included in the TMDL analysis and TMDL targets apply throughout the entire stream network. This broad approach is necessary to address the cumulative nature of stream temperature dynamics.

Since the temperature standard specifies that "*no measurable surface water temperature increase resulting from anthropogenic activities is allowed*" an important step in the TMDL is to examine the anthropogenic contributions to stream heating. The TMDL establishes that that the anthropogenic contributions of nonpoint source solar radiation heat loading results from varying levels of decreased stream surface shade throughout the subbasin. Decreased levels of stream shade are caused by near stream land cover disturbance/removal and channel morphology changes. Other anthropogenic sources of stream warming include stream flow reductions and warm surface water return flows.

As defined in this TMDL, system potential is the combination of potential near stream land cover condition and potential channel morphology conditions. Potential near stream land cover is that which can grow and reproduce on a site, given: climate, elevation, soil properties, plant biology and hydrologic processes. Potential channel morphology is developed using an estimate of width to depth ratios appropriate for the Rosgen channel type regressed from regional curves. System potential does not consider management or land use as limiting factors. In essence, system potential is the design condition used for TMDL analysis that meets the temperature standard by minimizing human related warming.

- System potential <u>is</u> an estimate of the condition where anthropogenic activities that cause stream warming are minimized.

- System potential <u>is not</u> an estimate of pre-settlement conditions. Although it is helpful to consider historic land cover patterns, channel conditions and hydrology, many areas have been altered to the point that the historic condition is no longer attainable given changes in stream location and hydrology (channel armoring, wetland draining, urbanization, etc.).

Heat is the identified pollutant. Nonpoint sources are expected to eliminate the anthropogenic portion of solar radiation heat loading. Point sources are allowed heating that results in less than 0.25°F increase in a defined mixing zone. Allocated conditions are expressed as heat per unit time (kcal per day). The nonpoint source heat allocation is translated to effective shade surrogate measures that translates the nonpoint source solar radiation allocation. Effective shade

surrogate measures provide site-specific targets for land managers. And, attainment of the surrogate measures ensures compliance with the nonpoint source allocations.

It is important to acknowledge limitations to analytical outputs and to indicate where future scientific advancements are needed and to provide some context for how results should be used in regulatory processes, outreach and education and academic studies. The past decade has brought remarkable progress in stream temperature monitoring and analysis. Undoubtedly, there will be continued advancements in the science related to stream temperature.

While the stream temperature data and analytical methods presented in TMDLs are comprehensive, there are limitations to the applicability of the results. Like any scientific investigation, research completed in this TMDL is limited to the current scientific understanding of the water quality parameter and data availability for other parameters that affect the water quality parameter. Physical, thermodynamic and biological relationships are well understood at finite spatial and temporal scales. However, at a large scale, such as a subbasin or basin, there are limits to the current analytical capabilities. The state of scientific understanding of stream temperature is evolving, however, there are still areas of analytical uncertainty that introduce errors into the analysis. Three major limitations should be recognized:

1. Current analysis is focused on a defined critical condition. This usually occurs in late July or early August when stream flows are low, radiant heating rates are high and ambient conditions are warm. However, there are several other important time periods where fewer data are available and the analysis is less explicit. For example, spawning periods have not received comparable treatment as the period of seasonal maximum stream temperature.

2. Current analytical methods fail to capture some upland, atmospheric and hydrologic processes. At a landscape scale these exclusions can lead to errors in analytical outputs. For example, methods do not currently exist to simulate riparian microclimates at a landscape scale.

3. In some cases, there is not scientific consensus related to riparian, channel morphology and hydrologic potential conditions. This is especially true when confronted with highly disturbed sites, meadows and marshes and potential hyporheic/subsurface flows.

As mandated by the stream temperature standard, this TMDL is designed to minimize human related warming. The Department feels that the anthropogenic source analysis is robust and accurate. When heat loading rates are quantified and analyzed, the results indicate that human related sources of heat can be minimized to negligible to levels specified in the TMDL. The Department feels that this approach affords the maximum possible level of protection to biota that is practical while considering limiting physical landscape, hydrologic and atmospheric factors indigenous to the Upper Klamath Lake drainage.

