ODEQ Water Quality Division

State of Oregon Department of Environmental Quality

Assessment Methodology for Oregon's 2004/2006 Integrated Report on Water Quality Status

(pursuant to Clean Water Act Sections 303(d) and 305(b))
(Appendix B pursuant to OAR 340-041-0046)

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Background

Section 305(b) of the Clean Water Act (CWA) requires States to report on the extent to which all navigable waters meet water quality standards. All surface waters, including rivers, streams, lakes, ponds, reservoirs, wetlands, estuaries and coastal waters are considered "navigable" under the CWA.

Section 303(d) of the CWA requires each State to identify those waters for which existing required pollution controls are not stringent enough to achieve that State's water quality standards. These water bodies are considered "water quality limited" or "impaired". Once a water body is identified as being water quality limited, Section 303(d) requires the state to develop Total Maximum Daily Loads (TMDLs) for the impaired water body. TMDLs describe the amount of each pollutant a water body can receive and not violate water quality standards.

Submissions of both water quality assessments are due to EPA every two years. Prior to 2002, States submitted the 303(d) list and the 305(b) report as separate documents. EPA recommends that States submit an Integrated Report that will satisfy Clean Water Act requirements for both Section 305(b) water quality reports and Section 303(d) lists of water quality limited water bodies[1]. In the Integrated Report, water bodies are placed into one of several assessment categories depending on available data, water quality status, and source of impairment.

EPA regulations require States to develop an assessment methodology to identify and categorize water bodies. An assessment methodology contains the "decision rules" that are used to assess water quality and determine the assessment category for water bodies throughout the state. Oregon's methodology for assessing and interpreting water quality data and information is consistent with the key elements of Oregon's water quality standards including designated uses, narrative and numeric criteria, antidegradation requirements, and implementation procedures associated with the standards. EPA's regulations require Oregon to submit a summary description of the methodology used to develop the 303(d) list. EPA also requests that Oregon provide a copy of the entire methodology. The methodology is used in EPA's review of the Oregon's 303(d) list.

Oregon's Assessment Methodology

This document provides the assessment methodology used by the Oregon Department of Environmental Quality (ODEQ) to review water quality information for Oregon's

- [1] Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act: United States Environmental Protection Agency, (July 21, 2003) http://www.epa.gov/owow/tmdl/tmdl0103/index.html

2004/2006 Integrated Report and determine the 303(d) list of impaired waters requiring a TMDL. The assessment methodology is based on the following documents:

- Water Quality Standards, Beneficial Uses, Policies, and Criteria for Oregon: Oregon Administrative Rules Chapter 340 Division 41. http://arcweb.sos.state.or.us/rules/OARs_300/OAR_340/340_041.html
- Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act: United States Environmental Protection Agency, (July 21, 2003) http://www.epa.gov/owow/tmdl/tmdl0103/index.html
- Consolidated Assessment and Listing Methodology (CALM), EPA, DRAFT April 20, 2001.
- Oregon Department of Environmental Quality's Listing Criteria for the 1998 303(d) list.
- Water Quality Monitoring, Technical Guide Book, the Oregon Plan for Salmon and Watersheds, July 1999.
- Letter from ODEQ to EPA, Region 10, Policy clarifications for Oregon's water quality standards interpretation, June 22, 1998.
- Letter from ODEQ to EPA Region 10, Oregon responses to EPA questions re: the State's water quality temperature standards, February 4, 2004.

This document presents information on the following elements of the assessment methodology:

1. Water quality standards - General
2. Data evaluation process
    - Metadata requirements
    - QA/QC requirements
    - Minimum number of samples
3. Assessment categories
4. General policy issues
    - De-listing
    - Segmentation
    - Narrative biological criterion
    - Tribal waters
    - Schedule
5. Parameter specific information
6. Integrated report format

Oregon's Water Quality Standards - General

The objective of the Clean Water Act (CWA) is to restore and maintain the physical, chemical and biological integrity of the Nation's waters (CWA 101(a)). To help implement these objectives, States develop and adopt water quality standards. Water quality standards include beneficial uses, narrative and numeric criteria, and anti-degradation policies.

Oregon's water quality standards are contained in Oregon Administrative Rules (OAR) Chapter 340 Division 41. These rules include policies and criteria that are applicable throughout the state. Beneficial uses for basins defined by the State of Oregon Water Resources Department are designated in OAR 340-041-0101 through OAR 340-041-0350. Designated uses and details on designated fish uses to be protected in each basin are shown in tables and figures included in these rules. For example, the beneficial uses protected in the Main Stem Columbia River are designated in OAR 340-041-0101(1) and (2) and shown in Table 101A and Table 101B as follows:

340-041-0101
Beneficial Uses to Be Protected in the Main Stem Columbia River
(1) Water quality in the main stem Columbia River (see Figure 1) must be managed to protect the designated beneficial uses shown in Table 101A (November 2003).
(2) Designated fish uses to be protected in the main stem Columbia River are shown in Table 101B (November 2003).

Table 101A
Designated Beneficial Uses
Mainstem Columbia River

Beneficial Uses	**Columbia River Mouth to RM 86**	**Columbia River RM 86 to 309**
Public Domestic Water Supply[1]	X	X
Private Domestic Water Supply1	X	X
Industrial Water Supply	X	X
Irrigation	X	X
Livestock Watering	X	X
Fish & Aquatic Life[2]	X	X
Wildlife & Hunting	X	X
Fishing	X	X
Boating	X	X
Water Contact Recreation	X	X
Aesthetic Quality	X	X
Hydro Power		X
Commercial Navigation & Transportation	X	X
1 With adequate pretreatment and natural quality that meets drinking water standards.		
2 See also Table 101B for fish use designations for this river.		

Table produced November, 2003

Table 101B
Beneficial Use Designations – Fish Uses
Mainstem Columbia River

Geographic Extent of Use	Salmon and Steelhead Migration Corridors (20°C)	Salmon and Steelhead Spawning through Fry Emergence	Shad and Sturgeon Spawning and Rearing
Mainstem Columbia River			
Beacon Rock to Upstream of Ives Island (RM 141.5 to RM 143.5)		October 15 - March 31	
Columbia River, mouth to WA border (RM309)	X		
Columbia River (RM 147 to RM 203)			X

Table produced November, 2003

Standards are designed to protect the most sensitive beneficial use within a water body. A determination that water quality is impaired can be based on: evidence of a numeric criterion exceedence; evidence of a narrative criterion exceedence; evidence of a beneficial use impairment; or evidence of a declining trend in water quality such that it would exceed a standard prior to the next listing period.

Data Evaluation Process

To gather information on water quality throughout Oregon, ODEQ reviewed water quality information available from agency monitoring activities and solicited data from outside the agency. Data was retrieved from ODEQ's Laboratory Analytical and Storage Retrieval (LASAR) database for the time period 1/1/1994 to 12/31/2003. A public call for data was issued along with a description of the minimum data requirements (Appendix 1) necessary for data submission. ODEQ accepted data submittals from April 1 to May 16, 2003.

EPA recommends several steps to evaluate data submitted by outside parties[2]. Each of these steps is discussed separately below. Water quality analyses conducted by ODEQ follow standard analytical methods and procedures and ODEQ's QA/QC plan for data validation.

[2] Consolidated Assessment and Listing Methodology (CALM), EPA, DRAFT April 20, 2001.

Metadata Requirements

1. *Determine if metadata accompanying the data set meets your agency's requirements; (e.g. determine adequacy and accuracy of geographic documentation in the data set)*[2]

For data submittals, ODEQ required geographic information for each sampling location in the form of latitude/longitude, preferably recorded as decimal degrees, along with the source of the latitude/longitude (i.e. GPS; USGS Topographic Map, 1:100,000 or 1:24,000 (with map scale); or other method). Sampling site descriptions were also required. ODEQ used the latitude and longitude and site description to assign stream identifier and river mile for each sampling station and evaluated the sampling data relative to geographic information for the Oregon's water bodies.

ODEQ uses a 1:100,000 geo-referenced river reach system complied for the Pacific Northwest. The river reach system is the hydrography component in a regional rivers and fisheries information system known as Stream Net. Information about this system is available at http://www.streamnet.org/pnwr/PNWNAR.html . A stream based identifier called the Longitude/Latitude ID (LLID) is used to uniquely identifying streams. This attribute consists of the longitude and latitude of the mouth of the stream. All reaches that comprise a given stream are assigned this unique LLID. Longitude precedes latitude to conform to standard x, y ordering. The code is 13 characters long, with 7 for decimal degrees of longitude and 6 for decimal degrees of latitude, with implied decimal points.

The LLID consists of the Longitude/Latitude at the mouth of the stream or the centroid of a lake/reservoir polygon. Only one LLID exists for a stream. Lakes and reservoirs may sometimes be identified by both the lake LLID and a stream LLID with the river miles at the inlet and outlet to the water body. Some water bodies evaluated for the 2004/2006 Integrated Report do not have a LLID and cannot be located on the Stream Net river reach system. Where water bodies did not have a LLID, a placeholder LLID was created so that information on this water body is retained in the database. Because these water bodies do not appear on the river reach map, there is no length assigned to them. Unless otherwise stated, the assessment status applies from the mouth to the headwaters.

Quality Assurance/Quality Control (QA/QC)

1. *Screen documentation to determine if appropriate procedures were used and QA/QC measures were in place.*
2. *Review sample collection and analytical methods to determine compatibility with your agency's QA/QC requirements and SOPs; also determine if the third party's sample collection and analytical methods were actually followed in the creation of the data set.*
3. *Determine if samples were collected under the appropriate conditions for comparison to water quality standards (e.g. correct time of year or flow conditions).*[3]

[3] Consolidated Assessment and Listing Methodology (CALM), EPA, DRAFT April 20, 2001.

The following description of Quality Assurance and Quality Control (QA/QC) is taken from the Water Quality Monitoring Technical Guide Book, The Oregon Plan for Salmon and Watersheds, July 1999.

> Quality Assurance (QA) is defined as: The overall management system of a project including the organization, planning, data collection, quality control, documentation, evaluation, and reporting activities. QA provides the information needed to determine the data's quality and whether it meets the project's requirements.
>
> Quality Control (QC) is defined as the routine technical activities intended primarily to control errors. Since errors can occur in either the field, the laboratory, or in the office, QC must be a part of each of these activities.

For the 2004/2006 Integrated Report, ODEQ required that the analytical method be documented in the data submittal form or the Quality Assurance Project Plan for the sampling project. The Quality Assurance Project Plan should also define project data quality objectives for precision, accuracy, representativeness, completeness and comparability of the data. ODEQ evaluated data quality as described in the following paragraphs.

QA/QC - Conventional Parameters

For conventional parameters, (i.e. E coli, pH, temperature, dissolved oxygen), data submitted to ODEQ were evaluated for precision and accuracy. Each of these terms is defined below.

> Precision: Precision refers to the amount of agreement among repeated measurements of the same parameter. To determine precision, duplicate samples must be collected at a number of sample sites (Oregon Plan). For grab data to be used for the 2004/2006 Integrated Report, duplicate samples must be collected at 10% of the total number of monitoring sites (1 duplicate for every 10 sites).
>
> Accuracy: Accuracy measures how close the results are to a true or expected value. This is normally determined by measuring a standard or reference sample of a known amount and comparing how far the results at the monitoring site are from the reference value (Oregon Plan).

ODEQ evaluated accuracy based on the equipment used (manufacturer and model) and the accuracy values recorded by the manufacturer. Data requirements included pre- and post-deployment checks or a minimum of two field audits used to determine the accuracy of continuous temperature data.

Grab data (a sample collected at one point in time) for conventional parameters were assigned a Data Quality Level using the criteria summarized in Table 1. The data quality level (DQL) depends on a combination of quality control and method selection. The DQLs were developed by ODEQ staff based on:

- Accuracy of the instrumentation as defined by the manufacturer.
- Accuracy of the instrumentation/method based on experience of ODEQ laboratory staff.
- Data analysis by ODEQ staff (see E Coli discussion).

To determine the acceptable precision for E Coli data, ODEQ used a method recommended by EPA. In this analysis, 228 paired samples were evaluated (Larry Caton, ODEQ, communication to Marilyn Fonseca, June 12, 2002). The difference in the results for the duplicates was calculated. The average difference of the samples was calculated. The average difference was multiplied by 2.456 to determine the 95% confidence limit for the dataset (confidence limit from: Youden, W.J. and Steiner, E.H., Statistical Manual of the Association of Official Analytical Chemists, Washington D.C., Association of Official Analytical Chemists, 1975). Based on this method, the precision for E coli was calculated to be 0.6 log.

Level A and B data were acceptable for use for the 2004/2006 Integrated Report and 303(d) list.

Level C data is data which does not meet QA/QC requirements. Data that falls into this category includes data in which the duplicate samples were not within the range of precision stated in Table 1: 303(d) and 305(b) Data Quality Level for Grab Data. pH data is graded as Level C data if a gel electrode is used.

Level E data is data for which no duplicates or field checks were obtained for the parameter of interest. Level E data is data of "unknown" quality. Level C and Level E data were not used for the 2004/2006 Integrated Report or 303(d) list.

Table 1: Data Validation Criteria for Water Quality Parameters

Data Quality Level	Quality Assurance Plan	Water Temperature Methods	pH Methods	Dissolved Oxygen Methods	Turbidity Methods	Conductivity Methods	Bacteria Methods	Data Uses
A+	ODEQ QAPP approved by ODEQ QA Officer	Thermometer Accuracy checked with NIST standards A ≤ ± 0.5°C P ≤ ± 1.5°C	Calibrated pH electrode A ≤ ± 0.2 S.U. P ≤ ± 0.3 S.U.	Winkler titration or calibrated Oxygen meter A ≤ ± 0.2 mgL^{-1} P ≤ ± 0.3 mgL^{-1}	Nephelometric Turbidity meter A ≤ ± 5% Standard value P ≤ ± 5%	Meter with temp correction to 25°C A ≤ ± 7% of standard value P ≤ ± 10%	ODEQ Approved Methods Absolute difference between log-transformed values P ≤ 0.6 log	Regulatory, permitting, compliance (e.g., 303(d) and 305(b) assessments)
A	External QAPP	External Data Thermometer Accuracy checked with NIST standards A ≤ ± 0.5°C P ≤ ± 1.5°C	External Data Calibrated pH electrode A ≤ ± 0.2 S.U. P ≤ ± 0.3 S.U.	External Data Winkler titration or calibrated Oxygen meter A ≤ ± 0.2 mgL^{-1} P ≤ ± 0.3 mgL^{-1}	External Data Nephelometric Turbidity meter A ≤ ± 5% Standard value P ≤ ± 5%	External Data Meter with temp correction to 25°C A ≤ ± 7% of standard value P ≤ ± 10%	External Data ODEQ Approved Methods Absolute difference between log-transformed values P ≤ 0.6 log	Regulatory, permitting, compliance (e.g., 303(d) and 305(b) assessments)
B	Minimum Data Acceptance Criteria Met	Thermometer Accuracy checked with NIST standards A ≤ ± 1.0°C P ≤ ± 2.0°C	Any Method A ≤ ± 0.5 S.U. P ≤ ± 0.5 S.U.	Winkler titration or calibrated Oxygen meter A ≤ ± 1 mgL^{-1} P ≤ ± 1 mgL^{-1}	Any Method A ≤ ± 30% P ≤ ± 30%	Meter with temp correction to 25°C A ≤ ± 10% of standard value P ≤ ± 15%	ODEQ Approved Methods Absolute difference between log-transformed values P ≤ 0.8 log	Regulatory, permitting, compliance (e.g., 303(d) and 305(b) assessments) <u>with professional judgment</u>
C		A > ± 1.0ºC P > ± 2.0°C	A > ± 0.5 S.U. P > ± 0.5 S.U.	A > ± 2 mgL^{-1} P > ± 2 mgL^{-1}	A > 30% P > 30%	A > ± 10% P > ± 15%	Absolute difference between log-transformed values P > 0.8 log	Void data. Not used for 303(d) and 305(b) assessments
D		Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data
E	No QAPP provided	No Precision Checks	Any Method No Precision Checks	Any Method No Precision Checks or A ≤ ± 2 mgL^{-1} P ≤ ± 2 mgL^{-1}	Any Method No precision checks	Meter without routine calibration No precision checks	Any Method No precision checks	Informational purposes only
F	See accompanying notes							

Table 1 Notes:

Data Quality Level Grading Criteria:

A = Accuracy as determined by comparison with standards, e.g., during equipment calibration or pre- and post-deployment checks

P = Precision as determined by replicate measurements, e.g., during field duplicates, field audits, or split samples

QA definitions of Data Quality Levels

A+ – Data of known quality; collected by ODEQ; meets QC limits established in the QAPP.

A – Data of known quality; submitted by entities outside of ODEQ; meets QC limits established in a *ODEQ -approved* QAPP.

B – Data of known *but lesser* quality; data may not meet established QC but is within marginal acceptance criteria; or data value may be accurate, however controls used to measure Data Quality Objective elements failed (e.g., batch failed to meet blank QC limit); the data may be useful in limited situations or in supporting other, higher quality data.

C – Data of unacceptable quality; data are discarded (Void) typically in response to analytical failure.

D – Incomplete data; no sample collected or no reportable results, typically due to sampling failure.

E – Data of unknown quality or known to be of poor quality; no QA information is available, data could be valid, however, no evidence is available to prove either way. Data is provided for Educational Use Only.

F – Exceptional Event; "A" quality data (data is of known quality), but not representative of sampling conditions as required by the project plan.(e.g., a continuous water quality monitor intended to collect background environmental conditions collects a sample impacted by a fire that created anomalous conditions to the environment).

Statistics for **turbidity, conductivity,** and **bacteria** are concentration-dependent; thus low-concentration B level data may be considered acceptable for all uses.

QA/QC - Continuous Temperature Data

Continuous temperature data were assigned a Data Quality Level using the criteria summarized in Table 2 and in Figures 1 and 2. For Data Quality Level A, both pre- and post-deployment checks and two field audits (at the beginning and end of the logger deployment period) must be conducted and the accuracy must be Level A.

If no pre- and post-deployment accuracy checks were conducted, but the beginning and ending field audits are either Level A or B, the data is Level B. Alternatively, if pre- and post-deployment accuracy checks were conducted and were at least Level B but no field audits were conducted, the data is Level B.

Data that fails any of the accuracy checks is graded Level C and was not used for the 2004/2006 Integrated Report or 303(d) list.

Data without pre- and post-deployment accuracy checks is graded Level E and was not used for the 2004/2006 Integrated Report or 303(d) list.

Data accompanied by one field audit, but with no pre- and post-deployment accuracy checks was graded Level E data and was not used for the 2004/2006 Integrated Report or 303(d) list.

All continuous temperature data was processed using Hydrostat Version 10.

