The Health of Oregon Waters

South Coast Basin Water Quality Status and Action Plan:

State of Oregon Department of Environmental Quality

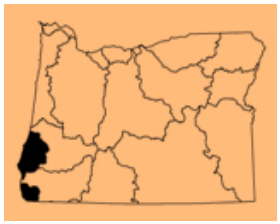

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Table of Figures and Tables

Executive Summary

The South Coast Basin status report and action plan were developed to improve the integration of the Oregon Department of Environmental Quality's (DEQ) water quality program efforts. The report summarizes DEQ's current knowledge of South Coast Basin water quality conditions and identifies actions to improve water quality in the basin.

The South Coast Basin is located in southwestern Oregon and consists of five sub-basins: Coos, Coquille, Sixes, Chetco, and a portion of the Smith. These sub-basins are located on the west side of the Siskiyou Mountains and in total contain over 1.9 million acres, which is about 2,973 square miles. The Coos, Coquille, Sixes, and Chetco sub-basins are comprised of multiple coastal frontal streams in addition to their namesake rivers.

Oregon's water quality criteria and standards are developed to assure the water is healthy enough to support beneficial uses, such as drinking water, recreation, fish, and other aquatic life. This document builds on and incorporates previous studies and assessments to describe water quality conditions in relation to the beneficial uses important to Oregonians.

A broad spectrum of water quality data is presented and data not presented is referenced for future inclusion. This is not intended to be a final product but rather should be revised and updated on a continual basis through input and interaction with DEQ staff, affected agencies, and stakeholders.

The document is organized to describe general water quality conditions and instances where there may be potential human health or fish and aquatic life concerns. Efforts to implement water quality improvements are highlighted and action items as well as alignment opportunities between DEQ programs are identified. Actions and alignment opportunities have been prioritized for implementation over the next several years by DEQ staff after discussions with area partners. These priorities will be used to guide DEQ areas of focus and will also be used to track meaningful progress.

General Water Quality Conditions in the South Coast Basin

Ambient Monitoring Network - Twelve DEQ long-term ambient water quality monitoring stations are present in the basin. The 2011 Oregon Water Quality Index classified three of these sites in excellent condition, three in good condition, three in fair condition, one in poor condition, and two in very poor condition. All of these sites received a poor sub-index score for the parameter total solids, so elevated levels of turbidity and sedimentation are certainly problems in many areas of the basin. This result aligns well with the Fish and Aquatic Life (Macroinvertebrate Assemblages) assessment discussed in more detail below.

Water Quality Impairments and Total Maximum Daily Load (TMDL) Development - Water quality impairments include temperature, dissolved oxygen, pH, bacteria (shellfish and recreational contact), biological criteria, aquatic weeds, and harmful algae blooms. When water quality does not fully support beneficial uses a waterbody is called water quality limited and the development of a TMDL is required. Because few TMDLs have been completed in the South Coast Basin to date the effort required to develop this document was quite large. Many datasets are inventoried, interpreted, and presented for the first time. TMDL development will be a high priority in the next several years.

Human Health

Bacteria - There are over 70 streams (or sections of streams) identified as impaired for bacteria at levels above those acceptable for recreational contact and or shellfish growing in the Coos and Coquille sub-basins. Streams in the Sixes and Chetco sub-basins are generally meeting bacteria water quality standards although little data is available. In addition, there are five beaches with bacterial impairments for water contact recreation. Three of these beaches are episodically impaired for bacteria during both dry and wet weather.

Intensive studies have been conducted in some areas to characterize bacterial loading during runoff events. Aging wastewater treatment facilities in the Coquille sub-basin contribute to bacterial loading during storm events. One Coquille sub-basin treatment facility has been recent upgraded and others are working on or planning upgrades. Relatively, though, a larger portion of the basin wide bacterial load comes from non point sources of pollution like wildlife, livestock, urban runoff, on-site systems, and pet waste.