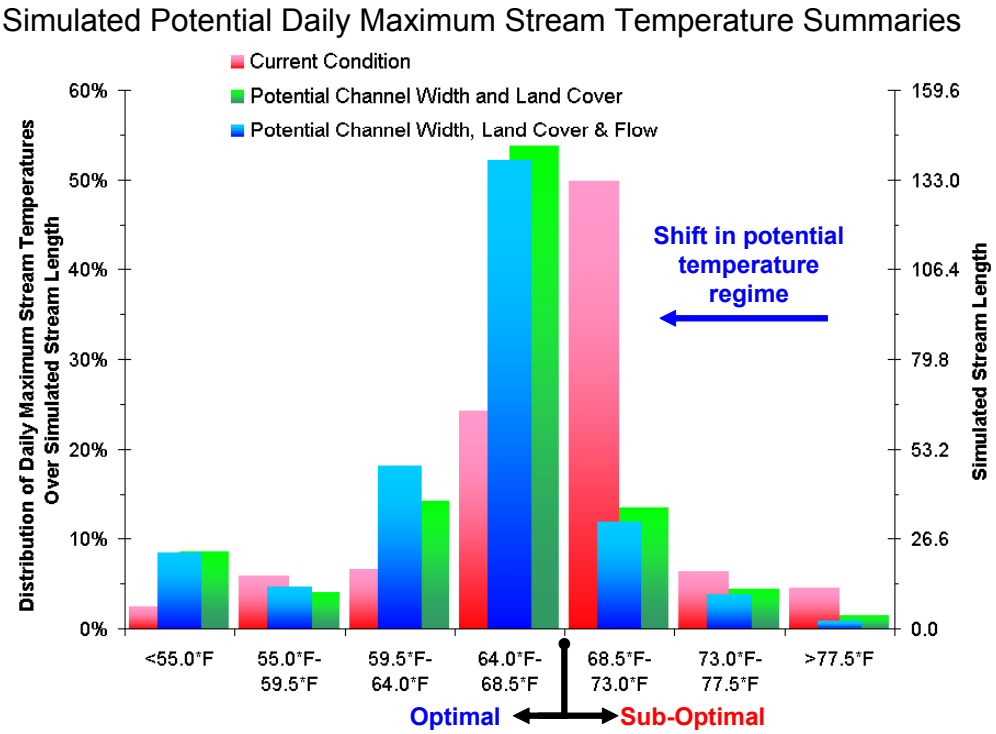
How do the TMDL derived system potential temperatures relate to biological thermal impacts and protection?

- Temperature TMDL fails to address the biological temperature needs.
- The significance of 68.5 F should be explained.

Response - The Proposed EPA Region 10 Guidance for State and Tribal Temperature Water Quality Standards targets 68^{o}F as the juvenile rearing standard for interior non-anadromous redband trout. The TMDL notes the significance of 68^{o}F since redband trout are a sensitive beneficial use and the EPA document represents the most recent science relating to the biological thermal needs of these trout.

The document has been edited to address the comment as follows:

- Spatial and temporal thermal variability includes departures from biologically derived temperature threshold conditions (i.e. EPA proposed Redband Trout limit of 68°F). This holds true even in the defined "potential conditions"
- The shift in stream temperature distribution is favorable to fish. An additional 117 stream miles are expected to become optimal, making sub-optimal thermal exposure very limited in the potential condition.