Table 2: 303(d) and 305(b) Data Quality Level for Continuous Temperature Data

Data Quality Level	Pre- and Post- Deployment Accuracy Checks	Field Audit Accuracy Checks
A	Difference between NIST thermometer and logger < 0.50ºC	Difference between NIST thermometer and logger < 1.5ºC
B	Difference between NIST thermometer and logger > 0.50ºC and < 1.0ºC	Difference between NIST thermometer and logger > 1.5ºC and < 2.0ºC
C	Difference between NIST thermometer and logger > 1.0ºC	Difference between NIST thermometer and logger > 2.0ºC
E	No pre or post deployment accuracy checks were conducted	No field audits were conducted

Figure 1: Continuous Temperature Data Grading for Analyses with Pre- and Post-Deployment Accuracy Checks and a Minimum of 2 Field Audits

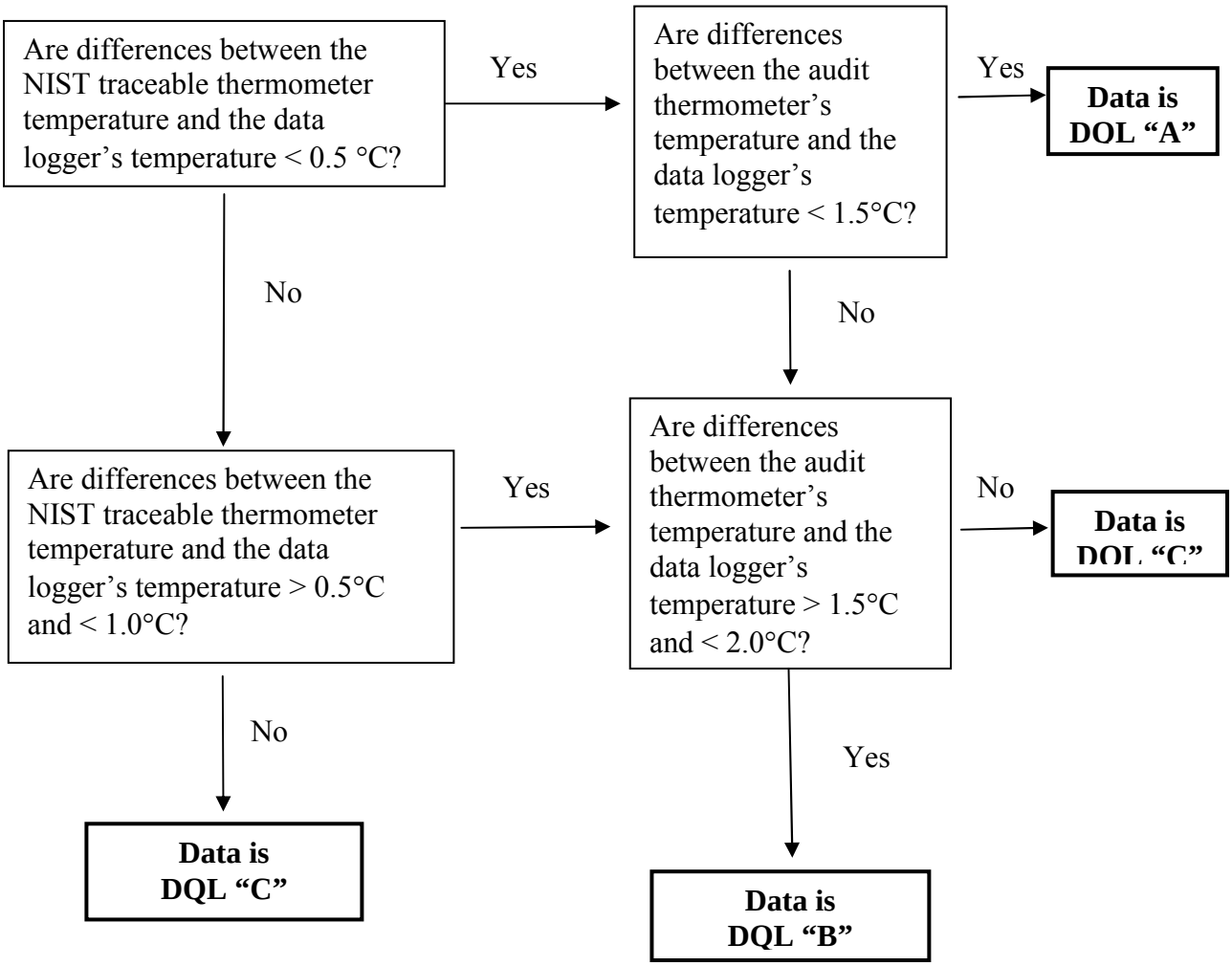
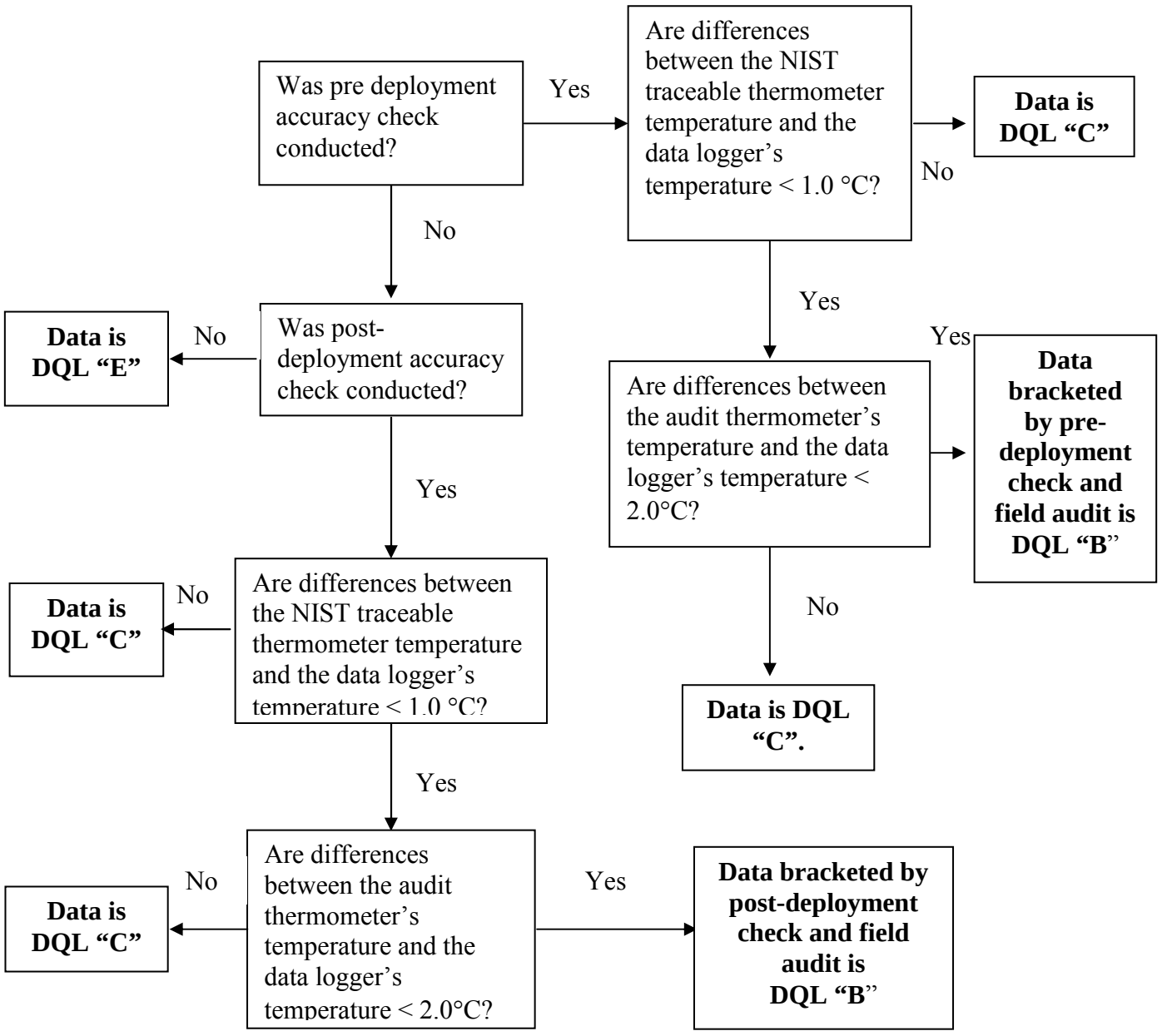


Figure 2: Continuous Temperature Data Grading for Analyses with Pre- or Post-Deployment Accuracy Checks and One (1) Field Audit



QA/QC – Toxic Substances

Water quality analyses for toxic substances (i.e. parameters included in OAR 340-041-0033 Table 20) are conducted by ODEQ's laboratory following standard analytical methods and ODEQ's QA/QC plan for data validation. ODEQ required that toxic substance data submitted by other agencies or parties include documentation of the analytical method used and the laboratory conducting the analyses. ODEQ required that QA/QC plans for outside laboratories conducting the analyses be available for ODEQ review, but did not require plans to be submitted with the data.

2004/2006 Integrated Report Water Quality Assessment Categories

As directed in EPA's Guidance, placing all of Oregon's waters into one of five categories is the most significant feature of the water quality data evaluation for Oregon's 2004/2006 Integrated Report.[4] The categories represent varying levels of water quality standards attainment, ranging from Category 1, where all of a water's designated uses are met, to Category 5, where a pollutant impairs a water and a TMDL is required. These category placements are based on evaluating all existing and readily available data and information consistent with Oregon's assessment methodology. In general terms, the categories are:

Category 1: All designated uses are met.

Category 2: Some of the designated uses are met but there is insufficient data to determine if remaining designated uses are met.

Category 3: Insufficient data to determine whether any designated uses are met.

3B: Insufficient data but some data indicate non-attainment of a criterion and a potential concern.

Category 4: Water is impaired or threatened but a TMDL is not needed. This includes:

4A: All TMDLs needed to result in attainment of all applicable water quality standards have been approved.

4B: Other pollution control requirements are expected to address all pollutants and will attain water quality standards.

4C: Impairment is not caused by a pollutant (e.g., flow or lack of flow is not considered a pollutant).

Category 5: Water is impaired or threatened and a TMDL is needed. This category constitutes the Section 303(d) list that EPA will approve or disapprove under the Clean Water Act.

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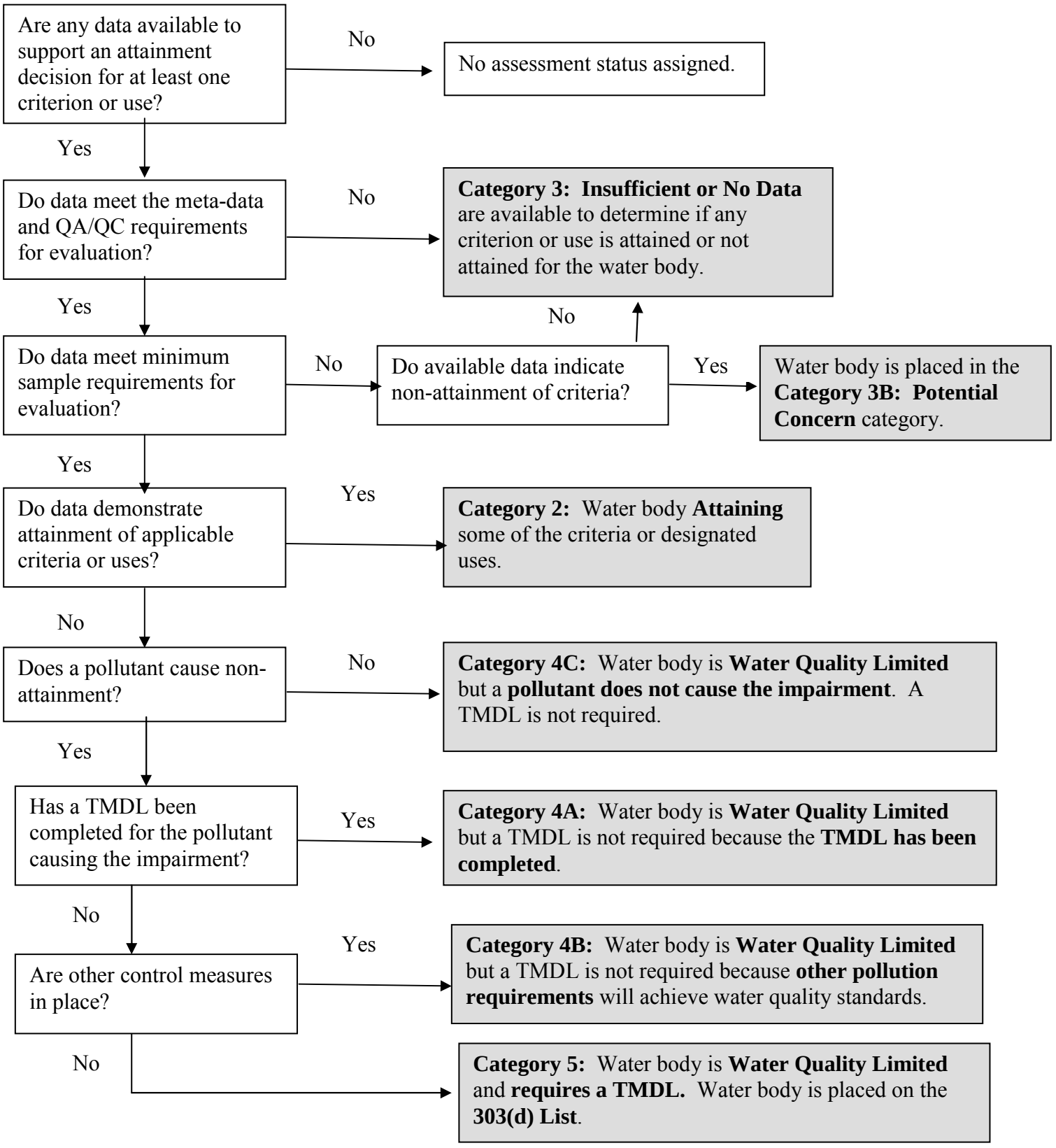
[4] Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act: United States Environmental Protection Agency, (July 21, 2003) http://www.epa.gov/owow/tmdl/tmdl0103/index.html

The following flow chart (Figure 3) summarizes Oregon's assessment process.

Figure 3: Integrated Report Categories



The data and sample requirements for each pollutant parameter are discussed in the section below titled: Oregon's Water Quality Standards – Assessment Methodology. Data at individual sampling sites are evaluated according to these requirements to determine if sufficient information is available and, if so, assign a status to the monitoring site. Results for the monitoring sites are then combined to determine the status for a segment of the water body. Rules for defining water body segments are discussing in the General Policy Discussion section on Segmentation.

General Policy Discussion

De-Listing Water Bodies

Water bodies placed on a 303(d) list in a previous assessment year remain on the **2004/2006 Category 5: 303(d) list** unless they are de-listed. Water bodies may be **de-listed** if:

1. New information is available that shows water quality standards are being met. A water body may de-listed and be moved to **Category 2: Attaining** if new information shows water quality standards are being met. Data for de-listing consideration must be Data Quality Level A or B and meet the minimum sample requirements. Generally, similar data are required to de-list a water body as initially used to place the water body on the 303(d) list. For example, if the listing was based on two successive years of a standard not being met, the Department would look for at least two successive years of data indicating that the standard is being met.

2. Additional data are submitted to correct a flaw in the original assessment. For example, a water body may have been placed on a previous 303(d) list but some data may not have been evaluated if QA/QC requirements were not met. If more recently collected data meet the QA/QC requirements and indicate compliance with the applicable criterion, the water body will be de-listed.

3. Water quality criteria are changed or no longer apply in certain water bodies. Oregon's water quality standards were revised and fish beneficial use designations were clarified in December 2003. Numeric criteria for temperature were changed. The criteria for temperature and dissolved oxygen are applied using the fish beneficial uses designated in 2003. If data are available on a previously listed water body and an evaluation shows that the new applicable criteria are met, the water body is de-listed in 2004. The previously listed record, with the original listing criteria and use, notes **Criteria change or use clarification** under "Status" and the "Action" notes **Delisted - Revised criteria or uses met.** If no data are available to evaluate against current applicable criteria, the water body remains on the 303(d) list. However, when water bodies were listed in a previous assessment for salmonid spawning, but the new fish use designation does not show salmon or steelhead spawning use exists, the water body is de-listed in 2004 for spawning, noting under "Status" **Criteria change or use clarification** and the "Action" notes **Delisted - Criteria change or use clarification.** The water body is evaluated in 2004 using available data and the current designated uses and applicable criteria. A water body may be de-listed for spawning, but may be

listed in 2004/2006 for exceeding year round, non-spawning criteria for temperature or dissolved oxygen or for another salmon and steelhead spawning use.

4. The water body and pollutant are addressed in a TMDL approved by EPA. Water body segments with an approved TMDL will be removed from the 303(d) list, but will retain their water quality limited status (per OAR 340-41-006(30)) until they meet water quality standards. The water body will de-listed and be placed in **Category 4A: Water Quality Limited TMDL Approved**. If a TMDL is developed for a pollutant on a watershed scale, all water bodies within the watershed will be de-listed and placed in Category 4A.

5. A pollutant does not cause the water body impairment. EPA defines a pollutant according to Section 502(6) of the Clean Water Act. For Oregon's 1998 assessment, ODEQ placed water bodies on the Category 5 303(d) list for habitat modification and flow modification. Habitat modification listings were based on information indicating inadequate pool frequency and lack of large woody debris. Flow modification listings were based on inadequate flow to maintain in-stream water rights purchased by Oregon Department of Fish and Wildlife. However, flow and habitat modification are not considered pollutants under the Clean Water Act. In 2002, ODEQ removed these water bodies from the 303(d) list and placed them in **Category 4C: Water Quality Limited but a pollutant does not cause the impairment** category. Another example is water bodies listed in 1998 for not meeting narrative biocriteria. Biocriteria are not measures of a pollutant, but pollutants such as temperature and dissolved oxygen contribute to impairments of a biological community. ODEQ has developed TMDLs for temperature and dissolved oxygen that also address biocriteria listings on the same water bodies by targeting temperature and dissolved oxygen levels. Biocriteria are de-listed for these water bodies based on the documentation in the TMDL.

6. Other pollution control requirements are in place and water quality standards will be achieved in a reasonable period of time. Examples include point source permits or 401 certification conditions for hydroelectric projects that address all pollutant sources on a water body. The measures and conditions will results in water quality improvements. When these control measures are in place, the water bodies will be de-listed and placed in **Category 4B: Water Quality Limited Other Control Measures in Place.**

Segmentation

To define water body segments for status and listing purposes, ODEQ began in 2002 to use a 1:100,000 geo-referenced river reach system complied for the Pacific Northwest. The river reach system is the hydrography component in a regional rivers and fisheries information system known as Stream Net. Information about this system is available at http://www.streamnet.org/pnwr/PNWNAR.html. A stream based identifier called the Longitude/Latitude ID (LLID) is used to uniquely identifying streams. This attribute consists of the longitude and latitude at the mouth of the stream. All reaches that comprise a given stream are assigned this unique LLID. Longitude precedes latitude to

conform to standard x, y ordering. The code is 13 characters long, with 7 for decimal degrees of longitude and 6 for decimal degrees of latitude, with implied decimal points.

Water body segments are identified by the LLID at the mouth of the stream or the centroid of a lake/reservoir polygon and starting and ending river miles. Only one LLID exists for a stream. Lakes and reservoirs may sometimes be identified by both the lake LLID and a stream LLID. Some water bodies evaluated for the 2004/2006 Integrated Report do not have a LLID and cannot be located on the Stream Net river reach system. Where water bodies did not have a LLID, a placeholder LLID was created so that information on this water body is retained in the database. Because these water bodies do not appear on the river reach map, there is no length assigned to them. Unless otherwise stated, the status and listing applies to the water body from the mouth to the headwaters. The status for a segment is determined based on an evaluation of the status assigned to each monitoring station in the segment. The following paragraphs and a summary table in Appendix 2 provide the decision rules used for the 2004/2006 Integrated Report to define segments and assign a status category to the segment.

General Segments

Water body segments are defined using an LLID, a starting river mile, and an ending river mile. For most pollutants, water body segment length is determined by:

1. Segments used for previous 303(d) lists.
2. If a water body is sampled at only one site, and has not been evaluated for previous 303(d) lists, the water body from mouth to headwaters is categorized by the status of the one site.
3. If several sampling stations are available on a water body that has not been evaluated for previous 303(d) lists, the segment length is determined from the mouth or furthest downstream station to the next upstream station showing a different status. Segments are based on available monitoring sites and site status.
4. Segment status is assigned based on sampling site status (See Appendix 2 table).

Fish Beneficial Use Segments for Temperature and Dissolved Oxygen

Oregon adopted new water quality standards in 2003 for temperature and clarified fish use designations in water bodies throughout the state. For the 2004/2006 Integrated Report, the water body segments are defined by these fish uses when numeric criteria protect these uses. Temperature and dissolved oxygen criteria protect similar fish uses and include protection of salmon and steelhead spawning. Dissolved oxygen criteria also protect resident trout spawning uses. The following steps were used to define water body segments for the 2004/2006 assessment:

1. Water body segments are defined based on designated fish uses for a stream using LLID, starting river mile, and ending river mile. The segment length is determined by sequential segments with the same fish use. If data at any point on the segment does not meet numeric criteria for temperature or dissolved oxygen, the entire segment with that fish use is listed as water quality limited.

2. Water body segments for fish spawning use are designated for specific spawning time periods on water bodies throughout the state. If data at any point on the segment does not meet numeric criteria for temperature or dissolved oxygen during the designated spawning period, the entire segment with that spawning time period is listed as water quality limited.

For example, the Sandy River (LLID 1224071455697) is designated as supporting salmon and trout rearing and migration from river mile 0 to 26 and as having core cold water habitat from river mile 26 to 55.5. The Sandy River also has four reaches designated for spawning use at specific times shown in the following table. Data from four monitoring stations at river miles 6, 19, 30, and 38 were evaluated. Data were available during the spawning periods at stations located on river miles 30 and 38. ODEQ compared available data to the specific numeric temperature criteria for each fish use. Data exceeded criteria in two segments for non-spawning time periods and uses, and one segment during a spawning period. These segments are assigned the **Category 5 303(d) list.** (Note: A TMDL was approved for the Sandy River on 4/15/2005 and the assigned status is Category 4A.)

Table 3: Example Fish Beneficial Use Segments – Sandy River

River Mile Start	River Mile End	Use	Spawning Period	Numeric Criteria (^{o} Celsius)	Status
0	26	Salmon and trout rearing and migration		18.0	**Category 5 303(d) list**
26	55.5	Core cold water habitat		16.0	**Category 5 303(d) list**
0	26	Spawning	October 15 – May 15	13.0	
26	48	Spawning	August 15 – June 15	13.0	**Category 5 303(d) list**
48	49.1	Spawning	October 15 – June 15	13.0	
49	54	Spawning	January 1 – June 15	13.0	
54	55.4	No spawning			

Tribal Waters

Only those waters that are under the State of Oregon's jurisdiction are subject to the State's 303(d) and 305(b) activities. Oregon's 2004/2006 Integrated Report does not intentionally include tribal waters.

When a water body lies partially within Tribal Reservation boundaries, ODEQ will only include the portions that are within Oregon's jurisdiction on Oregon's 303(d) list. For the 2002 303(d) list and 2004/2006 303(d) list, ODEQ used a map provided by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) to determine which

waters were within Umatilla tribal lands (data origin: BIA Geographic Data Service Center, publication date: 1999, title: Diminished Reservation Boundary for CTUIR). Oregon does not develop TMDLs for tribal waters. When a 303(d) listed water body is fully on Tribal lands, the Tribe may work directly with EPA to develop the TMDL.

Schedule

The Department's process to develop the 2004/2006 Integrated Report included the following steps and timelines:

1. Data Gathering and Review: ODEQ solicited data from federal and other state agencies, tribes, local governments, watershed councils, private and public organizations and individuals. ODEQ issued a public notice seeking data on the condition of Oregon's surface waters and requesting data be submitted from April 1, 2003 to May 16, 2003. The public notice was sent to over 2500 names on ODEQ's mailing list. A news release was sent to all newspapers in the State of Oregon. Third party data received during this "call for data" and data collected by ODEQ were reviewed according to the assessment methodology.

2. Second Public Review Process: A draft 2004/2006 Integrated Report and a draft 2004/2006 list of water quality limited waters was made available for public review, and public comments on the list of water quality limited waters were taken from September 9, 2005 to November 7, 2005, 5:00 PM. Public hearings were held to provide information and take public comments on October 11, 2005 in Salem, Oregon and on October 17, 2005 in Bend, Oregon. A summary of the written and oral comments and ODEQ's response to comments is available from ODEQ in a separate document.

3. Final 2004/2006 Integrated Report and 303(d) List: Based on a review of public comments, ODEQ revised the draft Integrated Report and draft Section 303(d) list of Category 5: Water quality limited waters needing a TMDL, where appropriate. ODEQ will submit Oregon's final 2004/2006 Section 303(d) list of Category 5: Water quality limited waters needing a TMDL to US EPA Region 10 with supporting documentation. Along with the Section 303(d) list, ODEQ will also submit the final 2004/2006 Integrated Report, response to comments, the Assessment Methodology for Oregon's 2004/2006 Integrated Report on Water Quality Status, and a prioritization and TMDL schedule to EPA. Only water bodies in the **Category 5: The water body is water quality limited and requires a TMDL (Section 303(d) list**) are subject to EPA's approval.

Oregon's Water Quality Standards – Assessment Methodology by Parameter

For the 2004/2006 Integrated Report, ODEQ evaluated water quality data to determine if water quality standards are being met in Oregon. The assessment protocols used to determine water quality status (Category 1 through 5) for specific designated uses and narrative and numeric criteria are discussed in the following sections. The narrative and numeric criteria from Oregon Administrative Rules are cited for each parameter.

PARAMETER: **Aquatic Weeds or Algae**

BENEFICIAL USES AFFECTED: Water Contact Recreation, Aesthetics, Fishing

NUMERIC CRITERION: None

NARRATIVE CRITERION: OAR 340-041-007(11)

> **340-041-0007**
> **Statewide Narrative Criteria**
> (11) The development of fungi or other growths having a deleterious effect on stream bottoms, fish or other aquatic life, or that are injurious to health, recreation, or industry may not be allowed;

WATER QUALITY LIMITED DETERMINATION (CATEGORY 5):
Macrophytes: Documented reports of an abundance of invasive, non-native macrophytes (those listed on the "A" or "B" Noxious Weed List maintained by the Department of Agriculture) that dominate the lake assemblage of plants and significantly reduces the surface area available for lake usage; frequent herbicide treatments to control aquatic weeds; or other activities initiated to manage weed growth such as through a Coordinated Resources Management Plan in response to frequent complaints about weeds interfering with various uses.

Periphyton (attached algae) or Phytoplankton (floating algae): Documented evidence that algae is causing other standard exceedences (e.g. pH or dissolved oxygen) or impairing a beneficial use.

ATTAINING CRITERION DETERMINATION (CATEGORY 2):
Not applicable.

TIME PERIOD:
Annual

DATA REQUIREMENTS:
Reports since 1993.

Notes:
No new data were collected or received for review for the 2004/2006 Integrated Report for aquatic weeds or algae. Listings from previous years are retained for 2004/2006.

Phosphorus Criterion/Phosphate Phosphorus Benchmark
The Table 20 criterion of 0.01 ug/L applies to elemental phosphorus (P) in marine or estuarine waters. This is based on the EPA criterion to protect marine organisms[5].

Neither Oregon nor EPA has set a criterion for phosphate phosphorus. EPA has recognized the relationship between phosphates, as major nutrients, and excessive aquatic weed and algae growth, and lake and reservoir eutrophication.[5] EPA recommends that total phosphates reported as phosphorus (P) should not exceed 50 ug/L in streams to control excessive aquatic growth. For the 2004/2006 Integrated Report, this value is used as a benchmark to evaluate water quality data for phosphate phosphorus. Water bodies with total phosphates reported as phosphorus (P) greater than 50 ug/L are a **Category 3B: Concern** for conditions that may result in not meeting water quality standards.

[5] 1986, Quality Criteria for Water, U.S. EPA Office of Water, EPA 440/5-86-001

PARAMETER: **Bacteria - *E. coli (Escherichia coli)*** (Freshwaters and Estuarine Waters Other than Shellfish Growing Waters)

BENEFICIAL USES AFFECTED: Water Contact Recreation

NARRATIVE CRITERION: OAR 340-041-0009(4)

NUMERIC CRITERION: OAR 340-041-0009(1)(a)

340-041-0009
Bacteria
(1) Numeric Criteria: Organisms of the coliform group commonly associated with fecal sources (MPN or equivalent membrane filtration using a representative number of samples) may not exceed the criteria described in paragraphs (a) and (b) of this paragraph:

(a) Freshwaters and Estuarine Waters Other than Shellfish Growing Waters:

(A) A 30-day log mean of 126 *E. coli* organisms per 100 milliliters, based on a minimum of five (5) samples;
(B) No single sample may exceed 406 *E. coli* organisms per 100 milliliters.

(4) Bacterial pollution or other conditions deleterious to waters used for domestic purposes, livestock watering, irrigation, bathing, or shellfish propagation, or otherwise injurious to public health may not be allowed;

WATER QUALITY LIMITED DETERMINATION (CATEGORY 5):
A 30-day log mean of 126 *E. coli* organisms per 100 ml or more than 10% of the samples exceed 406 *E. coli* organisms per 100 ml, with a minimum of at least two exceedences.

ATTAINING CRITERION DETERMINATION (CATEGORY 2):
The 30-day log mean is less than 126 *E. coli* organisms per 100 ml and, if data from 10 or more samples are available, 90% of the samples are below 406 *E. coli* organisms per 100 ml. If data from 5 to 9 samples are available, no exceedences of 406 *E. coli* organisms per 100 ml.

If data are insufficient to calculate a 30-day log mean, then, for 10 or more samples, 90% of the samples are below 406 *E. coli* organisms per 100 ml; or for 5 to 9 samples, no exceedences of 406 *E. coli* organisms per 100 ml.

INSUFFICIENT DATA CATEGORY (EPA CATEGORY 3):
Less than 5 samples are available for evaluation for the season of interest, or 5 to 9 samples for the season of interest with 1 exceedence.

TIME PERIOD:
Summer: June 1 through September 30 (period of highest use for water contact recreation)

Fall-Winter-Spring (FWS): October 1 through May 31

DATA REQUIREMENTS:
Data collected since 1993. A minimum of 5 representative data points available per site collected on separate days for each time period of interest.

NOTE:
A bacteria standard change in 1996 set numeric criteria for freshwater using *E. coli* as indicator organisms. This standard replaced the previous standard for freshwater based on fecal coliform. Only the current *E. coli* standard was applied in freshwater for new data reviewed for 2004/2006. Listings in previous years may have identified freshwater water bodies as water quality limited based on data for fecal coliform. These listings are retained in the 2004/2006 list unless additional data for *E. coli* are available for evaluation. If data show the current *E. coli* criteria are met, the water body will be de-listed for prior fecal coliform listings.

All monitored estuarine locations are presumed to be potential shellfish growing waters for assessment purposes and are evaluated using the fecal coliform standard, discussed in the next section, to protect that beneficial use.

PARAMETER: **Bacteria – Fecal Coliform**
(Marine Waters and Estuarine Shellfish Growing Waters)

BENEFICIAL USES AFFECTED: Shellfish Growing
Water Contact Recreation

NARRATIVE CRITERION: OAR 340-041-0009(4)

NUMERIC CRITERION: OAR 340-041-0009(1)(b)

340-041-0009
Bacteria
(1) Numeric Criteria: Organisms of the coliform group commonly associated with fecal sources (MPN or equivalent membrane filtration using a representative number of samples) may not exceed the criteria described in paragraphs (a) and (b) of this paragraph:

(b) Marine Waters and Estuarine Shellfish Growing Waters: A fecal coliform median concentration of 14 organisms per 100 milliliters, with not more than ten percent of the samples exceeding 43 organisms per 100 ml.

(4) Bacterial pollution or other conditions deleterious to waters used for domestic purposes, livestock watering, irrigation, bathing, or shellfish propagation, or otherwise injurious to public health may not be allowed;

WATER QUALITY LIMITED DETERMINATION (CATEGORY 5):
For a datasets of less than 30 samples, a minimum of 2 exceedences of 43 organisms/100 ml.
For datasets with greater than 30 samples, 10% of the samples must exceed 43 organisms/100mL.
OR, for datasets with a minimum of 5 samples, the median value is greater than 14 organisms/100 ml.

ATTAINING CRITERION DETERMINATION (CATEGORY 2):
90% of the samples are less than 43 organisms/100 ml and the median value is less than 14 organisms/100 ml. The minimum number of samples is 5 per site.

INSUFFICIENT DATA CATEGORY (EPA CATEGORY 3):
Less than 5 samples available for analysis.

TIME PERIOD:
Annual

DATA REQUIREMENTS:
Data collected since 1993. A minimum of 5 representative samples per site collected on separate days.

NOTES:
ODEQ has determined that the fecal coliform water quality criteria should be applied to water bodies that support recreational shellfish harvesting as well as commercial shellfish harvesting (Minutes from the Estuary Workgroup Meeting, ODEQ, Newport, Oregon, July 13, 2001).

For the 2004/2006 review of water quality data, marine waters were identified as any coastal beach sampling location and any location on the ocean side of a bay or estuary. All monitored estuarine waters were presumed to be potential shellfish harvesting waters for assessment purposes and were identified based on recorded conductivity measurements above 200 uS/cm.

A change to the bacteria standard in 1996 set numeric criteria for freshwater using *E. coli* as indicator organisms. This standard replaced the previous standard for freshwater based on fecal coliform. Listings in previous years may have identified freshwater water bodies as water quality limited based on data for fecal coliform. These listings are retained in the 2004/2006 list unless additional data for *E. coli* are available for evaluation. If data show the current *E. coli* criteria are met, the water body will be de-listed for prior fecal coliform listings.

PARAMETER: **Biocriteria**

BENEFICIAL USES AFFECTED: Aquatic Life

NARRATIVE CRITERION: OAR 340-041-0011

> **340-041-0011**
> **Biocriteria**
> Waters of the State must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.

WATER QUALITY LIMITED DETERMINATION (CATEGORY 5):
In previous assessments, ODEQ evaluated biological data using multi-metric scores and multivariate models. A water body was determined to be water quality limited by the following evaluation (ODEQ 1998 303(d) Listing Criteria):

> Aquatic communities (primarily macro invertebrates) which are 60% or less of the expected reference community for both multimetric scores and multivariate model scores are considered impaired.

DATA REQUIREMENTS:
Water bodies placed on the 1998 303(d) list based on interpretation of the narrative biological criterion will be maintained on the 2004/2006 303(d) list unless a TMDL addressing the listing has been approved by EPA or another analysis demonstrates biological uses are not impaired by a pollutant. Biological data collected during the 2004/2006 water quality assessment cycle will be evaluated when numeric biological criteria or protocol for applying narrative criteria are available.

NOTES:
For 2004/2006, ODEQ has reported the results of biocriteria assessments in the narrative discussion of the state's water quality program: Oregon's 2004 Water Quality Assessment Section 305(b) Report, July 2004, http://www.ODEQ state.or.us/wq/305bRpt/ORWQ305bRpt2004.pdf. ODEQ did not develop a protocol to apply the narrative criteria to biological monitoring data.

PARAMETER: **Chlorophyll a**

BENEFICIAL USES AFFECTED: Water Contact Recreation,
Aesthetics
Fishing
Water Supply
Livestock Watering

NUMERIC CRITERION: OAR 340-041-0019

340-041-0019
Nuisance Phytoplankton Growth
(1) The following values and implementation program must be applied to lakes, reservoirs, estuaries and streams, except for ponds and reservoirs less than ten acres in surface area, marshes and saline lakes:

(a) The following average Chlorophyll a values must be used to identify water bodies where phytoplankton may impair the recognized beneficial uses:

(A) Natural lakes that thermally stratify: 0.01 mg/1;
(B) Natural lakes that do not thermally stratify, reservoirs, rivers and estuaries: 0.015 mg/1;
(C) Average Chlorophyll a values may be based on the following methodology (or other methods approved by the Department): A minimum of three samples collected over any three consecutive months at a minimum of one representative location (e.g., above the deepest point of a lake or reservoir or at a point mid-flow of a river) from samples integrated from the surface to a depth equal to twice the secchi depth or the bottom (the lesser of the two depths); analytical and quality assurance methods must be in accordance with the most recent edition of Standard Methods for the Examination of Water and Wastewater.

WATER QUALITY LIMITED DETERMINATION (CATEGORY 5):
The average Chlorophyll a value over three consecutive months exceeds the value referenced in the rule.

ATTAINING CRITERION DETERMINATION (CATEGORY 2):
The average Chlorophyll a value over three consecutive months is less than the value referenced in the rule.

INSUFFICIENT DATA CATEGORY (EPA CATEGORY 3):
Data from less than 3 samples available in a 90 day time period.

TIME PERIOD:
Summer: June 1 through September 30 (period of highest use for water contact recreation)

Fall-Winter-Spring (FWS): October 1 through May 31

DATA REQUIREMENTS:
Data collected since 1993. A minimum of three samples collected over any three consecutive months at a minimum of one representative location (e.g., above the deepest point of a lake or reservoir or at a point mid flow of a river).

NOTES:
Information on thermally stratified lakes was obtained from the Atlas of Oregon Lakes[6].

Lakes are identified by an LLID assigned to a point at the center of the water body. They may also be identified with an LLID for a stream which flows into or out of the lake, and river miles are assigned at those points on the stream line.

[6] Johnson, D.M., Petersen, R.R., Lycan, D.R., Sweet, J.W., Neuhaus, M.E., Schaedel, A.L., 1985, Atlas of Oregon Lakes: Corvallis, OR, Oregon State University Press, 317 p.

PARAMETER: **Dissolved Oxygen**

BENEFICIAL USES AFFECTED: Fish and Aquatic Life
Salmon and Steelhead Spawning
Resident Trout Spawning
Cold-Water Aquatic Life
Cool-Water Aquatic Life
Warm-Water Aquatic Life
Estuarine Water

NUMERIC CRITERION: OAR 340-041-0016

340-041-0016
Dissolved Oxygen

Dissolved oxygen (DO): No wastes may be discharged and no activities must be conducted that either alone or in combination with other wastes or activities will cause violation of the following standards: The changes adopted by the Commission on January 11, 1996, become effective July 1, 1996. Until that time, the requirements of this rule that were in effect on January 10, 1996, apply:

(1) For water bodies identified as active spawning areas in the places and times indicated on the following Tables and Figures set out in OAR 340-041-0101 to 340-041-0340: Tables 101B, 121B, 180B, 201B and 260B, and Figures 130B, 151B, 160B, 170B, 220B, 230B, 271B, 286B, 300B, 310B, 320B, and 340B, (as well as any active spawning area used by resident trout species), the following criteria apply during the applicable spawning through fry emergence periods set forth in the tables and figures:

(a) The dissolved oxygen may not be less than 11.0 mg/l. However, if the minimum intergravel dissolved oxygen, measured as a spatial median, is 8.0 mg/l or greater, then the DO criterion is 9.0 mg/l;

(b) Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 11.0 mg/l or 9.0 mg/l criteria, dissolved oxygen levels must not be less than 95 percent of saturation;

(c) The spatial median intergravel dissolved oxygen concentration must not fall below 8.0 mg/l.

(2) For water bodies identified by the Department as providing cold-water aquatic life, the dissolved oxygen may not be less than 8.0 mg/l as an absolute minimum. Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 8.0 mg/l, dissolved oxygen may not be less than 90 percent of saturation. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen may not fall below 8.0 mg/l as a 30-day mean minimum, 6.5 mg/l as a seven-day minimum mean, and may not fall below 6.0 mg/l as an absolute minimum (Table 21);

(3) For water bodies identified by the Department as providing cool-water aquatic life, the dissolved oxygen may not be less than 6.5 mg/l as an absolute minimum. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen may not fall below 6.5

mg/l as a 30-day mean minimum, 5.0 mg/l as a seven-day minimum mean, and may not fall below 4.0 mg/l as an absolute minimum (Table 21);
(4) For water bodies identified by the Department as providing warm-water aquatic life, the dissolved oxygen may not be less than 5.5 mg/l as an absolute minimum. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen may not fall below 5.5 mg/l as a 30-day mean minimum, and may not fall below 4.0 mg/l as an absolute minimum (Table 21);
(5) For estuarine water, the dissolved oxygen concentrations may not be less than 6.5 mg/l (for coastal water bodies);
(6) For ocean waters, no measurable reduction in dissolved oxygen concentration may be allowed.

WATER QUALITY LIMITED DETERMINATION (CATEGORY 5):
Greater than 10 percent of the samples exceed the appropriate criterion and a minimum of at least two exceedences of the criterion for the time period of interest.

ATTAINING CRITERION DETERMINATION (CATEGORY 2):
For 10 or more samples in the time period of interest, greater than 90% of the samples meet the appropriate criterion. For 5 to 9 samples in the time period of interest, there are no exceedences of the appropriate criteria.

INSUFFICIENT DATA CATEGORY (EPA CATEGORY 3):
Less than 5 samples for the time period of interest, or 5 to 9 samples for the time period of interest with 1 exceedence.

TIME PERIOD:
Spawning and Non-Spawning Time Periods
In designated salmon and steelhead spawning areas, the spawning criterion will be applied during the time periods indicated in tables and figures referenced in OAR 340-041-0016(1). During the non-spawning part of the year in these areas, the cold or cool water criterion is applied depending on ecoregion according to a policy set out in a June 22, 1998 letter from ODEQ to EPA, Region 10 (Appendix 3, p. 3-4).

In areas designated in OAR 340-041 Table 190B for Lahontan trout use, spawning is assumed to occur throughout the range during the time periods indicated on the table. During the non-spawning part of the year in these areas, the cool water criterion is applied based on ecoregion according to a policy set out in a June 22, 1998 letter from ODEQ to EPA, Region 10 (Appendix 3).

In areas designated as bull trout (char) spawning and juvenile rearing in tables and figures referenced in OAR 340-041-0016(1), the spawning criterion will be applied during the time periods set out in a February 2, 2004 letter from ODEQ to EPA, Region 10 (Appendix 4) and summarized in Table 4. During the non-spawning part of the year in these areas, the cold water criterion is applied.