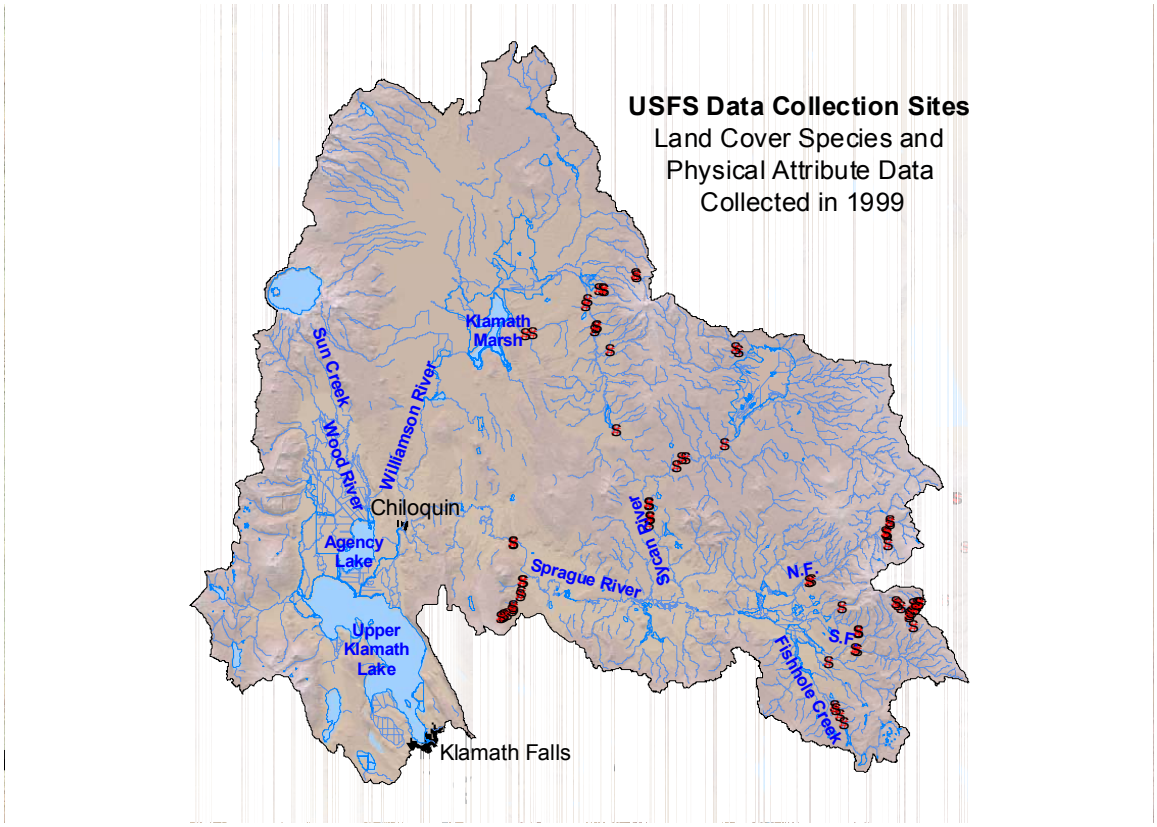


Temperature TMDL does not provide elements that were used to justify site potentials that can support vegetative components suggested in the model output.

Response – The Department makes an earnest effort to determine potential vegetation targets that are attainable, including: setting targets based in the existing conditions, referencing healthy sites, and when faced with uncertainty at a particular site or vegetation species group, developing ranges of targets. The process of developing potential near stream land cover data should start with definitions and a discussion of the context in which it is used in the TMDL methodology. **Potential near stream land cover** is that which can grow and reproduce on a site given plant biology, site elevation, soil characteristics and local climate. Potential near stream land cover does not include considerations for resource management, human use or other human disturbance. Natural disturbance regimes (i.e. fire, disease, wind-throw, etc.) are also not accounted for in this definition. There is an assumption that despite natural disturbance, potential near stream land cover types (as defined) will survive and recover from a natural disturbance event. **Potential near stream land cover**, by definition, is the condition that meets Oregon's stream temperature standard, and is therefore, targeted in the TMDL

The land cover targets in the TMDL are developed from data collected at sites throughout the drainage (see the analysis presented in Attachment 1 – Section 3.5.3 Near Stream Land Cover – Potential Condition Development). The USFS collected species and physical data at 56 sites, resulting in 616 discrete land cover species identifications in the Sprague River subbasin and the

Williamson River subbasin during 1999. Data were then statistically summarized by land cover type to determine the average land cover heights and variability within the data stratification.



Summarized Land Cover Height Data (USFS data)

Land cover Type	Samples	Median Height (feet)	Average Height (feet)	Standard Deviation (feet)	Maximum Height (feet)	Minimum Height (feet)
Graminoid/Forb	362	2.0	1.8	0.9	7.0	0.3
Wetland Shrub	125	4.0	6.3	5.0	38.0	1.0
Dryland Shrub	22	3.0	3.4	1.7	8.0	1.0
Western Juniper	9	15.0	17.6	10.0	40.0	7.0
Other Conifer	73	70.0	66.7	14.9	100.0	15.0
Deciduous	3	45.0	41.0	31.2	70.0	8.0

The Department recognizes that developing land cover potentials can often be complex and has attempted to simplify the procedure for developing potential land cover data sets with simple rules based upon clearly stated assumptions. And, the Department acknowledges that in some areas determining the potential land cover type/distribution is not a well understood science. This is particularly true for low gradient meadow systems that have been subject to the removal of woody shrubs such as willows. Literature and local expertise do not always agree on the land cover potential of a given site. In the TMDL, the Department acknowledges these uncertainties by using a high and low range of land cover types/attributes to account for the range created in the literature, evident in ground level studies/data or provided by differences in the professional judgment of local experts in the Upper Klamath Lake drainage and surrounding areas.