Table 4: Bull Trout Spawning Time Periods

Basin	Subbasin	Spawning Period
South Willamette		August 15 – May 30
John Day		September 1 – April 30
Umatilla		September 1 – April 30
Walla Walla		September 1 – April 30
Grande Ronde	Upper Grande Ronde	September 1 – April 15
	Wallowa	September 1 – May 15
	Wenaha	August 15 – March 31
	Imnaha	August 15 – May 31
Hood		August 15 – May 15
Deschutes		August 15 – May 15
Powder		August 15 – May 15
Malheur		August 15 – May 30
Klamath		August 15 - May 30

Detailed information on spawning locations and spawning time periods is not available for other resident trout species such as redband, rainbow, westslope and cutthroat trout. Therefore, in areas not designated as salmon and steelhead spawning use or Lahontan trout use, ODEQ assumes resident trout spawning occurs. The spawning criterion will be applied for resident trout during the time periods indicated in a policy set out in a February 2, 2004 letter from ODEQ to EPA Region 10 (Appendix 4). In this letter, the spawning time periods were linked to the designated fish uses such as trout rearing, core cold water, and char (bull trout) spawning and rearing. Table 5 summarizes the assumed spawning time periods for resident trout in streams with designated fish uses.

Table 5: Resident Trout Spawning Time Periods

Designated Fish Use	Resident Trout Spawning
Salmon and trout rearing and migration	January 1 – May 15
Redband trout	January 1 – May 15
Core cold water habitat and upstream trout rearing water	January 1 – June 15
Bull trout spawning and juvenile rearing	January 1 – June 15
Salmon and Steelhead Migration Corridors	Assume not suitable for spawning

Spawning time periods for resident trout and bull trout are combined in areas where the designated fish use is bull trout spawning and juvenile rearing. For example, in the John Day basin where bull trout spawning occurs, the resident trout spawning time period (Table 5: January 1 – June 15) and the bull trout spawning time period (Table 4: September 1 – April 30) are combined and the spawning criterion is applied during the time period September 1 through June 15.

DATA REQUIREMENTS:
Data collected since 1993. A minimum of 5 representative data points available per site collected on separate days per applicable time period. The daily mean of continuous dissolved oxygen data is calculated and represents one data point. Any combination of 5 days of continuous or grab sample data in the time period is acceptable.

NOTES:
Cold or Cool Water Criteria:
During non-spawning time periods, cold water criteria for dissolved oxygen are applied in areas designated for core cold water fish use in tables and figures referenced in OAR 340-041-0101 through OAR 340-041-0340.

Cold water criteria are also applied in designated bull trout spawning and rearing areas in non-spawning time periods.

Cool water criteria for dissolved oxygen are applied in areas designated specifically for cool water species fish use in tables and figures referenced in OAR 340-041-0101 through OAR 340-041-0340.

Cool water criteria for dissolved oxygen are also applied in non-spawning time periods in areas designated as salmon and trout migration corridors (no rearing) on tables and figures referenced in OAR 340-041-0101 through OAR 340-041-0340.

In non-spawning time periods where the designated fish use is salmon and trout rearing and migration or redband and Lahontan cutthroat trout, the cold or cool water criteria apply based on the ecoregion where the sampling site is located. This policy is described in a June 22, 1998 letter from ODEQ to EPA, Region X (Appendix 3). The ecoregions are described in: Omernik, J. and Gallant, A., 1986, Ecoregions of the Pacific Northwest, EPA/600/3-86/033.

Warm Water Criteria:
The warm water criteria are applied to waters identified in OAR 340-041 Table 190B as supporting borax lake chub.

Lakes:
Unless designated as salmon and steelhead spawning areas, natural lakes and reservoirs are not considered spawning habitat. The applicable cold or cool water criteria are applied year round.

Estuarine Criteria:
The estuarine water criterion for dissolved oxygen applies for samples taken in estuarine conditions. The spawning criteria is not applied for resident trout, but is applied for designated salmon and steelhead spawning periods. ODEQ used conductivity measurements as an indicator for estuarine conditions. This indicator was chosen after reviewing conductivity measurements collected from coastal waters. As shown in Figures 4 through 6, the measured conductivity is generally lower than 200 uS/cm at river locations where salt water is not present.

For dissolved oxygen data collected in the coastal waters of the North Coast, Mid Coast, South Coast, Rogue and Umpqua Basins, the conductivity of each sample was also evaluated. For continuous data, the daily mean conductivity was calculated. If the recorded conductivity was greater than 200 uS/cm, the estuarine dissolved oxygen criterion of 6.5 mg/L was applied. If the recorded conductivity was less than 200 uS/cm, the appropriate freshwater criteria were applied. Data collected in non- coastal waters was evaluated using the appropriate freshwater criteria.

The spawning criterion during assumed resident trout spawning time periods was not applied in sections of a water body where data indicated estuarine conditions.

Figure 4: Conductivity Measured in Columbia River

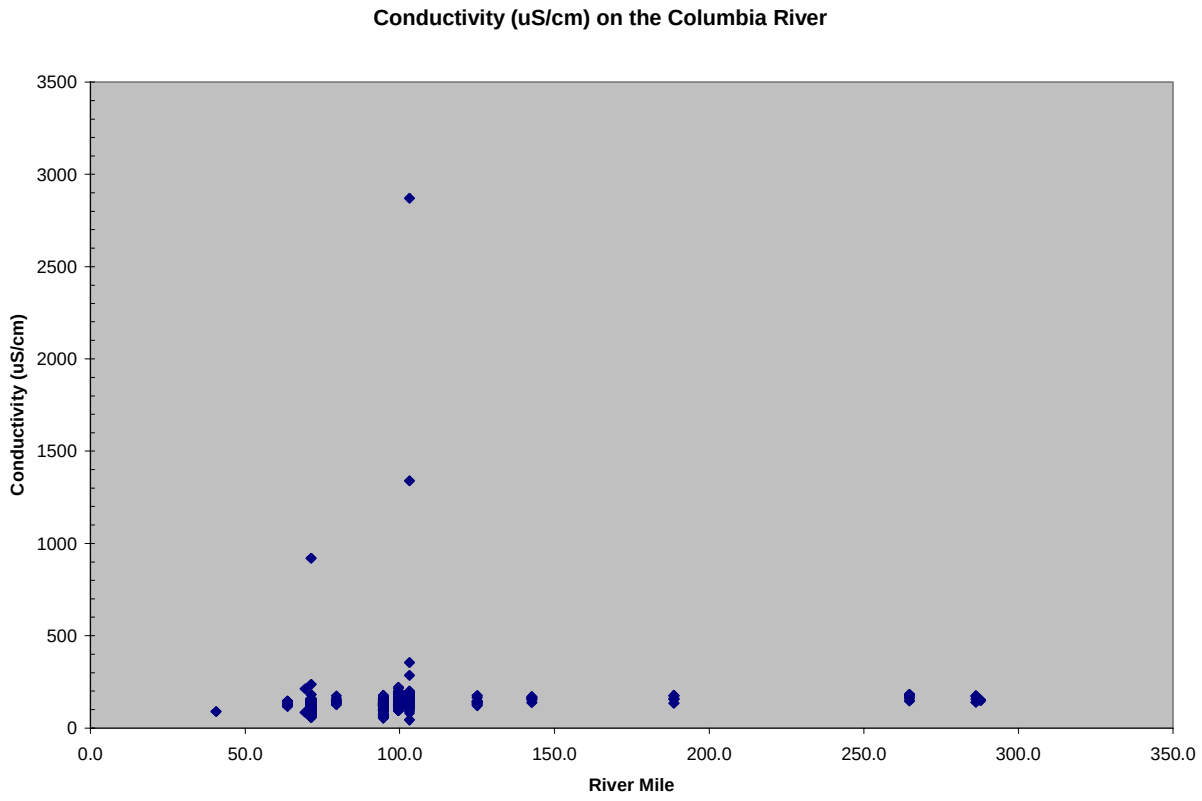


Figure 5: Conductivity Measured in Rogue River

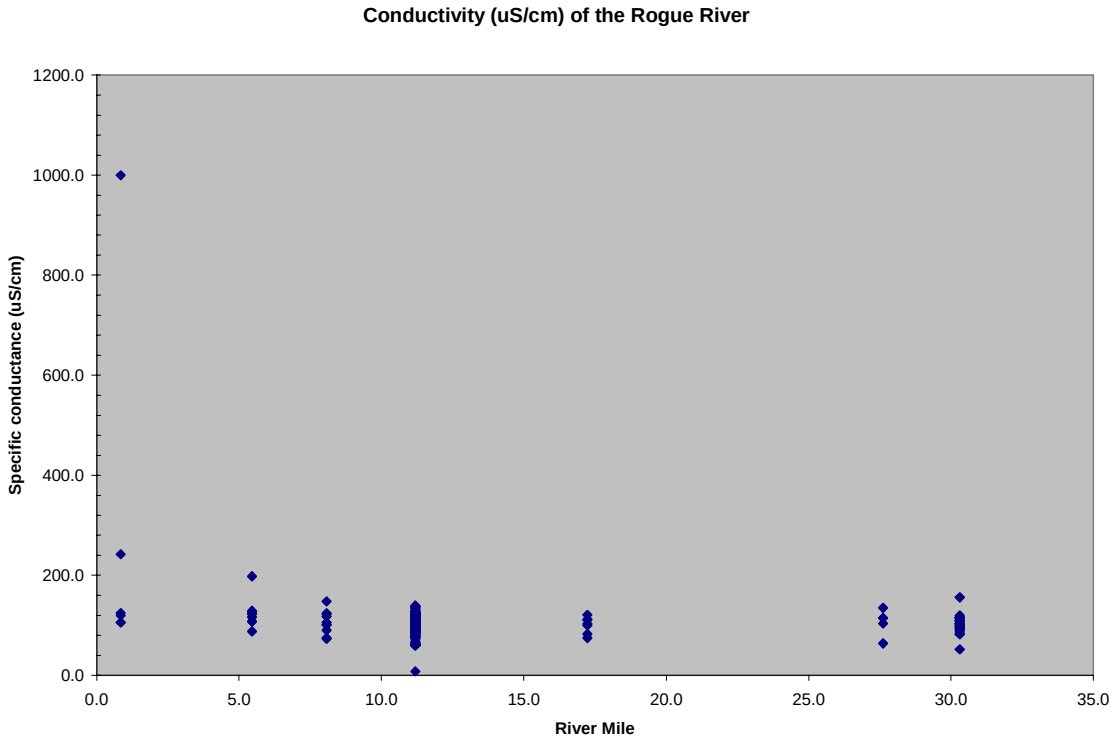
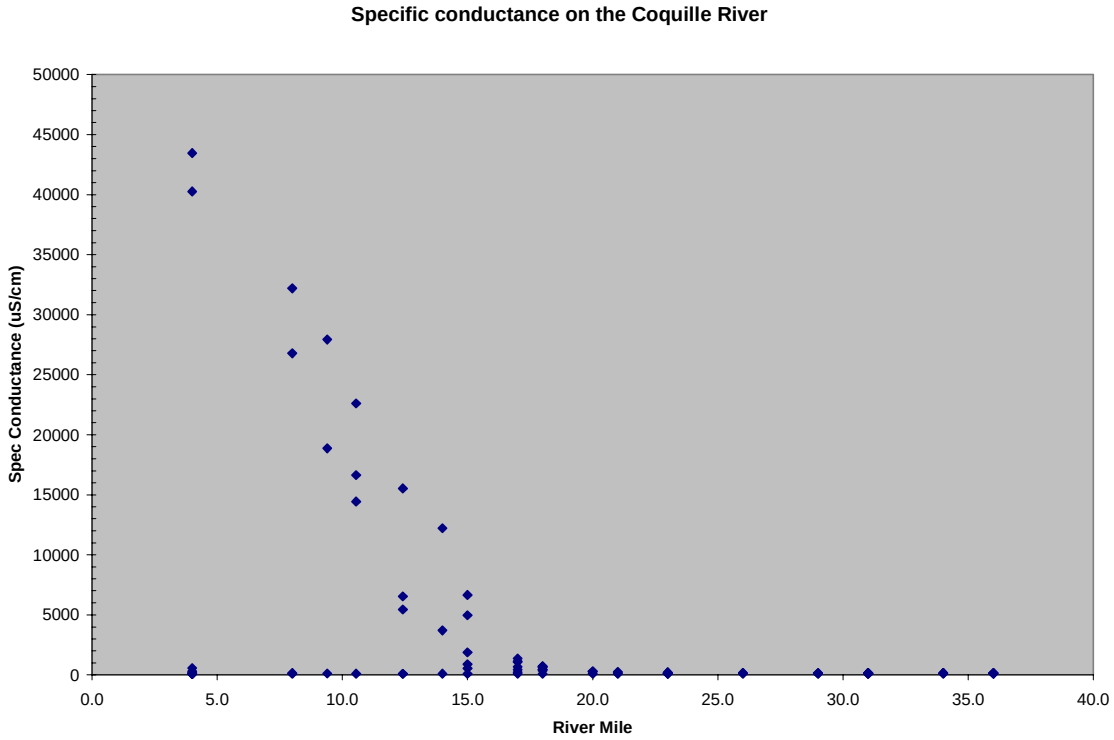
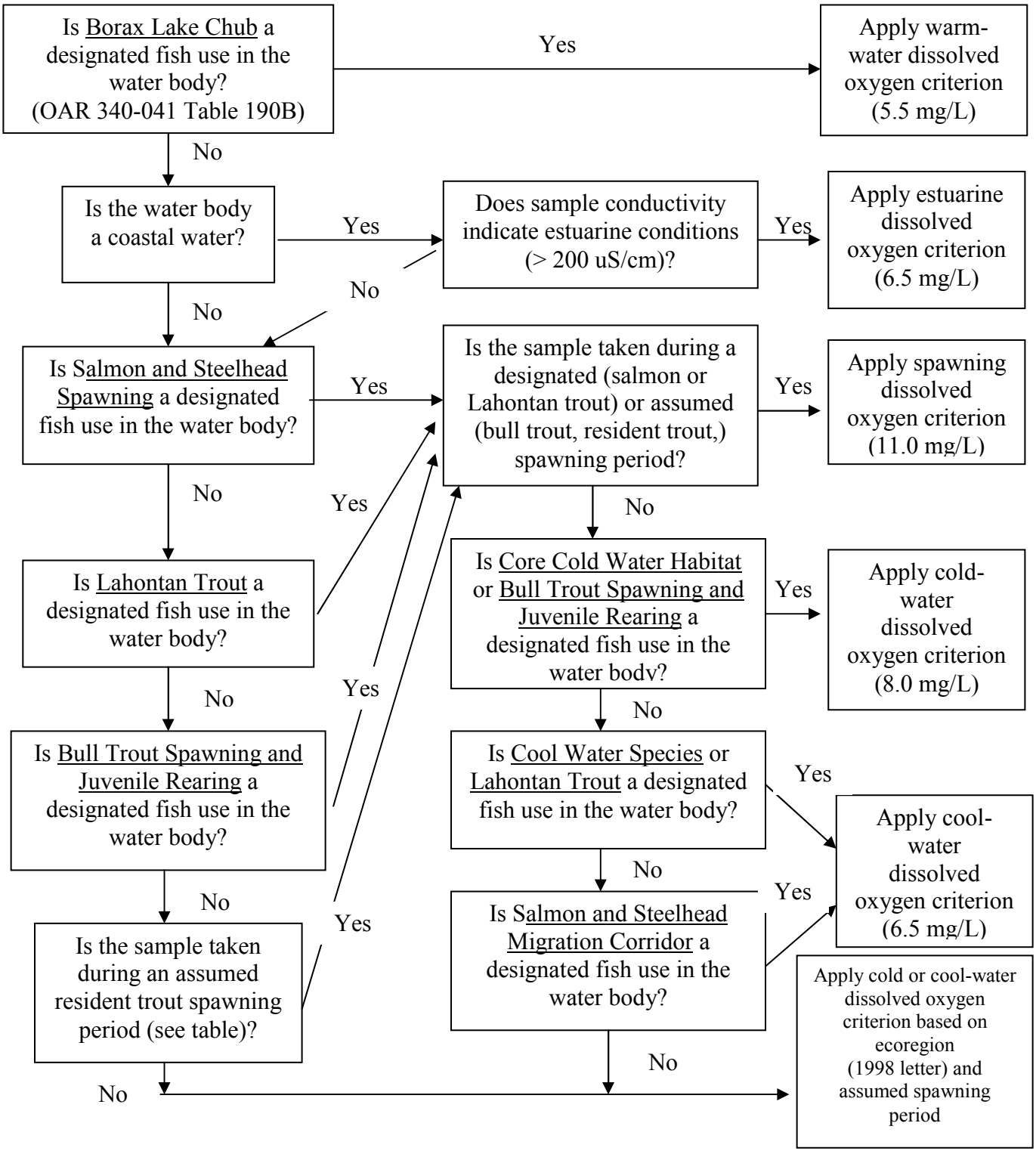


Figure 6: Conductivity Measured in Coquille River



Summary:
The following flow chart (Figure 9) illustrates the evaluation process for dissolved oxygen data collected from Oregon water bodies.

Figure 9: Evaluation of Dissolved Oxygen Data



PARAMETER: **pH**

BENEFICIAL USES AFFECTED: Resident Fish and Aquatic Life
Water Contact Recreation

NUMERIC CRITERION: Statewide: OAR 340-041-0021
Basin-Specific:
OAR 340-041-0101 through OAR 340-041- 0350

340-041-0021
pH
(1) Unless otherwise specified in OAR 340-041-0101 through 340-041-0350, pH values (Hydrogen ion concentrations) may not fall outside the following ranges:
(a) Marine waters: 7.0-8.5;
(b) Estuarine and fresh waters: 6.5-8.5.
(2) Waters impounded by dams existing on January 1, 1996, which have pHs that exceed the criteria are not in violation of the standard, if the Department determines that the exceedance would not occur without the impoundment and that all practicable measures have been taken to bring the pH in the impounded waters into compliance with the criteria.

Basin-Specific
340-041-0104
Water Quality Standards and Policies Specific to the Main Stem Columbia River
(1) pH (hydrogen ion concentration). pH values may not fall outside the following range: main stem Columbia River (mouth to river mile 309): 7.0 - 8.5.

340-041-0124
Water Quality Standards and Policies Specific to the Main Stem Snake River
(1) pH (hydrogen ion concentration). pH values may not fall outside the following range: main stem Snake River (river miles 260 to 335): 7.0-9.0.

340-041-0135
Water Quality Standards and Policies for this Basin (Deschutes Basin)
(1) pH (hydrogen ion concentration). pH values may not fall outside the following ranges:
(a) All other Basin streams (except Cascade lakes): 6.5-8.5;
(b) Cascade lakes above 3,000 feet altitude: pH values may not fall outside the range of 6.0 to 8.5.

340-041-0145
Water Quality Standards and Policies for this Basin
(1) pH (hydrogen ion concentration):
(a) Goose Lake: pH values may not fall outside the range of 7.5 to 9.5;

Table 6: Summary of Basin-Specific Criteria Excerpted from OAR 340-041-0101 through OAR 340-041-0350

Basin	Range	Basin	Range
Deschutes Basin:	6.5 to 8.5	North Coast Basin	6.5 to 8.5
Goose & Summer Lake Basin	7.0 to 9.0*	Owyhee Basin	7.0 to 9.0*;
Grande Ronde Basin	6.5 to 9.0*	Powder Basin	6.5 to 9.0*;
Hood Basin	6.5 to 8.5	Rogue Basin	6.5 to 8.5
John Day Basin	6.5 to 9.0*	Sandy Basin	6.5 to 8.5
Klamath Basin:	6.5 to 9.0*	South Coast Basin:	6.5 to 8.5
Malheur River Basin	7.0 to 9.0*	Malheur Lake Basin	7.0 to 9.0*
Umpqua Basin	6.5 to 8.5	Mid Coast Basin:	6.5 to 8.5
Walla Walla Basin:	6.5 to 9.0*	Willamette Basin	6.5 to 8.5
Umatilla Basin	6.5 to 9.0*		

* When greater than 25 percent of ambient measurements taken between June and September are greater than pH 8.7, and as resources are available according to priorities set by the Department, the Department will determine whether the values higher than 8.7 are anthropogenic or natural in origin.

WATER QUALITY LIMITED DETERMINATION (CATEGORY 5):
Greater than 10 percent of the samples are outside the range of the appropriate criterion and a minimum of at least two samples outside the range of the appropriate criterion for the time period of interest.

ATTAINING CRITERION DETERMINATION (CATEGORY 2):
For 10 or more samples in the time period of interest, greater than 90% of the samples are within the range of the appropriate criterion. For 5 to 9 samples in the time period of interest, there are no samples outside the range of the appropriate criterion.

INSUFFICIENT DATA CATEGORY (EPA CATEGORY 3):
Less than 5 samples for the time period of interest, or 5 to 9 samples for the time period of interest with 1 sample outside the range of the appropriate criterion.

TIME PERIOD:
Summer: June 1 through September 30
Fall-Winter-Spring (FWS): October 1 to May 31

DATA REQUIREMENTS:

Data collected since 1993. A minimum of 5 representative data points available per site collected on separate days for each time period of interest.

NOTES:
Cascade Lakes where identified as lakes at elevations over 3,000 feet. The Cascade Lake criterion was also applied to man-made lakes at elevations over 3,000 feet.

PARAMETER: **Sedimentation**

BENEFICIAL USES AFFECTED: Resident Fish and Aquatic Life
Salmonid Fish Spawning and Rearing

NUMERIC CRITERION: None

NARRATIVE CRITERION: OAR 340-041-0007(13)

> **340-041-0007**
> **Statewide Narrative Criteria**
> (13) The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry may not be allowed;

WATER QUALITY LIMITED DETERMINATION (CATEGORY 5):
Previous water quality assessment methodologies (Listing Criteria for Oregon's 1998 303(d) List of Water Quality Limited Water Bodies) have used stream specific documentation that showed excessive sedimentation was a significant limitation to fish or other aquatic life. This included information indicating beneficial uses impairment (aquatic community status, biomonitoring reference sites, or fishery data) and measurement data for benchmarks such as cobble embeddedness or percent fines.

ATTAINING CRITERION DETERMINATION (CATEGORY 2):
To de-list streams, ODEQ will use best professional judgment to review data and information submitted to demonstrate that stream beneficial uses are being supported. This information may include data on aquatic community status compared to a reference community, and stream specific sediment data such as percent fines by methods such as the modified Wolman pebble count, relative bed stability, and comparison to ecoregion reference sites

TIME PERIOD:
Annual

DATA REQUIREMENTS:
Data collected since 1993.

PARAMETER: **Temperature**

BENEFICIAL USES AFFECTED: Salmon and Steelhead Spawning
Core Cold Water Habitat
Salmon and Trout Rearing and Migration
Salmon and Steelhead Migration Corridor
Lahontan Cutthroat Trout or Redband Trout
Bull Trout Spawning and Juvenile Rearing

NARRATIVE CRITERION: OAR 340-041-0028

NUMERIC CRITERION: OAR 340-041-0028(4)

340-041-0028
Temperature

(4) Biologically Based Numeric Criteria. Unless superseded by the natural conditions criteria described in section (8) of this rule, or by subsequently adopted site-specific criteria approved by EPA, the temperature criteria for State waters supporting salmonid fishes are as follows:

(a) The seven-day-average maximum temperature of a stream identified as having salmon and steelhead spawning use on subbasin maps and tables set out in OAR 340-041-0101 to 340-041-0340: Tables 101B, and 121B, and Figures 130B, 151B, 160B, 170B, 220B, 230B, 271B, 286B, 300B, 310B, 320B, and 340B, may not exceed 13.0 degrees Celsius (55.4 degrees Fahrenheit) at the times indicated on these maps and tables;

(b) The seven-day-average maximum temperature of a stream identified as having core cold water habitat use on subbasin maps set out in OAR 340-041-101 to 340-041-340: Figures 130A, 151A, 160A, 170A, 220A, 230A, 271A, 286A, 300A, 310A, 320A, and 340A, may not exceed 16.0 degrees Celsius (60.8 degrees Fahrenheit);

(c) The seven-day-average maximum temperature of a stream identified as having salmon and trout rearing and migration use on subbasin maps set out at OAR 340-041-0101 to 340-041-0340: Figures 130A, 151A, 160A, 170A, 220A, 230A, 271A, 286A, 300A, 310A, 320A, and 340A, may not exceed 18.0 degrees Celsius (64.4 degrees Fahrenheit);

(d) The seven-day-average maximum temperature of a stream identified as having a migration corridor use on subbasin maps and tables OAR 340-041-0101 to 340-041-0340: Tables 101B, and 121B, and Figures 151A, 170A, and 340A, may not exceed 20.0 degrees Celsius (68.0 degrees Fahrenheit). In addition, these water bodies must have coldwater refugia that's sufficiently distributed so as to allow salmon and steelhead migration without significant adverse effects from higher water temperatures elsewhere in the water body. Finally, the seasonal thermal pattern in Columbia and Snake Rivers must reflect the natural seasonal thermal pattern;

(e) The seven-day-average maximum temperature of a stream identified as having Lahontan cutthroat trout or redband trout use on subbasin maps and tables set out in OAR 340-041-0101 to 340-041-0340: Tables 120B, 140B, 190B, and 250B, and Figures 180A, 201A, and 260A may not exceed 20.0 degrees Celsius (68.0 degrees Fahrenheit);
(f) The seven-day-average maximum temperature of a stream identified as having bull trout spawning and juvenile rearing use on subbasin maps set out at OAR 340-041-0101 to 340-041-0340: Figures 130B, 151B, 160B, 170B, 180A, 201A, 260A, 310B, and 340B, may not exceed 12.0 degrees Celsius (53.6 degrees Fahrenheit). From August 15 through May 15, in bull trout spawning waters below Clear Creek and Mehlhorn reservoirs on Upper Clear Creek (Pine Subbasin), below Laurance Lake on the Middle Fork Hood River, and below Carmen reservoir on the Upper McKenzie River, there may be no more than a 0.3 degrees Celsius (0.5 Fahrenheit) increase between the water temperature immediately upstream of the reservoir and the water temperature immediately downstream of the spillway when the ambient seven-day-average maximum stream temperature is 9.0 degrees Celsius (48 degrees Fahrenheit) or greater, and no more than a 1.0 degree Celsius (1.8 degrees Fahrenheit) increase when the seven-day-average stream temperature is less than 9 degrees Celsius.

WATER QUALITY LIMITED DETERMINATION (CATEGORY 5):
Where continuous temperature data are collected, the seven-day-average maximum temperature exceeds the applicable criterion. Seven-day average maximum temperature means a calculation of the average of the daily maximum temperatures from seven consecutive days made on a rolling basis.

ATTAINING CRITERION DETERMINATION (CATEGORY 2):
Where continuous temperature data are collected, the seven-day-average maximum temperature attains the applicable criterion.

INSUFFICIENT DATA CATEGORY (EPA CATEGORY 3):
Where continuous temperature data are collected, insufficient data is available to calculate the seven-day-average maximum temperature.

TIME PERIOD:
In designated salmon and steelhead spawning areas, the spawning criterion will be applied during the time periods indicated in tables and figures referenced in OAR 340-041-0028(4)(a). Other applicable criteria will be applied during non-spawning time periods.

DATA REQUIREMENTS:
Continuous temperature data collected since 1993 for the time period of interest. "Grab" temperature readings were not evaluated, and "grab" data included in prior assessments were not re-evaluated.

PARAMETER: **Total Dissolved Gas**

BENEFICIAL USES AFFECTED: Resident Fish and Aquatic Life

NARRATIVE CRITERION: OAR 340-041-0031(1)

NUMERIC CRITERION: OAR 340-041-0031(2)

> **340-041-0031**
> **Total Dissolved Gas**
> (1) Waters will be free from dissolved gases, such as carbon dioxide hydrogen sulfide, or other gases, in sufficient quantities to cause objectionable odors or to be deleterious to fish or other aquatic life, navigation, recreation, or other reasonable uses made of such water.
> (2) Except when stream flow exceeds the ten-year, seven-day average flood, the concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection may not exceed 110 percent of saturation. However, in hatchery-receiving waters and other waters of less than two feet in depth, the concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection may not exceed 105 percent of saturation.

WATER QUALITY LIMITED DETERMINATION (CATEGORY 5):
More than 10 percent of the samples exceed standard and a minimum of at least two exceedences of the standard, or a survey that identifies beneficial use impairment due to total dissolved gas such as assessment of fish conditions.

TIME PERIOD:
Annual

NOTE:
No new data were evaluated for the 2004/2006 water quality assessment.

PARAMETER: **Toxic Substances**

BENEFICIAL USES AFFECTED: Aquatic Life – Fresh Water and Marine Water
Human Health – Water and Fish Ingestion, Fish Consumption, Drinking Water

NARRATIVE CRITERION: OAR 340-041-0033(1)

NUMERIC CRITERION: OAR 340-041-0033(2)

340-041-0033
Toxic Substances

(1) Toxic substances may not be introduced above natural background levels in waters of the state in amounts, concentrations, or combinations that may be harmful, may chemically change to harmful forms in the environment, or may accumulate in sediments or bioaccumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare or aquatic life, wildlife, or other designated beneficial uses.

(2) Levels of toxic substances in waters of the state may not exceed the applicable criteria listed in Tables 20, 33A, and 33B. Tables 33A and 33B, adopted on May 20, 2004, update Table 20 as described in this section.

(a) Each value for criteria in Table 20 is effective until the corresponding value in Tables 33A or 33B becomes effective.

(A) Each value in Table 33A is effective on February 15, 2005, unless EPA has disapproved the value before that date. If a value is subsequently disapproved, any corresponding value in Table 20 becomes effective immediately. Values that are the same in Tables 20 and 33A remain in effect.

(B) Each value in Table 33B is effective upon EPA approval.

(b) The department will note the effective date for each value in Tables 20, 33A, and 33B as described in this section.

Note: Oregon standards for toxic substances were revised in 2004 but have not yet been approved by EPA for Clean Water Act purposes. For the 2004/2006 Integrated Report, Oregon applied pre-revision numeric criteria from Table 20. See Appendix 5 for pre-revision Table 20. Criteria for metals on Table 20 are total recoverable concentrations.

WATER QUALITY LIMITED DETERMINATION (CATEGORY 5):
Two (2) exceedences of the most stringent applicable criteria for a specific toxic substance.

POTENTIAL CONCERN (CATEGORY 3B)
One (1) exceedence of the most stringent applicable criteria for a specific toxic substance. (See Notes below regarding alkalinity criterion.)

ATTAINING CRITERION DETERMINATION (CATEGORY 2):
A minimum of 5 samples, with all sample results below the most stringent applicable criteria for a specific toxic substance.

INSUFFICIENT DATA CATEGORY (EPA CATEGORY 3):
Less than 5 valid samples for the toxic substance of interest. For sample results reported as less than a minimum reporting limit (<MRL), the MRL was compared to the most stringent applicable criteria. If the MRL was higher than the most stringent criteria, the sample was not considered valid. If sample data were not available to calculate toxic criteria dependent on hardness, temperature, pH, or salinity, the sample was not considered valid.

TIME PERIOD:
Annual

DATA REQUIREMENTS:
Data collected since 1993.

NOTES:
Minimum Reporting Limit
For sample results reported as less than a minimum reporting limit (<MRL), the MRL was compared to the toxic substance criteria. If the MRL was below the criteria, the result was counted as attaining the criteria. If the MRL was above the criteria, the sample result is unknown with regard to the standard and was not counted as either exceeding or attaining the criteria.

Freshwater and Saltwater Criteria
ODEQ used EPA guidance to determine when to apply freshwater and saltwater toxics criteria.[7]

For waters with salinity equal or greater than 10 parts per thousand, the most stringent of the freshwater or marine acute or chronic criteria for aquatic life or the human health criteria for "fish-consumption-only" was applied. If there was no "fish-consumption-only" criteria, the "water and fish ingestion" criteria was applied if more stringent than the aquatic life criteria.

For marine waters, the most stringent of the freshwater or marine acute or chronic criteria or the human health criteria for "fish-consumption-only" was applied. If there was no "fish-consumption-only" criteria, the water and fish ingestion criteria was applied if more stringent than the aquatic life criteria.

For non-marine and non-saline waters, the most stringent of the freshwater acute or chronic criteria or the human health criteria for "fish-consumption-only", "water-and-fish-ingestion", or "drinking water MCL" criteria was applied.

[7] 2002, National Recommended Water Quality Criteria: 2002, U.S. EPA Office of Water, EPA 822-R-02-047.

Total Recoverable Analysis
To evaluate water quality for metals, results for total recoverable analyses were compared to the applicable criteria. If no total analysis was available, then a dissolved analytical result was evaluated against the criteria. If the data did not identify the analysis as total or dissolved, the result was evaluated as if it were a total analysis.

Hardness Dependent Criteria
The freshwater criterion for several metals is expressed as a function of hardness (mg/L) in the water column. These criteria are flagged on Table 20 with a "+" notation. Criteria values may be calculated from the following formulae according to EPA guidelines[8]:

Freshwater Acute Criteria:

Criteria maximum concentration (CMC) = $e^{(m_a[\ln(hardness)]+b_a)}$

Freshwater Chronic Criteria:

Criteria chronic concentration (CCC) = $e^{(m_c[\ln(hardness)]+b_c)}$

Metal	m_a	b_a	m_c	b_c
Cadmium	1.128	-3.828	0.7852	-3.490
Chromium	0.819	3.688	0.819	1.561
Copper	0.9422	-1.464	0.8545	-1.465
Lead	1.273	-1.460	1.273	-4.705
Nickel	0.8460	3.3612	0.8460	1.1645
Silver	1.72	-6.520		
Zinc	0.8473	0.8604	0.8473	0.7614

If hardness was not measured directly, the following equation was used to calculate the hardness value[9]:

Hardness, mg equivalent $CaCo_3$/L = 2.497{Ca, mg/L} + 4.1189 {Mg, mg/L)

A minimum hardness of 25 mg/L was used as specified by EPA for calculating hardness dependent freshwater metals criteria in 40 CFR Section 131.36(c)(4)(i).

Ammonia Criteria - Freshwater
Ammonia criteria for freshwater depend on pH, temperature, and the presence of salmonids or other fish with ammonia-sensitive early life stages. Values for freshwater criteria (of total ammonia nitrogen in mg N/L) can be calculated using the following formulae[10,11]:

[8] 1986, Quality Criteria for Water, U.S. EPA Office of Water, EPA 440/5-86-001
[9] 1998, Standard Methods for the Examination of Water and Wastewater, 20th edition, American Public Health Association, American Water Works Association, Water Environment Federation
[10] 1985, Ambient Water Quality Criteria for Ammonia - 1984, U.S. EPA Office of Water, EPA 440/5-85-001
[11] 1986, Quality Criteria for Water 1986, U.S. EPA Office of Water, EPA 440/5-86-001

Freshwater Acute Criterion[12]:

Salmonids present:

CMC = 0.52 / FT / FPH / 2

Where:

FT = 1 when 20 ≤ Temperature (T) ≤ 30

Or

$FT = 10^{0.03(20-T)}$ when 0 ≤ T ≤ 20

And

FPH = 1 when 8 ≤ pH ≤ 9

Or

$FPH = \frac{1+10^{7.4-pH}}{1.25}$ when 6.5 ≤ pH ≤ 8

Salmonids absent:

CMC = 0.52 / FT / FPH / 2

Where:

FT = 0.71 when 25 ≤ T ≤ 30

Or

$FT = 10^{0.03(20-T)}$ when 0 ≤ T ≤ 25

And

FPH = 1 when 8 ≤ pH ≤ 9

Or

$FPH = \frac{1+10^{7.4-pH}}{1.25}$ when 6.5 ≤ pH ≤ 8

Freshwater Chronic Criterion:

Salmonids present:

CCC = 0.80 / FT / FPH / RATIO

Where

FT = 1.4 when 15 ≤ T ≤ 30

Or

$FT = 10^{0.03(20-T)}$ when 0 ≤ T ≤ 15

And

FPH = 1 when 8 ≤ pH ≤ 9

Or

$FPH = \frac{1+10^{7.4-pH}}{1.25}$ when 6.5 ≤ pH ≤ 8

And

RATIO = 16 when 7.7≤ pH ≤ 9

Or

[12] 1985, Ambient Water Quality Criteria for Ammonia - 1984, U.S. EPA Office of Water, EPA 440/5-85-001.

$$RATIO = 24 * \frac{10^{7.7-pH}}{1+10^{7.4-pH}} \quad \text{when } 6.5 \leq pH \leq 7.7$$

Salmonids absent:

CCC = 0.80 / FT / FPH / RATIO

Where

FT = 1 when $20 \leq T \leq 30$

Or

$FT = 10^{0.03(20-T)}$ when $0 \leq T \leq 20$

And

FPH = 1 when $8 \leq pH \leq 9$

Or

$$FPH = \frac{1+10^{7.4-pH}}{1.25} \quad \text{when } 6.5 \leq pH \leq 8$$

And

RATIO = 16 when $7.7 \leq pH \leq 9$

Or

$$RATIO = 24 * \frac{10^{7.7-pH}}{1+10^{7.4-pH}} \quad \text{when } 6.5 \leq pH \leq 7.7$$

Ammonia criteria calculated above are for un-ionized ammonia (NH_3) fraction[13]. The fraction of un-ionized ammonia in measured total ammonia ($NH_3 + NH_4^+$) is calculated using the following formulae[14]:

pKa = 0.09018 + (2729.92/(273.15 + Temperature))
Fraction = 1/(10^(pKa – pH) + 1)

A total ammonia criteria can be calculated by:

Total ammonia ($NH_3 + NH_4^+$) criteria = Un-ionized ammonia (NH_3) criteria/Fraction

To convert this criteria to total ammonia determined as mg/L N:

Total ammonia as N criteria = Total ammonia ($NH_3 + NH_4^+$) criteria * 0.822

Ammonia Criteria – Saltwater

Ammonia criteria for saltwater depend on pH, temperature, and salinity. National criteria for saltwater are given for unionized ammonia along with methods for calculating criteria for total ammonia[15]:

[13] 1985, Ambient Water Quality Criteria for Ammonia - 1984, U.S. EPA Office of Water, EPA 440/5-85-001.

[14] 1999, 1999 Update of Ambient Water Quality Criteria for Ammonia, U.S. EPA Office of Water, EPA 822-R-99-014.

Saltwater Acute Criteria

CMC = 0.233 mg/L unionized NH_3

Saltwater Chronic Criteria

CCC = 0.035 mg/L unionized NH_3

Converting to total ammonia as N:

$$\text{Molal Ionic Strength } (MIS) = \frac{19.9273S}{1000 - 1.005109S}$$

$$pK_a^S = 9.245 + 0.116MIS$$

$$\text{\% Unionized Ammonia (UIA)} = 100\left[1 + 10\text{^}\left(pK_a^s + 0.0324(298 - T) + 0.0415\frac{P}{T} - pH\right)\right]^{-1}$$

Where:

S = salinity (g/kg)
T = temperature (ºK)
P = pressure (atm)

Saltwater Acute Criteria

Total NH_3 acute criterion as NH_3 = CMC/UIA = 0.233/UIA
Total NH_3 acute criterion as N = 0.822*CMC/UIA = 0.822*0.233/UIA

Saltwater Chronic Criteria

Total NH_3 chronic criterion as NH_3 = CCC/UIA = 0.035/UIA
Total NH_3 chronic criterion as N = 0.822*CCC/UIA = 0.822*0.035/UIA

Alkalinity Criterion

The freshwater criterion for alkalinity is "20 mg/L or more as $CaCO_3$ freshwater aquatic life except where natural concentrations are less."[16] Alkalinity should not be below this value in order to protect beneficial uses.

Alkalinity is a measure of carbonate and bicarbonate ions and the buffering capacity of water to pH changes. Freshwater systems have natural variations in pH that are related to photosynthetic activity and other inorganic and organic chemical reactions. Applying the alkalinity criterion as an isolated standard to determine where water is water quality limited may lead to incorrect conclusions about overall natural water quality. For the 2004/2006 Integrated Report evaluation, analytical data indicating alkalinity less than the criterion is flagged as a **Category 3B Potential Concern** and should be considered with

[15] 1989, Ambient Water Quality Criteria for Ammonia (Saltwater)-1989, U.S. EPA Office of Water, EPA 440/5-88-004; http://www.epa.gov/ost/pc/ambientwqc/ammoniasalt1989.pdf

[16] 1986, Quality Criteria for Water, U.S. EPA Office of Water, EPA 440/5-86-001

other water quality information such as exceedences of criteria for pH, chlorophyll a, aquatic weeds or algae, and dissolved oxygen.

Phosphorus Criterion/Phosphate Phosphorus Benchmark
The Table 20 criterion of 0.01 ug/L applies to elemental phosphorus (P) in marine or estuarine waters. This is based on the EPA criterion to protect marine organisms[17].

Neither Oregon nor EPA has set a criterion for phosphate phosphorus. EPA has recognized the relationship between phosphates, as major nutrients, and excessive aquatic weed and algae growth, and lake and reservoir eutrophication.[15] EPA recommends that total phosphates as phosphorus (P) should not exceed 50 ug/L in streams to control excessive aquatic growths. For the 2004/2006 Integrated Report, this value is used as a benchmark to evaluate water quality data for phosphate phosphorus. Water bodies with total phosphates as phosphorus (P) greater than 50 ug/L are a **Category 3B Potential Concern** for conditions that may result in not meeting water quality standards.