Rules for Developing Potential Near Stream Land Cover

1. Barren land cover types that can grow land cover (i.e. clearcut areas, embankments, forest roads, etc.) are assigned the nearest adjacent non-developed land cover type.
2. Developed land cover types that can grow land cover are assigned the nearest adjacent non-developed land cover type.
3. Pastures, cultivated fields and lawn land cover types are assigned the nearest adjacent non-developed land cover type.
4. Instream and channel structures (i.e. dikes, canals, etc.) land cover types that can grow land cover are assigned the nearest adjacent non-developed land cover type.
5. Water and barren rock cannot grow land cover and are not changed.
6. The Klamath Marsh land cover type is not changed due to lack of information regarding potential land cover types/attributes.
7. The Western Juniper land cover type is not changed due to lack of information regarding potential land cover types/attributes.
8. The large conifer land cover type is considered at potential and land cover type/attributes are not changed.
9. The large hardwood land cover type is considered at potential and land cover type/attributes are not changed.
10. The large mixed conifer/hardwood land cover type is considered at potential and land cover type/attributes are not changed.
11. The upland shrub land cover type is considered at potential and land cover type/attributes are not changed.
12. The wetland shrub land cover type is considered at potential and land cover type/attributes are not changed.
13. The small conifer land cover type is assumed to grow to the large conifer land cover type/attributes.
14. The small hardwood land cover type is assumed to grow to the large hardwood land cover type/attributes.
15. The small mixed conifer/hardwood land cover type is assumed to grow to the large mixed conifer/hardwood land cover type/attributes.
16. In the high range, the upland grasses land cover type is assumed to grow upland shrub land cover type/attributes at a 75% probability distribution and upland grasses land cover type/attributes at a 25% probability distribution.
17. In the high range, the wetland grasses land cover type is assumed to grow wetland shrub land cover type/attributes at a 75% probability distribution and wetland grasses land cover type/attributes at a 25% probability distribution.
18. In the low range, the upland grasses land cover type is assumed to grow upland shrub land cover type/attributes at a 25% probability distribution and upland grasses land cover type/attributes at a 75% probability distribution.
19. In the low range, the wetland grasses land cover type is assumed to grow wetland shrub land cover type/attributes at a 25% probability distribution and wetland grasses land cover type/attributes at a 75% probability distribution.
20. Land cover density for each land cover type remains unchanged between current and potential conditions.

Surrogate models indicating that shade significantly effects stream heating violate the laws of thermodynamics.

Response – The Department's analytical methods are completely consistent within the laws of thermodynamics (and common sense). Stream water will heat and cool in response to thermal gradients and radiant processes that deliver and remove heat. Solar radiation is a significant source of heat. With few exceptions, the literature is uniform in documenting the importance of shade in reducing stream heating processes and consistent in analytical methods that comply with basic thermodynamic and physical laws.

Temperature TMDL does not target critical dry water year type.

Response – The temperature TMDL was based on available data collected during the critical season for 1999 and 2000. The analysis was conducted using data from these two years. It is true that the low flow seasons are not addressed in the TMDL. However, the best available data was used and the analysis is completed to the extent that the data allows. Continued study of low flow rate relations to stream temperature would be required to develop new conclusions or modify existing conclusions. As it stands, the TMDL found low flow rates to be an important factor in stream heating rates and quantifies low flow conditions to a high degree of accuracy.

DEQ should take flow and stream morphology into account in the temperature TMDL and WQMP.

Response – The analysis presented in the stream temperature TMDL is largely based on near stream land cover, flow and stream morphology. The temperature TMDL targets system potential conditions as the combination of potential near stream land cover condition and stream channel morphology conditions that meets the temperature standard by minimizing human related warming.

How are the temperature NPS loads allocated by DMA and/or land use? Also, include allocations for future point sources.