[17] 1986, Quality Criteria for Water, U.S. EPA Office of Water, EPA 440/5-86-001

PARAMETER: **Turbidity**

BENEFICIAL USES AFFECTED: Resident Fish and Aquatic Life
Water Supply
Aesthetics

NARRATIVE CRITERION: OAR 340-041-0036

NUMERIC CRITERION: OAR 340-041-0036

340-041-0036
Turbidity
Turbidity (Nephelometric Turbidity Units, NTU): No more than a ten percent cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity. However, limited duration activities necessary to address an emergency or to accommodate essential dredging, construction or other legitimate activities and which cause the standard to be exceeded may be authorized provided all practicable turbidity control techniques have been applied and one of the following has been granted:

(a) Emergency activities: Approval coordinated by the Department with the Oregon Department of Fish and Wildlife under conditions they may prescribe to accommodate response to emergencies or to protect public health and welfare;

(b) Dredging, Construction or other Legitimate Activities: Permit or certification authorized under terms of section 401 or 404 (Permits and Licenses, Federal Water Pollution Control Act) or OAR 14l-085-0100 et seq. (Removal and Fill Permits, Division of State Lands), with limitations and conditions governing the activity set forth in the permit or certificate.

WATER QUALITY LIMITED DETERMINATION (CATEGORY 5):
A systematic or persistent increase (of greater than 10%) in turbidity due to an operational activity that occurs on a persistent basis (e.g. dam release or irrigation return, etc.)

TIME PERIOD:
Annual

Notes:
No new data were collected or received for review for the 2004/2006 Integrated Report for turbidity. Listings from previous years are retained for 2004/2006.

Appendix 1

2004 303(d) LIST/DELIST DATA SUBMITTALS
MINIMUM DATA REQUIREMENTS

The following quality assurance and quality control (QA/QC) requirements must be met by all data submitted in support of listing or delisting a water body segment in the Oregon 2004 303(d) List

- Identify and document precise sampling site location(s). The sampling location must be documented by latitude and longitude in either decimal degrees or degrees, minutes, seconds.

- Document date and time the samples were collected.

  Sampling and analysis should be conducted under a written QA/QC Plan or by established and approved protocols such as contained in the Water Quality Monitoring Technical Guidebook, The Oregon Plan for Salmon and Watersheds, July 1999. The QA/QC plan must contain the data quality objectives (DQOs).

- Chemistry samples must be analyzed in accordance with methods cited in the most recent edition of Standard Methods for the Examination of Water and Waste Water, or using EPA approved methods listed in the most recent update of 40 CFR 136. The analysis must utilize appropriate QA/QC protocols, such as routinely analyzing replicates, blanks, laboratory control samples (LCS) and spiked samples. Data using field kits is only acceptable if the kits use a method approved under 40 CFR 136 and the QA/QC protocols referenced above have been adhered to. (See ODEQ Laboratory Field Sampling Reference Guide, and ODEQ Laboratory Quality Assurance Manual.)

- Samples analyzed must comply with preservation, transportation and holding time recommendations cited in the most recent edition of Standard Methods for the Examination of Water and Waste Water or the ODEQ Laboratory Field Sampling Reference Guide".

- Data must be reported in standard units recommended in the relevant approved method.

- Instruments (pH, DO, Conductivity, Temperature, etc.) are to be operated and calibrated according to manufacturer's recommendations, or other acceptable, established procedure. Field measurements must be conducted using methods cited in the most recent edition of Standard Methods for Analysis of Water and Waste Water. For grab samples, duplicate samples will be taken at a minimum of 10% of the total number of monitoring sites (1 duplicate for every 10 sites).

Reference: Water Quality Monitoring Technical Guide Book, The Oregon Plan for Salmon and Watersheds July 1999. Available from Oregon Plan website at: http://oregon.gov/OWEB/docs/pubs/wq_mon_guide.pdf

- Continuous temperature monitoring must follow standardized field protocols. At a minimum, pre and post deployment accuracy checks must be conducted using a NIST (National Institute of Standards and Technology) traceable thermometer. For data to be acceptable it must be bracketed by two acceptable field temperature audits during the deployment period.

  Reference: Water Quality Monitoring Technical Guide Book, The Oregon Plan for Salmon and Watersheds July 1999. Available from Oregon Plan website at: http://oregon.gov/OWEB/docs/pubs/wq_mon_guide.pdf

- Multi-parameter continuous monitors must be calibrated following the manufacturer's calibration procedures prior to field deployment. For data to be acceptable it must be bracketed by two acceptable field audits during the deployment period.

- For macroinvertebrate assessments the Level 3 protocol described in the Oregon Plan Water Quality Monitoring Technical Guide Book, must be followed.

  References: Water Quality Monitoring Technical Guide Book, The Oregon Plan for Salmon and Watersheds July 1999. Available from Oregon Plan website at: http://oregon.gov/OWEB/docs/pubs/wq_mon_guide.pdf

DRAFT Reference Condition Approach and Site Selection, ODEQ , February 2003.

Appendix 2
2004/2006 Integrated Report on Water Quality Status: Water Body Segmentation Rules

Temperature and Dissolved Oxygen

Use segments designated in Oregon Administrative Rules (OAR) Chapter 340 Division 41 as revised in 2003 for designated fish beneficial uses and designated spawning time periods. Assign status as follows:

If		**Then:**	
2004 stations		**2004 Segment**	**2004 Status**
One or more station 303d		Start and end river mile for designated fish use	Cat 5: 303d list
One or more stations 303d	TMDL approved for temperature or dissolved oxygen for stream	Start and end river mile for designated fish use	Cat 4a: WQ limited, TMDL approved
One or more stations 303d, others insufficient data		Start and end river mile for designated fish use	Cat 5: 303d list
One or more stations attaining; others insufficient data		Start and end river mile for designated fish use	Cat 2: Attaining
One or more stations with insufficient data		Start and end river mile for designated fish use	Cat 3: Insufficient data
No 2004 data	2002 303d status	Retain previous segment start and end	3030d based on previous listing

Other Pollutants

For pollutants other than temperature and dissolved oxygen, if segment was defined in 2002 for parameter and season, use pre-existing segment river mile start and end.
For **bacteria**, use 2002 segment for matching parameter and season (example, *e.coli* for summer);

If match for parameter but not season, use segment for matching parameter for any season (example, *e.coli* for fall/winter/spring). Assign 2004 status based on evaluation of 2004 data.

If no match for parameter, use segment for other bacteria parameter (example, for *e. coli*, use previous fecal coliform segment). Assign 2004 status based on evaluation of 2004 data.

For segments with **matching parameter and season**, assign status to segment as follows:

If	**And**	**Then:**	
2004 stations	**2002 Segment Status**	**2004 Segment**	**2004 Status**
One or more stations 303d	303d	Same	Cat 5: 303d list
One or more stations 303d	TMDL approved	Same	Cat 4a: WQ limited, TMDL approved
One or more stations 303d	Attaining	Same	Cat 5: 303d list
Stations insufficient data	303d	Same	Cat 5: 303d list
One or more stations potential concern (toxics)	303d	Same	Cat 5: 303d list
One or more stations potential concern (toxics)	Potential concern or insufficient data	Same	Cat 3B: Potential concern
One or more stations potential concern (toxics)	Attaining	Same	Cat 3B: Potential concern
Stations insufficient data	Attaining	Same	Cat 2: Attaining
Stations insufficient data	Potential concern	Same	Cat 3B: Potential concern
One or more stations attaining and one or more stations insufficient data	Attaining	Same	Cat 2: Attaining
Attaining and/or insufficient data	303d	Same	Cat 5: 303d list (Check for data equivalency to de-list).
Combination insufficient data, 303d, and attaining	303d	Same	Cat 5: 303d list
Stations attaining	Attaining	Same	Cat 2: Attaining
Combination insufficient data, 303d, and attaining	Attaining	Same	Cat 5: 303d list
Attaining	TMDL approved	Same	Cat 2: Attaining

Other Pollutants (con't)

If **NO** segment is defined in 2002 for parameter and season, define 2004 segment up to the next monitoring station and assign 2004 status to segment as follows:

If	**And No 2002 Segment**	**Then:**	
2004 stations		**2004 segment**	**2004 segment status**
One station 303d		Mouth to headwaters	Cat 5: 303d list
One or more stations 303d with upstream data points.		Segment from mouth up to next station that shows other status information	Cat 5: 303d list
One station 303d with downstream station attaining		Define segments start/end at halfway point between attaining and 303d point	Cat 2: Attaining from data point to halfway ; Cat 5 303d list from halfway below data point to next upstream data point showing different status.
One or more station 303d, other insufficient data		Mouth to headwaters	Cat 5: 303d list
One or more station attaining; others with insufficient data		Mouth to headwaters	Cat 2: Attaining
One or more stations with insufficient data		Mouth to headwaters	Cat 3: Insufficient data

Appendix 3

June 22, 1998

Philip Millam
Director, Office of Water, OW-134
U.S. Environmental Protection Agency, Region X
1200 Sixth Avenue
Seattle, Washington 98101

Dear Phil:

This letter is to provide policy clarification of the Oregon water quality standards revisions that were submitted for Environmental Protection Agency's (EPA) approval on July 10, 1996. Specifically, this letter addresses how the Department of Environmental Quality (ODEQ) is interpreting certain language contained in the Oregon Water Quality Standards (OAR 340-41) and responds to questions that EPA has raised in its review of the standards.

The regulatory clarifications included herein will be incorporated into the water quality standards, to the extent possible, during the next triennial review. As there are quite a number of issues that are candidates for review in the next triennial review, we will need to carefully prioritize these issues working with EPA and the next Policy Advisory Committee.

The following comments are organized in the following manner: beneficial use issues, numeric criteria issues and implementation issues.

BENEFICIAL USE ISSUES:

Bull Trout Waters: The language in the rule (OAR 340-41- basin (2)(b)(A)) reads: *"…no measurable surface water temperature increase resulting from anthropogenic activities is allowed: … (v) In waters determined by the Department to support or to be necessary to maintain the viability of native Oregon bull trout, when surface water temperatures exceed 50.0º F (12.8º C)"*. [Please note that the specific citation for the temperature criteria for Bull Trout may vary slightly in its numbering depending on the basin, this example and subsequent citations are from the standards for the Willamette Basin (OAR 340-41-445)].

The Department has consulted with the Oregon Department of Fish and Wildlife (ODFW) to make a determination of the current distribution of Bull Trout. Maps have been developed by ODFW as part of an effort to develop plans to protect and restore Bull Trout populations. These maps can be found in the following publication: "Status of Oregon's Bull Trout" (Oregon Department of Fish and Wildlife; October 1997; Buchanan, David, M. Hanson, and R. Hooton; Portland, OR) which is available from ODFW or viewed in the "StreamNet" website (www.streamnet.org). A map showing the most recent Bull Trout distribution (export file dated June 1997) has been sent separately to EPA and a digital version can be provided to EPA.

The Department will use the 1997 Bull Trout distribution maps contained in the 1997 ODFW publication to clarify the phrase "waters determined by the Department to support or to be necessary to maintain the viability of native Oregon Bull Trout." The temperature criteria of 50ºF applies to the stream reaches which indicate that "Spawning, Rearing, or Resident Adult Bull Trout" populations are present. These waters are shown by a solid green line on the maps that are referenced.

The mapping and planning effort is an on-going effort by ODFW. Any changes made to the mapped distribution will represent a change in the standard which would be submitted to EPA for approval. The Bull Trout portion of the standards will be revised to incorporate a reference to the 1997 ODFW publication or identify any other means for determining waters that support or are necessary to support Bull Trout in the next triennial standards review.

Waters supporting spawning, egg incubation and fry emergence: The language in the rule reads:

Temperature (OAR 340-41- basin (2)(b)(A)): "…*no measurable surface water temperature increase resulting from anthropogenic activities is allowed: … (iv) In waters and periods of the year determined by the Department to support native salmonid spawning, egg incubation, and fry emergence from the egg and from the gravels in a basin which exceeds 55ºF (12.8ºC)".*

Dissolved Oxygen (OAR 340-41- basin (2)(a)(A)): *"For waterbodies identified by the Department as providing salmonid spawning, during the periods from spawning until fry emergence from the gravels, following criteria apply…"*

The Beneficial Use Tables (Tables 1-19 in the Oregon water quality standards) indicate the recognized beneficial uses to generally be protected **in the basin**. In some basins (e.g. Table 15, Malheur River Basin), the information in the Tables has been refined for particular water bodies. In general, salmonid spawning and rearing are shown on the tables to be found in all basins. In order to make the spawning determinations, information on location and timing in a specific waterbody is further developed through consultation with ODFW as spawning does not occur at all times of the year or in all locations in the basin. In addition, timing often varies from year to year depending on seasonal factors such as flow. ODFW, in cooperation with other federal and tribal fishery agencies has begun to map out this information on a species by species basis (StreamNet Project) but this work is still several years from completion.

ODEQ is submitting the attached table that identifies when the spawning criteria listed under the dissolved oxygen and temperature standards will be applied to a basin. This table provides the generally accepted time frame during which spawning occurs. However, spawning periods for Spring Chinook and Winter Steelhead vary with elevation (e.g. Spring Chinook tend to spawn earlier and fry emergence occurs later in the Spring for Winter Steelhead in streams at higher elevations). Therefore, to address differences in actual spawning periods, the Department will consult directly with the ODFW to determine if waterbody specific adjustments (which would be changes to the standards) are necessary.

Furthermore, the Department will apply the antidegradation policy in specific actions, e.g. permits, 401 certification and 303(d) listing, to protect spawning that occurs outside the

identified time frames or utilize the narrative temperature criteria that applies to threatened or endangered species.

Application of the warm-water Dissolved Oxygen Criteria (OAR 340-41- basin (2)(a)(F))**:** The language in the rule reads: *"For waterbodies identified by the Department as providing warm-water aquatic life, the dissolved oxygen shall not be less than 5.5 mg/l as an absolute minimum..."*

Warm-water criteria is applied in waters where Salmonid Fish Rearing and Salmonid Fish Spawning are not a listed beneficial use in Tables 1 - 19 with the exception of Table 19 (Klamath Basin) in which the cool water dissolved oxygen criteria will be applied (see Klamath TMDL supporting documentation, (Hammon 1998)). Specifically, the warm water criteria would be applied to:

Table 15: Malheur River (Namorf to Mouth), Willow Creek (Brogan to Mouth), Bully Creek (Reservoir to Mouth);
Table 16: Owyhee River (RM 0-18);
Table 17: Malheur Lake Basin - Natural Lakes;
Table 18: Goose and Summer Lakes Basin - High Alkaline & Saline Lakes.

Application of the cool-water Dissolved Oxygen Criteria (OAR 340-41- basin (2)(a)(E))**:** The language in the rule reads: *"For waterbodies identified by the Department as providing cool-water aquatic life, the dissolved oxygen shall not be less than 6.5 mg/l as an absolute minimum..."*

Cool-water aquatic life is a sub-category of cold-water aquatic life and is defined under OAR 340-41-006 (52) as *"the aquatic communities that are physiologically restricted to cool waters, composed of one or more species having dissolved oxygen requirements believed similar to the cold-water communities. Including but not limited to Cottidae, Osmeridae, Acipenseridae, and sensitive Centrachidae such as the small-mouth bass."* This criteria will be applied on an ecoregional basis[18] (see attached map) as follows:

West Side:

Cold Water: Coast Range Ecoregion - all, Sierra Nevada Ecoregion -all, Cascade-all, Willamette Valley - generally typical including Willamette River above Corvallis, Santiam (including the North and South), Clackamas, McKenzie, Mid Fork and Coast Fork mainstems.

[18] The original Ecoregions described in "Ecorgions of the Pacific Northwest" (James Omernik and A. Gallant, 1986, EPA/600/3-86/033) were used. This work is currently being updated but is not complete for Oregon. The terms most typical and generally typical are defined as follows: "The most typical portions of ecoregions are generally those areas that share all of the characteristics that are predominant in each ecoregion. The remaining portions, generally typical of each ecoregion, share most, but not all, of these same characteristics. These areas are defined on maps included in the publication referenced above and have been sent separately to EPA.

Cool Water: Willamette Valley Ecoregion - most typical.

East Side (with the exception of waters listed under warm water criteria in Tables 15-19)**:**
Cold Water: Eastern Cascades Slopes and Foothills - most typical, Blue Mountain - most typical.
Cool Water: Remainder of Eastern Oregon Ecoregions.

NUMERIC CRITERIA ISSUES:

Temperature criteria for waters without a specific numeric criterion: The temperature criteria of 64ºF will be applied to all water bodies that support salmonid fish rearing as identified in Tables 1 - 19. This would include all waters except those listed as warm water above. Currently, there is no numeric criteria for those waters listed as warm water. This was an inadvertent oversight for the rivers described under 2 and 3 below which will be corrected by setting site specific criteria during the next triennial review. In the mean time, these waters will be protected as follows:

1. There is a criteria that covers natural lakes and would cover lakes in the Malheur Lake Basin (Table 17) and Goose and Summer Lakes Basin (Table 18). This criteria (OAR 340-41-922 (2)(b)(A)) reads: *"…no measurable surface water temperature increase resulting from anthropogenic activities is allowed: … (vii) In natural lakes"*.

2. The waters shown in the Klamath Basin (Table 19) are currently listed in Oregon's 1994/96 303(d) list for temperature based on exceedence of the criterion that is linked to dissolved oxygen. This criterion (OAR 340-41-965 (2)(b)(A)) reads: *"…no measurable surface water temperature increase resulting form anthropogenic activities is allowed: … (vi) In Oregon waters when the dissolved oxygen (DO) levels are within 0.5 mg/l or 10 percent saturation of the water column or intergravel DO criterion for a given stream reach or subbasin."* An additional narrative criterion would apply to these waters as they contain a federally listed Threatened and Endangered species - Lost River Sucker and Shortnose Sucker, both of which are listed as endangered (USFWS, 7/88, 53FR27130). This criterion (OAR 340-41-965 (2)(b)(A)) states: *"no measurable surface water temperature increase resulting form anthropogenic activities is allowed: … (v) In stream segments containing federally listed Threatened and Endangered species if the increase would impair the biological integrity of the Threatened and Endangered population."* A Site Specific Criteria is currently being developed as part of a TMDL for these waters and a new criteria for temperature will be established. This criterion will be adopted by the EQC and submitted to EPA for approval prior the completion of a TMDL. This work should be accomplished during our next triennial standards review (1998 - 2000). The TMDL schedule is currently being negotiated with EPA.

3. Warm water streams in the lower Malheur and Owyhee (Table 15 and 16) would be addressed in a similar manner using temperature criterion that relates to dissolved oxygen. These waters were not listed on the current 303(d) list as the waters were not within 0.5 mg/l or 10 percent saturation of the water column DO criterion. These waters are included in beneficial use survey work that the Department is undertaking in the Snake River Basin/High Desert Ecoregion. This work, which will include the

development of numeric temperature criteria for these waters, will be accomplished during our next triennial standards review (1998-2000).

Willamette and Columbia River Temperature Criteria: The language in the rule (OAR 340-41-445 (2)(b)(A)) reads: *"…no measurable surface water temperature increase resulting from anthropogenic activities is allowed: … (ii) In the Columbia River or its associated sloughs and channels from the mouth to river mile 309 when surface water temperatures exceed 68.0ºF (20.0ºC); (iii) In the Willamette River or its associated sloughs and channels from the mouth to river mile 50 when surface water temperatures exceed 68.0ºF (20.0ºC);"*

For the Columbia River, this is not a change to the previous standard (OAR 340-41-445 (2) (b) (D). The Columbia River forms the boundary between the states of Oregon and Washington and this criterion is consistent with the current temperature standard for the State of Washington.

For the Willamette River, this value represents a decrease from the previous temperature criteria of 70ºF and makes it consistent with the Columbia River numeric criteria. The technical committee had recommended the 68ºF criteria for these large, lower river segments recognizing that temperatures were expected to be higher in these segments as factors such as the naturally wide channels would minimize the ability to shade these rivers and reduce the thermal loading.

Both of these rivers are water quality limited for temperature and the temperature criteria can be revisited as part of the effort to develop Total Maximum Daily Loads. The Department is currently working with EPA to develop a temperature assessment for the Columbia River and is participating in a Willamette Basin Reservoir Study with the Corp of Engineers and other state agencies. The timing of specific TMDLs is currently being negotiated with EPA.

64º F Temperature Criteria: EPA has expressed concern that the 64ºF criterion may not be fully protective. The Final Issue Paper on Temperature indicates that "the incidence of disease from *Chondrococcus columnaris* increases above 60-62º F and cites various sources for this statement (page 2-4 and Appendix D of the Final Issue Paper on Temperature). This is based both on observations from laboratory studies and field studies.

A review of this literature indicates that it is difficult to establish a temperature criteria for waters that experience diurnal temperature changes that would assure no affects due to *C. columnaris*. For example, J. Fryer and K. Pilcher ("Effects of Temperature on Diseases of Salmonid Fishes, EPA-660/3-73-020, 1974) conducted in the laboratory studies using constant temperatures and concluded:

"When coho and spring chinook salmon, and rainbow trout are infected with *C. columnaris* by water contact, the percentage of fatal infections is high at temperatures of 64ºF and above, moderate at 59ºF and approaches zero at 49ºF and below. A temperature of 54ºF is close to the threshold for development of fatal infection of salmonids by *C. columnaris."*

There is literature that suggests that fish pathogens which affect Oregon's cold-water fishes become more infective and virulent at temperatures ranging from the lower mid-sixties to low seventies (Becker and Fujihara, 1978). Ordal and Pacha (1963) found that mortalities due to *C. columnaris* outbreaks are lessened or cease when temperatures are reduced below 65ºF. Bell (1986) suggested that outbreaks of high virulence strains of *C. columnaris* occur when average water temperatures reach 15.5ºC and the low virulence strains become apparent with average water temperatures over 20ºC.

A good discussion of field studies is given in the report "Columbia River Thermal Effects Study" (EPA, 1971).

> "Natural outbreaks of columnaris disease in adult salmon have been linked to high water temperatures in the Fraser River, British Columbia. …The pathological effects of the disease became evident when water temperatures along the migration route, and in spawning areas, exceeded 60ºF. Prespawning mortality reached 90 percent in some tributaries. Columnaris is the infected sockeye spawners was controlled when temperatures fell below 57-58ºF and mortalities were reduced. "
>
> "Data collected on antibody levels in the Columbia River fish "…suggest peak yearly effective infection of at least 70 percent to 80 percent of most adult river fish species" (Fujihara and Hungate, 1970). Occurrence of the disease was generally associated with temperatures above 55ºF; the authors further suggest that the incidence of columnaris may be increased by extended periods of warm temperatures than by peak summer temperatures."
>
> "Other factors including the general condition of the fish, nutritional state, size, presence of toxicants, level of antibody protection, exposure to nitrogen supersaturation, level of dissolved oxygen, and perhaps other factors interrelate in the infection of fish by diseases. However, the diseases discussed here are of less importance at temperatures below 60ºF; that is, in most instances mortalities due to columaris are minimized or eliminated below that level."

As indicated in the section on "Standard Alternatives and Technical Evaluation" in the Temperature Issue Paper, the technical committee had recommended a temperature range (58 - 64ºF) as being protective for salmonid rearing. While 64ºF is at the upper end of the range, the key to this recommendation is the temperature unit (page 3-2) that is used in the standard - the seven-day moving average of the daily maximum temperatures. Exceedence of the criteria is based on the average of the daily maximum temperatures that a waterbody experiences over the course of seven consecutive days exceeding 64ºF.

Streams experience a natural fluctuation of daily temperatures so streams that were just meeting the temperature standard would be experiencing temperatures over 60ºF for only short periods of time during the day and have lower average temperatures. For example, the Department has summarized temperature data collected at 6 sites around the state which are near the 7-day average of the daily maximum of 64ºF (see table below). As shown, the daily average temperatures typically range between 55-60ºF. Risks should be minimized at these average temperatures.

In conclusion, the criteria does not represent an assured no-effect level. However, because the criteria represent a "maximum" condition, given diurnal variability, conditions will be better that criteria nearly all of the time at most sites.

	7-Day Statistic	Average Daily Temperatures						
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Grande Ronde Basin								
East Fork Grande Ronde River	64.7	57.8	58.1	57.4	57.1	57.3	58.0	58.1
Beaver Creek (upstream La Grande Res.)	65.2	55.1	56.5	58	58.2	59.7	60.1	59.9
Umpqua Basin								
Jim Creek (mouth)	62.5	58.2	59.5	59.9	60.1	58.6	55.7	56.8
Pass Creek (upper)	64.4	59.0	58.7	58.1	58.5	59.1	59.3	57.7
Tillamook Basin								
Myrtle Creek (mouth)	65.0	57.7	59.1	58.6	57.9	58.0	57.6	56.8
Sam Downs Creek (mouth)	63.9	55.8	55.9	55.5	55.5	55.7	55.6	56.1

Minimum Dissolved Oxygen Criteria for Cool Water and Warm Water Species:

Warm Water: The Oregon warm water criteria for dissolved oxygen is 5.5 mg/l as a 30 day mean and 4.0 mg/l as a minimum. These values meet or exceed the recommended national criteria for warm water criteria for other life stages (5.5 mg/l as a 30 day mean and 3.0 as a 1 day minimum as shown in Table 1 of the dissolved oxygen criteria in *Quality Criteria for Water, 1986* (EPA 440/5-86-001)). These values are slightly below national criteria suggested for protection of early life stages (6.0 mg/l as a 7 day mean and 5.0 as a 1 day minimum as shown in Table 1 of the dissolved oxygen criteria in *Quality Criteria for Water, 1986)*. As shown on Table 2 of the dissolved oxygen criteria in *Quality Criteria for Water, 1986*, this would represent a slight impairment for early life stages.

This criteria would be applied to both native and non-native warm water species. Table 2-3 in the Temperature Issue Paper (page 2-14) contains a list of non-salmonid fish species present in Oregon. Warm water species include: Borax Chub; Cyprinids (goldfish, carp, fathead minnows); Centrarchids (Bluegill, Crappie, Large-mouth Bass); and Catfish. The only known warm-water species that is native to Oregon is the Borax Chub, which is found near a hot springs. The others have been introduced and now perpetuate themselves in some basins. These species are typically Spring spawners (April - June) during which times dissolved oxygen values are not at the seasonal lows (July - August) and typically have not been found to be a problem. In addition, salmonid spawning criteria, which are more protective, typically apply during these time period.

It should be noted that most of the introduced warm water species now compete with the native cold and cool water species for habitat and food. There are numerous recovery plans being developed for these native species. A level of protection that may have a slight production impairment for non-native warm water species is not necessarily undesirable.

Cool Water: A cool water classification was created to protect cool water species where cold-water biota may be present during part or all of the year but would not form the dominate community structure. The cool water criteria match the national coldwater criteria - other life stages criteria.

Table 2-3 in the Temperature Issue Paper (page 2-14) contains a list of non-salmonid fish species present in Oregon. Cool water species include: Chub; Suckers; Sandroller; Sturgeon; Centrarchids (Small-mouth Bass); Striped Bass; and Walleye. Small mouth bass, striped bass and walleye are introduced species. This category was set up to provide more protection than that afforded by the other life stage criteria for warm water fish and, as discussed in the Gold Book, we provided these cool water species with the cold water species protection suggested in the national criteria (Table 1 of the dissolved oxygen criteria in *Quality Criteria for Water*, 1986). These species are typically Spring spawners (April - June) during which times dissolved oxygen values are not at the seasonal lows (July- August) and typically have not been found to be a problem.

Table 2-2 of the Dissolved Oxygen Issue Paper indicates that salmonids and other cold-water biota may be present during part or all of the year but may not dominate community structure. Any salmonid spawning would still be covered by the salmonid spawning standard. The Oregon standards provide higher protection for salmonid spawning and cold water rearing than that recommended under the national criteria by choosing the "no production impairment" levels suggested in Table 2 of the dissolved oxygen criteria in *Quality Criteria for Water*, 1986.

When adequate information/data exists: The dissolved oxygen standard provides multiple criteria for cold, cool and warm water aquatic life. For example, OAR 340-41-445 (2) (a) (D) reads: *"For waterbodies identified by the Department as providing cold-water aquatic life, the dissolved oxygen shall not be less than 8.0 mg/l as an absolute minimum. Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 8.0 mg/l, dissolved oxygen shall not be less than 90 percent of saturation. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen shall not fall below 8.0 mg/l as a 30-day mean minimum, 6.5 mg/l as a seven-day minimum mean, and shall not fall below 6.0mg/l as an absolute minimum (Table 21)."*

In this example, the Department would routinely compare dissolved oxygen values against 8.0 mg/l criteria (the higher dissolved oxygen criteria). Most dissolved oxygen data is collected by a grab sample during the day time and would not reflect minimum conditions, that is why we would use a more restrictive criteria. Adequate information to use the other criteria would involve the collection of diurnal data over long enough periods of time (e.g. multiple days or multiple weeks) during critical time periods (e.g. low flow periods, hottest water temperature periods, period of maximum waste discharge). Such data would be collected through continuous monitoring with proper quality assurance. Based on this data collection, sufficient data would be available to calculate means, minimum means and minimum values and to compare to the appropriate criteria. Models that would provide these statistics could also be compared to the appropriate criteria.

In addition, for actions such as permitting and developing TMDLs, additional information on the beneficial uses of the waterbody will be considered such as: species present; listing

status of those species; locations, time periods and presence of sensitive early life stages, etc. Based on presence of early life stages or T&E species, the more conservative criteria would be used.

IMPLEMENTATION ISSUES:

Air temperature exemption to the water temperature criteria: OAR 340-41-basin (2)(b)(B) specifies that *"an exceedence of the numeric criteria identified subparagraph (A) … of this subsection will not be deemed a temperature standard violation if it occurs when the air temperature during the warmest seven-day period of the year exceeds the 90th percentile of the seven-day average daily maximum air temperature calculated in a yearly series over the historic record. However, during such periods, the anthropogenic sources must still continue to comply with their surface water temperature management plans developed under OAR 340-41-026(3)(a)(D)."*

This policy identifies criteria to be used in certain limited circumstances to determine whether a violation of the temperature water quality standard has occurred. This interpretation would be applied for the purposes of enforcement of standards and the 303(d) listing determinations. Our interpretation of how this air temperature exemption would be applied has been sent to you separately. In the 1994/96 303(d) list, no water bodies were excluded from the list for this reason.

Exceptions to the policy that prohibits new or increased discharged load to receiving streams classified as being water quality limited:

OAR 340-41-026 (3) (C) states "the new or increased discharged load shall not be granted if the receiving stream is classified as being water quality limited under OAR 340-41-006(30)(a), unless…"

OAR 340-41-026 (3) (a) C (iii) added new language under this policy which defines a condition under which a new or increased discharged load could be allowed to a water quality limited waterbody for dissolved oxygen. The language states: "*(iii) Effective July 1, 1996, in waterbodies designated water-quality limited for dissolved oxygen, when establishing WLAs under a TMDL for waterbodies meeting the conditions defined in this rule, the Department may at its discretion provide an allowance for WLAs calculated to result in no measurable reduction of dissolved oxygen. For this purpose, "no measurable reduction" is defined as no more than 0.10 mg/l for a single source and no more than 0.20 mg/l for all anthropogenic activities that influence the water quality limited segment. The allowance applies for surface water DO criteria and for Intergravel DO if a determination is made that the conditions are natural. The allowance for WLAs would apply only to surface water 30-day and seven-day means, and the IGDO action level."*

This is an implementation policy for OAR 340-41-026 (3) (C) and clarifies that we could allow for an increase in load in a waterbody that is water quality limited for dissolved oxygen as long as it did not result in a measurable reduction of dissolved oxygen as defined above and it was determined that the low DO values were due to a natural condition. A site

specific criteria for the waterbody would need to be developed and submitted to EPA for review and approval.

All feasible steps: OAR 340-41-026 (3) (D) indicates that: *"Sources shall continue to maintain and improve, if necessary, the surface water temperature management plan in order to maintain the cooling trend until the numeric criterion is achieved or until the Department, in consultation with the Designated Management Agencies (DMAs), has determined that all feasible steps have been taken to meet the criterion and that the designated beneficial uses are not being adversely impacted. In this latter situation, the temperature achieved after all feasible steps have been taken will be the temperature criterion for the surface waters covered by the applicable management plan. The determination that all feasible steps have been taken will be based on, but not limited to, a site-specific balance of the following criteria: protection of beneficial uses; appropriateness to local conditions; use of best treatment technologies or management practices or measures; and cost of compliance."*

As indicated, if the waters do not come into compliance with the standard after all feasible steps have been taken, the Department would develop a site-specific criteria which would be submitted to EPA for approval pursuant to EPA policy.

1.0º F increase for new or increased discharge loads from point sources or hydro-power projects in temperature water quality limited basins: OAR 340-41-026 (3) (F), (G), (H) state: *"(F) In basins determined by the Department to be exceeding the numeric temperature criteria, and which are required to develop surface water temperature management plans, new or increased discharge loads from point source sources which require an NPDES permit under Section 402 of the Clean Water Act or hydro-power projects which require certification under Section 401 of the Clean Water Act are allowed a 1.0ºF total cumulative increase in surface water temperatures as the surface water*

temperature management plan is being developed and implemented for the water quality limited basin if:

- *(i) in the best professional judgment of the Department, the new or increased discharge load, even with the resulting 1.0ºF cumulative increase, will not conflict with or impair the ability of the surface water temperature management plan to achieve the numeric temperature criteria; and*
- *(ii) A new or expanding source must demonstrate that it fits within the 1.0ºF increase and that its activities will not result in a measurable impact on beneficial uses. This latter showing must be made by demonstrating to the Department that the temperature change due to its activities will be less than or equal to 0.25ºF under a conservative approach or by demonstrating the same to the EQC with appropriate modeling.*

(G) Any source may petition the Department for an exception to paragraph (F) of this subsection, provided:

- *(i) The discharge will result in less than 1.0ºF increase at the edge of the mixing zone, and subparagraph (ii) or (iii) of this paragraph applies;*
- *(ii) The source provides the necessary scientific information to describe how the designated beneficial uses would not be adversely impacted; or*
- *(iii) The source demonstrates that:*
  - *(I) It is implementing all reasonable management practices;*

(II) Its activity will not significantly affect the beneficial uses; and
(III) The environmental cost of treating the parameter to the level necessary to assure full protection would outweigh the risk to the resource.

OAR 340-41-026 (3) (F) and (G) reflect an implementation policy for OAR 340-41-026 (3) (C). They clarify under what conditions the Department could allow for an increase in load to a waterbody that is water quality limited for temperature as long as the load did not result in a measurable increase in temperature (less than or equal to 0.25ºF) or a cumulative increase of 1.0ºF under (F) but a source could petition for up to the cumulative increase of 1.0ºF under (G). The cumulative increase typically addresses the situation where there may be multiple new or increased discharges. A TMDL would still be developed to bring the waterbody back into compliance with the temperature criteria. The WLA and the permit for the new or increased source would target the appropriate temperature criteria using a conservative approach as shown below (e.g. calculations would be made using 63ºF so that the cumulative increase would not be above the standard of 64ºF).[19]

OAR 340-41-026 (3) (H) states: *"Any source or DMA may petition the Commission for an exception to paragraph (F) of this subsection, provided:*

(i) The source or DMA provides the necessary scientific information to describe how the designated beneficial uses would not be adversely impacted; or
(ii) The source or DMA demonstrates that:
(I) It is implementing all reasonable management practices;
(II) Its activity will not significantly affect the beneficial uses; and
(III) The environmental cost of treating the parameter to the level necessary to assure full protection would outweigh the risk to the resource. "

This exemption is a variance policy in which a source can petition the Commission to allow the temperature to increase by a specified amount for a limited period of time in order to allow for new or increased point source discharges to water quality limited waters until a TMDL is prepared. The variance would be submitted to EPA for review and approval. These variances would be reviewed again during the development of a TMDL or at permit renewal.

[19] Examples of various of discharge scenarios using a conservative mass balance analysis. The odd numbered examples show a scenario when the stream meets standards. The subsequent even numbered example shows the scenario when the stream is above standard. Examples 1 - 4 would be addressed under OAR 340-41-026 (3) (F); examples 5 - 8 would be addressed under OAR 340-41-026 (3) (G); and examples 9 - 10 would be addressed under OAR 340-41-026 (3) (H).

Example	Upstream		Effluent		Downstream		Change in
	Flow	Temp	Flow	Temp	Flow	Temp	Temp
1	10	63	0.4	69.5	10.4	63.25	0.25
2	10	73	0.4	69.5	10.4	72.87	-0.13
3	10	63	0.1	88	10.1	63.25	0.25
4	10	73	0.1	88	10.1	73.15	0.15
5	10	63	0.4	79.5	10.4	63.63	0.63
6	10	73	0.4	79.5	10.4	73.25	0.25
7	10	63	0.4	89	10.4	64.00	1.00
8	10	73	0.4	89	10.4	73.62	0.62
9	10	61.5	1	89	11	64.00	2.50
10	10	73	1	89	11	74.45	1.45

Source Petition for an exception to temperature criteria: OAR 340-41-basin (2)(b)(C) specifies that *"Any source may petition the Commission for an exception to subparagraph (A)…of this subsection for discharge above the identified criteria if: (i) The source provides the necessary scientific information to describe how the designated beneficial uses would not be adversely impacted; or (ii) a source is implementing all reasonable management practices or measures; its activity will not significantly affect the beneficial uses; and the environmental cost of treating the parameter to the level necessary to assure full protection would outweigh the risk to the resource."*

This will be, for most cases, a variance policy which allows the temperature to increase by a specified amount for a limited period of time in order to allow for an existing point source to discharge to water quality limited waters until a TMDL is prepared. In the case where that source would be the major cause for the temperature criteria to be exceeded and a TMDL would not be developed for that waterbody to bring it back into compliance, a site specific criteria would be developed and submitted to EPA for approval.

pH Standard exception: OAR 340-41-basin (2) (d) states *"The following exception applies: Waters impounded by dams existing on January 1, 1996, which have pHs that exceed the criteria shall not be considered in violation of the standard if the Department determines that the exceedence would not occur without the impoundment and that all practicable measures have been taken to bring the pH in the impounded waters into compliance with the criteria."*

This language was intended to address the situation where a hydroproject would be applying for a 401 re-certification and it was found that the action of impounding the waters caused algal growth which caused the reservoir to subsequently exceed the pH standard. This might set up the situation where the only way to re-certify the project would be to destroy the dam which may not be the preferred option. In the cases where this exception would be applied, the Department would develop either a TMDL for nutrients in the upstream watershed, develop a site specific criteria for the waterbody or develop a use attainability analysis to modify the uses for portions of the reservoir.

Final Note: ODFW has a great deal of knowledge regarding location and timing for presence, spawning, etc of fish in Oregon streams. Much of this information is either in the files contained in local field offices or is gained from the judgment of the local biologist. Until recently, it has not been mapped. A mapping effort is underway and is furthest along for Bull Trout and Anadromous fish species. There is a coordinated effort underway entitled "StreamNet" (www.streamnet.org). This work is focused on a species by species mapping which would need to be generalized to match cold, cool, warm-water classification and spawning vs rearing groupings indicated in the standards. Issues such as mapping scales and coverage would still need to be worked out. This effort, to better categorize aquatic life uses, could be addressed in subsequent triennial standards reviews but will need additional funding to complete.

There are quite a number of standards related issues that are candidates for consideration during the next triennial review. ODEQ and EPA should get together once ODEQ has hired a new standards coordinator to discuss priorities and approaches for conducting the next triennial review process.

Please feel to contact Andy Schaedel (503-229-6121) or Lynne Kennedy (503-229-5371) if you have further questions.

Sincerely,

Michael T. Llewelyn
Administrator, Water Quality Division

cc: Water Quality Managers

Oregon
Theodore Kulongoski, Governor

Department of Environmental Quality
Headquarters
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
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Appendix 4

February 4, 2004

Mr. Randy Smith, Director
Office of Water
U.S. EPA Region 10
1200 Sixth Avenue
Seattle, WA 98101

Re: Oregon Responses to EPA Questions re the State's water quality temperature standards

Dear Mr. Smith:

This letter is a follow up to our similar correspondence of December 19, 2003, which described Oregon's newly adopted antidegradation and temperature rules. There are three purposes for this letter. First, we are offering similar clarifications regarding the State's intended methodology for identifying natural conditions for parameters other than temperature. Second, we are commenting on several proposed conservation measures EPA is developing pursuant to consultation under the Endangered Species Act. Finally, we are providing your Agency with information on the application of the dissolved oxygen criteria to resident fish spawning.