Response - The solar radiation heat loads are allocated to background nonpoint sources. These solar radiation heat loads are linearly translated to effective shade surrogate measures. Due to the mosaic and multiple patterns of land uses, the solar heat load allocations are not broken down by land uses or DMAs. However, the surrogate measures provide high resolution and accurate targets for DMAs and private citizens.

Include separate section for Critical Conditions and Reasonable Assurances in Temperature TMDL chapter.

Response – The document has been edited to reflect the comment.

The stream temperature TMDL does not quantify loads from geothermal and loading from Sycan and Klamath marshes.

Response – Despite extensive ground level and remotely sensed temperature data, the Department does not have data that indicates the presence of geothermal hot springs. In the event that geothermal mass transfers to the stream system do exist, they should be considered background sources of heat. Heat loads from Klamath Marsh and Sycan Marsh are included in the TMDL as natural background sources of heat.

Management options besides shade surrogate to cool the river should be considered.

Response - Management options other than the effective shade surrogate are targeted for the temperature TMDL. Land cover targets and channel morphology targets are also used as surrogate measure for nonpoint source pollutant loading. Finally, while shade does not directly cool water, it has been shown to slow rates of heating by attenuating short wave radiation.

XII. Sprague River DO/pH TMDL – General

Sprague River pH and dissolved oxygen allocations should consider nutrient reductions

- The temperature TMDL as a target for achieving Sprague River pH and DO standards is insufficient approach to improve WQ standards.
- The DO TMDL for the Sprague should link to the Upper Klamath Lake phosphorus TMDL.
- For the Sprague River TMDL, measures should also be taken to limit nutrients as well as temperature.
- The TMDL for UKL emphasizes sources of phosphorus as a pollutant but fails to evaluate total phosphorus in the Sprague River TMDL for pH and DO.

Response - Water quality modeling for the pH and dissolved oxygen presented in Chapters IV and V demonstrates that when meeting stream temperature surrogate measures (presented in Section 3.7 Surrogate Measures – 40 CFR 130.2(I)) that relate to channel morphology and near stream land cover, water quality standards will be attained. Further, stream temperature reductions that are expected under the stream temperature TMDL reduce primary productivity and further improve water quality (i.e. pH and DO). The phosphorus TMDL for Upper Klamath Lake will require phosphorus reductions in all of the tributaries to the lake. These nutrient reductions (presented in the Upper Klamath Lake TMDL) are considered an implicit margin of safety for the Sprague River pH/DO TMDL.

Water levels (flow) should be considered as a factor that affects DO.

Response – The technical analysis in Chapters IV and V demonstrates compliance with pH and DO water quality standards is achieved with existing flow rates.

DO sampling locations need to be within the critical habitat area for the Redband trout.

Response – All of the public waters covered by these TMDLs are considered habitat for the Redband trout. The Department feels that adequate monitoring was completed to recognize that some areas of the Sprague River that have DO violations will meet water quality standards with improvements to land cover and channel morphology. With this said, the Department recognizes that DO is a complex WQ parameter and agrees that future monitoring will improve the overall understanding of DO and biological relationships.

TMDL only shows how the allocations will attain the absolute minimum, without demonstrating that this is the most limiting and therefore meeting the other parts of the DO standard.

Response – The analytical results presented in the TMDL demonstrate that the minimum DO concentration will be 6.4 ppm, compared to the 6.0 ppm water quality standard. The analysis was focused on the summer low-flow season where sufficient data for model calibration were available and the 6.0 ppm DO criteria applied. The TMDL could be refined in a future iteration with modeling that targets other DO criteria if additional seasonal data necessary for model calibration are collected.

XIII. Water Quality Management Plans and Implementation

As written the rules and plan will be enforced based on maybe, potential or speculative causes. This is unrealistic.

Response - The Department believes the analysis that supports the TMDLs was done with the best information and science available. With that said, there is always some level of uncertainty. The TMDL also contains an adaptive management process that will review new information and allow for adjustments to the TMDL as needed.

Change "Conservation Reserved Enhancement Program" to Conservation Reserve Enhancement Program.

Response – The document has been edited to reflect the comment.

The bulleted item "Rules under Senate Bill (SB) 1010…"under the list of Oregon Department of Agriculture items should be deleted, because it is a sub-part of the bulleted item "Agricultural Water Quality Management Plan Development…"

Response – The document has been edited to reflect the comment.