Natural Conditions

As we indicated in our earlier letter, our revised rules make it clear that where ODEQ identifies a natural condition which is less stringent than the numeric criteria set out in the State's water quality standards, the natural condition supercedes the numeric criteria. Very similar language appeared in our previous rules, which were previously approved by EPA.

By definition, "natural conditions" are those pollutants that are present in the State's waters that are not attributable to anthropogenic activities. Rather, these conditions are caused by local geophysical, hydrological and meteorological processes and wildlife. ODEQ anticipates that site-specific natural conditions might be identified for the following parameters:

- Bacteria (attributed to wildlife)
- Metals (attributed to naturally eroding ore deposits)
- Nutrients (attributed to background soil, vegetation and/or wildlife conditions)
- Sediments and Turbidity (attributed to soil erosion and/or organic matter not accelerated by human activities)

- Other parameters attributed to similar natural processes.

Prior to a natural condition superceding otherwise applicable numeric criteria, ODEQ will make a finding as to the level at which the pollutant is present with no influence from anthropogenic activities. Similarly, ODEQ will document the natural process contributing to the presence of the pollutant. The specific methodology used to support a natural condition finding may vary in each local situation. However, in general the methodologies used will be similar to that described in our December 19, 2003 letter:

- Reference streams,
- Pollutant transport models,
- DNA testing,
- Historical data (where available) and/or
- Other sampling methods and studies.

The public will have specific notice of these natural conditions whenever they are relevant to one of the Clean Water Act regulatory programs. The public notices and documentation accompanying the biannual 303(d) listing process, draft TMDLs, draft NPDES permits and 401 water quality certifications will indicate that the otherwise applicable numeric criteria have been superceded by a natural conditions finding. Moreover, since 303(d) listings and TMDLs are transmitted to EPA for approval, the Agency will have an opportunity to review ODEQ 's natural conditions conclusions. ODEQ is committed to work with EPA as natural condition methodologies are refined in the TMDL, NPDES and 303(d) listing contexts.

ODEQ expects that natural conditions will most commonly be identified through the TMDL process. In that circumstance, EPA will have an opportunity to review and evaluate any natural condition determination as part of its TMDL approval action. ODEQ will list the water bodies where "natural conditions" findings have been made on our standards web page to ensure that the public is aware and notified of natural conditions,

It should be noted that it is possible, at some locations in the State, that the natural condition will not support, and never has supported a designated beneficial use. In such circumstances, ODEQ will modify the designated use to properly adjust the beneficial use to better reflect the existing use of the water segment.

Proposed Conservation Measures

ODEQ is aware that EPA is considering several conservation measures associated with its approval of the State water quality standards revisions. EPA has inquired whether ODEQ would participate in these conservation measures if they are pursued. To begin with, ODEQ notes that most of these conservation measures pursue information on the future *implementation* of the State's standards. They are best categorized as efforts

intended to identify additional information supporting the use of our standards once they are in place.

Since Oregon has a strong interest in these federal initiatives, ODEQ will, resources allowing, participate in the proposed conservation measures as described in EPA's Biological Evaluation: Temperature Monitoring and Use Designations (2.5.1) and the Two Year Review (2.5.2).

Dissolved Oxygen and Spawning

The revised Oregon rules clarified spawning locations and timing for anadromous fish and Lahontan Cutthroat Trout. Due to a lack of site specific data for species other than these, and since temperature criteria for spawning were not established for other species, no similar clarification was made for resident trout (i.e., rainbow, redband, Westslope cutthroat and coastal cutthroat) or char (bull trout) spawning. However, the dissolved oxygen criteria contain provisions that continue to apply to resident trout and char spawning areas. ODEQ will use the following dates to apply the dissolved oxygen spawning criteria (throughout the range where the Oregon maps indicate trout rearing, redband trout and core cold water habitat uses are identified).

Resident Trout Spawning (Redband, Rainbow, Westslope and Coastal Cutthroat)

- *For waters designated as trout rearing, or redband trout use, spawning is deemed to occur from January 1 – May 15 each year;*

- *For waters designated as core cold water habitat, or bull trout spawning and rearing use, resident trout spawning is deemed to occur from January 1 – June 15 each year; and*

- *For trout rearing waters upstream from core cold water habitat, spawning is also deemed to occur from January 1 – June 15 each year.*

Char (Bull Trout) Spawning

The following dates apply to all reaches designated as having "bull trout spawning and rearing use" within the specified basin or subbasin:

Basin	Subbasin	Spawning Period	Source of Information
South Willamette		Aug 15 – May 30	ODFW
John Day		Sept 1 – April 30	ODFW

Umatilla		Sept 1 – April 30	ODFW
Walla Walla		Sept 1 – April 30	ODFW
Grand Ronde	Upper G. R.	Sept 1 – April 15	ODFW
	Wallowa	Sept 1 – May 15	ODFW
	Wenaha	Aug 15 – March 31	ODFW
Imnaha		Aug 15 – May 31	ODFW
Hood		Aug 15 – May 15	USFWS
Deschutes		Aug 15 – May 15	USFWS
Powder		Aug 15 – May 15	USFWS
Malheur		Aug 15 – May 30	USFWS
Klamath		Aug 15 - May 30	USFWS

This timing information will be circulated to ODEQ field staff responsible for implementing the dissolved oxygen criteria. ODEQ will continue to refine all of these designations as more information is developed on resident trout and char spawning activities.

Oregon looks forward to EPA's review and approval of our water quality standards. If you require any additional information or clarification of these rules, please contact me or have your staff call Mark Charles, water quality standards manager at (503) 229-5589.

Sincerely,

Michael T. Llewelyn, Administrator
Water Quality Program

Cc: Stephanie Hallock - ODEQ
Mark Charles - ODEQ
Paula van Haagen - EPA
Mary Lou Soscia - EPA

Appendix 5: Table 20

WATER QUALITY CRITERIA SUMMARY

(Applicable to all Basins)[1]

The concentration for each compound listed in this chart is a criteria or guidance value* not to be exceeded in waters of the state for the protection of aquatic life and human health. Specific descriptions of each compound and an explanation of values are included in Quality Criteria for Water (1986). Selecting values for regulatory purposes will depend on the most sensitive beneficial use to be protected, and what level of protection is necessary for aquatic life and human health.

Compound Name (or Class)	Priority Pollutant	Carcinogen	Concentration in Micrograms Per Liter for Protection of Aquatic Life				Concentration in Units Per Liter for Protection of Human Health		
			Fresh Acute Criteria	Fresh Chronic Criteria	Marine Acute Criteria	Marine Chronic Criteria	Water and Fish Ingestion	Fish Consumption Only	Drinking Water M.C.L.
ACENAPTHENE	Y	N	*1,700	*520	*970	*710			
ACROLEIN	Y	N	*68	*21	*55		320ug	780ug	
ACRYLONITRILE	Y	Y	*7,550	*2,600			0.058ug**	0.65ug**	
ALDRIN	Y	Y	3		1.3		0.074ng**	0.079ng**	
ALKALINITY	N	N		20,000					
AMMONIA	N	N	CRITERIA ARE pH AND TEMPERATURE DEPENDENT—SEE DOCUMENT USEPA JANUARY 1985 (Fresh Water) CRITERIA ARE pH AND TEMPERATURE DEPENDENT—SEE DOCUMENT USEPA APRIL 1989 (Marine Water)						
ANTIMONY	Y	N	*9,000	*1,600			146ug	45,000ug	
ARSENIC	Y	Y					2.2ng**	17.5ng**	0.05mg
ARSENIC (PENT)	Y	Y	*850	*48	*2,319	*13			
ARSENIC (TRI)	Y	Y	360	190	69	36			
ASBESTOS	Y	Y					30K f/L**		
BARIUM	N	N					1mg		1.0mg
BENZENE	Y	Y	*5,300		*5,100	*700	0.66ug**	40 ug**	
BENZIDINE	Y	Y	*2,500				0.12ng	0.53ng**	
BERYLLIUM	Y	Y	*130	*5.3			6.8ng**	117ng**	
BHC	Y	N	*100		*0.34				
CADMIUM	Y	N	3.9+	1.1+	43	9.3	10ug		0.010mg
CARBON TETRACHLORIDE	Y	Y	*35,200		*50,000		0.4ug**	6.94ug**	
CHLORDANE	Y	Y	2.4	0.0043	0.09	0.004	0.46ng**	0.48ng**	
CHLORIDE	N	N	860 mg/L	230 mg/L					
CHLORINATED BENZENES	Y	Y	*250	*50	*160	*129	488 ug		
CHLORINATED NAPHTHALENES	Y	N	*1,600		*7.5				
CHLORINE	N	N	19	11	13	7.5			
CHLOROALKYL ETHERS	Y	N	*238,000						
CHLOROETHYL ETHER (BIS-2)	Y	Y					0.03 ug	1.36 ug**	
CHLOROFORM	Y	Y	*28,900	*1,240			0.19ug**	15.7ug**	
CHLOROISOPROPYL ETHER (BIS-2)	Y	N					34.7ug	4.36mg	
CHLOROMETHYL ETHER (BIS)	N	Y					0.00000376ng**	0.00184ug**	
CHLOROPHENOL 2	Y	N	*4,380	*2,000					
CHLOROPHENOL 4	N	N			*29,700				
CHLOROPHENOXY HERBICIDES (2,4,5,-TP)	N	N					10ug		

TABLE 20
WATER QUALITY CRITERIA SUMMARY (Continued)

Compound Name (or Class)	Priority Pollutant	Carcinogen	Concentration in Micrograms Per Liter for Protection of Aquatic Life				Concentration in Units Per Liter for Protection of Human Health		
			Fresh Acute Criteria	Fresh Chronic Criteria	Marine Acute Criteria	Marine Chronic Criteria	Water and Fish Ingestion	Fish Consumption Only	Drinking Water M.C.L.
CHLOROPHENOXY HERBICIDES (2,4-D)	N	N					100ug		
CHLORPYRIFOS	N	N	0.083	0.041	0.011	0.0056			
CHLORO-4 METHYL-3 PHENOL	N	N	*30						
CHROMIUM (HEX)	Y	N	16	11	1,100	50	50ug		0.05mg
CHROMIUM (TRI)	N	N	1,700.+	210.+	*10,300		170mg	3,433mg	0.05mg
COPPER	Y	N	18.+	12.+	2.9	2.9			
CYANIDE	Y	N	22	5.2	1	1	200ug		
DDT	Y	Y	1.1	0.001	0.13	0.001	0.024ng**	0.024ng**	
(TDE) DDT METABOLITE	Y	Y	*0.06		*3.6				
(DDE) DDT METABOLITE	Y	Y	*1,050		*14				
DEMETON	Y	N		0.1		0.1			
DIBUTYLPHTHALATE	Y	N					35mg	154mg	
DICHLOROBENZENES	Y	N	*1,120	*763	*1,970		400ug	2.6mg	
DICHLOROBENZIDINE	Y	Y					0.01ug**	0.020ug**	
DICHLOROETHANE 1,2	Y	Y	*118,000	*20,000	*113,000		0.94ug**	243ug**	
DICHLOROETHYLENES	Y	Y	*11,600		*224.000		0.033ug**	1.85ug**	
DICHLOROPHENOL 2,4	N	N	*2,020	*365			3.09mg		
DICHLOROPROPANE	Y	N	*23,000	*5,700	*10,300	*3,040			
DICHLOROPROPENE	Y	N	*6,060	*244	*790		87ug	14.1mg	
DIELDRIN	Y	Y	2.5	0.0019	0.71	0.0019	0.071ng**	0.076ng**	
DIETHYLPHTHALATE	Y	N					350mg	1.8g	
DIMETHYL PHENOL 2,4	Y	N	*2,120						
DIMETHYL PHTHALATE	Y	N					313mg	2.9g	
DINITROTOLUENE 2,4	N	Y					0.11ug**	9.1ug**	
DINITROTOLUENE	Y	N					70ug	14.3mg	
DINITROTOLUENE	N	Y	*330	*230	*590	*370			
DINITRO-O-CRESOL 2,4	Y	N					13.4g	765ug	
DIOXIN (2,3,7,8-TCDD)	Y	Y	*0.01	*38pg/L			0.000013ng**	0.000014ng**	
DIPHENYLHYDRAZINE	Y	N					42ng**	0.56ug**	
DIPHENYLHYDRAZINE 1,2	Y	N	*270						
DI-2-ETHYLHEXYL PHTHALATE	Y	N					15mg	50mg	
ENDOSULFAN	Y	N	0.22	0.056	0.034	0.0087	74ug	159ug	
ENDRIN	Y	N	0.18	0.0023	0.037	0.0023	1ug		0.0002mg
ETHYLBENZENE	Y	N	*32,000		*430		1.4mg	3.28mg	
FLUORANTHENE	Y	N	*3,980		*40	*16	42ug	54ug	
GUTHION	N	N		0.01		0.01			
HALOETHERS	Y	N	*360	*122					

TABLE 20
WATER QUALITY CRITERIA SUMMARY (Continued)

Compound Name (or Class)	Priority Pollutant	Carcinogen	Concentration in Micrograms Per Liter for Protection of Aquatic Life				Concentration in Units Per Liter for Protection of Human Health		
			Fresh Acute Criteria	Fresh Chronic Criteria	Marine Acute Criteria	Marine Chronic Criteria	Water and Fish Ingestion	Fish Consumption Only	Drinking Water M.C.L.
HALOMETHANES	Y	Y	*11,000		*12,000	*6,400	0.19ug**	15.7ug**	
HEPTACHLOR	Y	Y	0.52	0.0038	0.053	0.0036	0.28ng**	0.29ng**	
HEXACHLOROETHANE	N	Y	*980	*540	*940		1.9ug	8.74ug	
HEXACHLOROBENZENE	Y	N					0.72ng**	0.74ng**	
HEXACHLOROBUTADIENE	Y	Y	*90	*9.3	*32		0.45ug**	50ug**	
HEXACHLOROCYCLOHEXANE (LINDANE)	Y	Y	2	0.08	0.16				0.004mg
HEXACHLOROCYCLOHEXANE-ALPHA	Y	Y					9.2ng**	31ng**	
HEXACHLOROCYCLOHEXANE-BETA	Y	Y					16.3ng**	54.7ng**	
HEXACHLOROCYCLOHEXANE-GAMA	Y	Y					18.6ng**	62.5ng**	
HEXACHLOROCYCLOHEXANE-TECHNICAL	Y	Y					12.3ng**	41.4ng**	
HEXACHLOROCYCLOPENTADIENE	Y	N	*7	*5.2	*7		206ug		
IRON	N	N		1,000			0.3mg		
ISOPHORONE	Y	N	*117,000		*12,900		5.2mg	520mg	
LEAD	Y	N	82.+	3.2+	140	5.6	50ug		0.05mg
MALATHION	N	N		0.1		0.1			
MANGANESE	N	N					50ug	100ug	
MERCURY	Y	N	2.4	0.012	2.1	0.025	144ng	146ng	0.002mg
METHOXYCHLOR	N	N		0.03		0.03	100ug		0.1mg
MIREX	N	N		0.001		0.001			
MONOCHLOROBENZENE	Y	N					488ug		
NAPHTHALENE	Y	N	*2,300	*620	*2,350				
NICKEL	Y	N	1,400.+	160+	75	8.3	13.4ug	100ug	
NITRATES	N	N					10mg		10mg
NITROBENZENE	Y	N	*27,000		*6,680		19.8mg		
NITROPHENOLS	Y	N	*230	*150	*4,850				
NITROSAMINES	Y	Y	*5,850		*3,300,000		0.8ng**	1,240ng**	
NITROSODIBUTYLAMINE N	Y	Y					6.4ng**	587ng**	
NITROSODIETHYLAMINE N	Y	Y					0.8ng**	1,240ng**	
NITROSODIMETHYLAMINE N	Y	Y					1.4ng**	16,000ng**	
NITROSODIPHENYLAMINE N	Y	Y					4,900ng**	16,100ng**	
NITROSOPYRROLIDINE N	Y	Y					16ng**	91,900ng**	
PARATHION	N	N	0.065	0.013					
PCB's	Y	Y	2	0.014	10	0.03	0.079ng**	0.079ng**	

TABLE 20
WATER QUALITY CRITERIA SUMMARY (Continued)

Compound Name (or Class)	Priority Pollutant	Carcinogen	Concentration in Micrograms Per Liter for Protection of Aquatic Life				Concentration in Units Per Liter for Protection of Human Health		
			Fresh Acute Criteria	Fresh Chronic Criteria	Marine Acute Criteria	Marine Chronic Criteria	Water and Fish Ingestion	Fish Consumption Only	Drinking Water M.C.L.
PENTACHLORINATED ETHANES	N	N	*7,240	*1,100	*390	*281			
PENTACHLOROBENZENE	N	N					74ug	85ug	
PENTACHLOROPHENOL	Y	N	***20	***13	13		1.01mg		
PHENOL	Y	N	*10,200	*2,560	*5,800		3.5mg		
PHOSPHORUS ELEMENTAL	N	N				0.1			
PHTHALATE ESTERS	Y	N	*940	*3	*2,944	*3.4			
POLYNUCLEAR AROMATIC HYDROCARBONS	Y	Y			*300		2.8ng**	31.1ng**	
SELENIUM	Y	N	260	35	410	54	10ug		0.01mg
SILVER	Y	N	4.1+	0.12	2.3		50ug		0.05mg
SULFIDE HYDROGEN SULFIDE	N	N		2		2			
TETRACHLORINATED ETHANES	Y	N	*9,320						
TETRACHLOROBENZENE 1,2,4,5	Y	N					38ug	48ug	
TETRACHLOROETHANE 1,1,2,2	Y	Y		*2,400	*9,020		0.17ug**	10.7ug**	
TETRACHLOROETHANES	Y	N	*9,320						
TETRACHLOROETHYLENE	Y	Y	*5,280	*840	*10,200	*450	0.8ug**	8.85ug**	
TETRACHLOROPHENOL 2,3,5,6	Y	N				*440			
THALLIUM	Y	N	*1,400	*40	*2,130		13ug	48ug	
TOLUENE	Y	N	*17,500		*6,300	*5,000	14.3mg	424mg	
TOXAPHENE	Y	Y	0.73	0.0002	0.21	0.0002	0.71ng**	0.73ng**	0.005mg
TRICHLORINATED EtHANES	Y	Y	*18,000						
TRICHLOROETHANE 1,1,1	Y	N			*31,2000		18.4mg	1.03g	
TRICHLOROETHANE 1,1,2	Y	Y		*9,400			0.6ug**	41.8ug**	
TRICHLOROETHYLENE	Y	Y	*45,000	*21,900	*2,000		2.7ug**	80.7ug**	
TRICHLOROPHENOL 2,4,5	N	N					2,600ug		
TRICHLOROPHENOL 2,4,6	Y	Y		*970			1.2ug**	3.6ug**	
VINYL CHLORIDE	Y	Y					2ug**	525ug**	
ZINC	Y	N	120+	110+	95	86			

TABLE 20
WATER QUALITY CRITERIA SUMMARY (Continued)

MEANING OF SYMBOLS:

g	=	grams	M.C.L	=	Maximum Contaminant Level
mg	=	milligrams	+	=	Hardness Dependent Criteria (100 mg/L used).
ug	=	micrograms	*	=	Insufficient data to develop criteria; value presented is the L.O.E.L – Lower Observed Effect Level.
ng	=	nanograms	**	=	Human health criteria for carcinogens reported for three risk levels. Value presented is the 10-6 risk level, which means the probability of one concern case per million people at the stated concentration.
pg	=	picograms	***	=	pH Dependent Criteria (7.8 pH used).
f	=	fibers			
Y	=	Yes			
N	=	No			

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1 = Values in Table 20 are applicable to all basins as follows:.

Basin	Rule	Basin	Rule
North Coast	340-041-205(p)	Umatilla	340-041-645(p)
Mid Coast	340-041-245(p)	Walla Walla	340-041-685(p)
Umpqua	340-041-285(p)	Grande Ronde	340-041-725(p)
South Coast	340-041-325(p)	Powder	340-041-765(p)
Rogue	340-041-365(p)	Malheur River	340-041-805(p)
Willamette	340-041-445(p)	Owyhee	340-041-845(p)
Sandy	340-041-485(p)	Malheur Lake	340-041-885(p)
Hood	340-041-525(p)	Goose & Summer Lakes	340-041-925(p)
Deschutes	340-041-565(p)	Klamath	340-041-965(p)
John Day	340-041-605(p)		

Water and Fish Ingestion
Values represent the maximum ambient water concentration for consumption of both contaminated water and fish or other aquatic organisms.

Fish Ingestion
Values represent the maximum ambient water concentrations for consumption of fish or other aquatic organism