The Klamath Tribes should be listed as a DMA.

Response – This TMDL does not apply to Tribal lands. EPA is responsible for developing TMDLs with the Klamath Tribe for all Tribal lands. Consequently, the Klamath Tribes are not listed as a DMA in this TMDL effort.

Adaptive management is needed to address uncertainties of the TMDL.

Response – The Department agrees. Please see Section 6.2 Adaptive Management.

In addition to measuring water quality surrogates and TMDL targets, the adaptive management process should revisit the underlying beneficial uses to measure progress in the future.

Response - Under the federal Clean Water Act, the Department periodically revisits its water quality standards and the underlying beneficial use designations. Should the adaptive management process develop information concerning beneficial uses or water quality standards, the Department would consider such information in its standards review process.

Adaptive management should include characterization of water quality discharging from Upper Klamath Lake when the lake TMDL targets are met. These estimates would be appropriate boundary conditions for the Klamath River TMDL.

Response – The Department agrees that establishment of the boundary condition between Upper Klamath Lake and the Klamath River will be important. This step, however, will be accomplished when the Department develops the TMDL for the Lost River drainage which includes the Klamath River.

The document needs to include a fiscal impact analysis.

Response – Cost benefit analysis is outside the scope of the TMDL process. The Department believes that such issues are best addressed when developing detailed implementation plans rather than in the development of TMDLs given that there are a variety of management measure options and timelines that can be considered for achieving the allocations.

The WQMP needs to tie more to the load allocations. Not clear how DMA activities will be coordinated. Need to fully describe commitments, roles, and processes used to judge whether DMA plans need to be revised.

Response - The WQMP provides a framework for additional specificity and planning. The Department accepts that management planning is an ongoing process, time available to prepare WQMP is limited, and that many decisions must be either individually-based and therefore cannot be prescribed at the basin scale or require consensus and infrastructure that may take years to develop. As stated in Section 6.3.6 Timelines for Implementation, modifications to the WQMP and the Implementation Plans are expected to occur. Plans will be reviewed on a periodic basis.

The Review Period for the TMDL Should be Frequent

- Five year review schedule is inadequate for a successful adaptive management process.
- If DEQ adopts the TMDLs for Upper Klamath Lake Drainage, a one year review schedule is recommended.

Response – Within two years (and every two years thereafter) the Department will convene a special meeting of the science review team and local stakeholders to consider and/or propose modifications to the TMDL and/or WQMP. The Department will seriously and sincerely consider any and all recommendations. Because a revision of the TMDL will require significant resources, however, the Department must reserve the final decision on revising the TMDL.

It is inappropriate to use and agriculture WQ management area plan to provide reasonable assurance that a TMDL load allocation for agriculture will be met.

Response – Under State Law, water quality problems attributable to agriculture are to be addressed by the Oregon Department of Agriculture. They have authority to develop and enforce agricultural water quality management rules. The Department believes this authority provides the reasonable assurance necessary for this TMDL.

WQMP should include measures to address soil erosion, restoration of stream morphology, use of wetlands to treat nonpoint source pollution, and failed septic systems.

Response – Current management measures to address soil erosion, restoration of stream morphology, use of wetlands to treat nonpoint source pollution, and failed septic systems are addressed in Section 6.3.5 Proposed Management Measures. DMA specific implementation plans will address soil erosion, stream morphology and treatment wetlands. Failed septic systems are currently managed under existing rules enforced by Klamath County.

Temperature TMDL and WQMP needs to be integrated to insure a workable plan.

Response - The Department believes the TMDL and WQMP are adequately connected in text to provide a workable document. With this said, we will continue to look for ways to work with DMAs constructively to enhance BMP implementation that improve the condition of near stream land cover, channel morphology and instream flows.

The draft TMDL/WQMP does not guarantee adequate enforcement measures, attainment and maintenance of standards.

Response - The Department has cited the enforcement authorities allowed by law. The Department believes that these authorities are sufficient to ensure implementation of the WQMP.

The WQMP must not allow discharge from sources that have not been given a load allocation.

Response – Other than storm water sources, which are addressed as a nonpoint source of pollution, point sources without a waste load allocation will not be permitted to discharge pollutants covered by the TMDL.

State of Oregon
Department of Environmental Quality

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