Toxic Algae Blooms - Two lakes in the basin have had health advisories posted due to harmful cyanobacteria or blue-green algae blooms. These blooms affect the suitability of water for water contact and drinking. The Tenmile Watershed TMDL identified excessive nutrients as the primary causal factor of harmful algae blooms. The management of introduced fish is another important consideration.

Tissue Contaminants - Fish tissue data is limited but some information is available for metals, organics, and pesticides. The Oregon Health Authority (OHA) examined shellfish and fish tissue chemical contaminant levels in accordance with their Standard Operating Guidance, Target Analytes for Oregon's Fish Advisory Program. Screening values assume 4 eight ounce fish meals per month. Based upon OHA's review of available data they have determined that no human health risks exist. Entities consuming more than 4 eight ounce fish meals per month may wish to seek additional information. DEQ's Toxics Monitoring Program collected and analyzed additional shellfish tissue in 2013 and these results should be available in early 2015.

Groundwater
Data from the Oregon Health Authority's real estate transaction domestic well testing in Coos and Curry Counties showed little evidence of groundwater contamination. Testing of 402 domestic wells from 1989-2006, showed only eight wells with nitrate levels between five and 10 mg/L and one well above the nitrate level of concern for public water supplies with greater than 10 mg/L. This status report does not report on site specific groundwater or surface drinking water conditions.

Sediment and Water Contaminates - Contaminate data presented in this report come from a variety of DEQ programs including the Coos Bay Toxics Study, Coastal Environmental Monitoring and Assessment Program (CEMAP), Coastal Coho chemical contaminant monitoring,, 2007 Oregon Senate Bill 737 priority pollutant legislation, mixing zone studies, and DEQ's Drinking Water program.

The CEMAP program widely identified a variety of estuarine sediment contaminates above the "low effects" range in Coos Bay. Elevated PCB and metal levels in effluent from various sources were identified through mixing zone and priority pollutant studies. Atrazine, a herbicide widely used for the control of broadleaf plants, was detected at five of eight surface water sites sampled.

Drinking Water
There are 24 public drinking water systems in the South Coast Basin supplied in whole or in part by surface water and 51 public water systems supplied in whole or in part by groundwater. These water systems serve approximately 76,000 people. Public water systems periodically exceed drinking water standards for a number of parameters including: volatile organic compounds, synthetic organic and inorganic compounds, turbidity, and bacteria. Low levels of steroids, hormones, and phthalate compounds (plasticizers) were found at some drinking water intakes indicative of upstream discharges of human and or animal wastes.

Fish and Aquatic Life

Endangered Species Act - Coho salmon and Green Sturgeon are listed as threatened under the Endangered Species Act. This means the South Coast Basin is considered critical habitat and very important to the health of these fish. Other fish species of concern include Pacific Lamprey, Steelhead, Coastal Cutthroat Trout, and Chinook salmon.

Temperature - Elevated temperatures have been identified as a pollutant stressor adversely affecting fish and other aquatic life throughout the basin. In areas where water temperatures exceed 70°F, cold water refugia holding capacities are likely limiting to fish populations. There are 110 individual temperature impairment listings on the 2010 303d Assessment in the South Coast Basin. Some streams may have more than one temperature listing based upon multiple beneficial uses.

Dissolved Oxygen and pH - Monitoring designed to better assess dissolved oxygen and pH conditions in many South Coast Basin estuaries and streams has improved DEQ's understanding of the spatial and temporal extent of water quality impairments for these parameters. Continuous monitoring of these parameters indicates that photosynthetic processes are resulting in significant diurnal fluctuations in dissolved oxygen and pH within a 24 hour period. Measures to address these parameters will likely focus on nutrient management and temperature improvements. Dissolved oxygen criteria exceedances have been documented in 32 stream and estuary segments.

Macroinvertebrate Communities - Macroinvertebrate sampling of wadeable streams in the basin found 54 percent of sites are in *least disturbed* condition, 10 percent in *moderately disturbed* condition, and 36 percent of sites were in *most disturbed* condition. When aquatic insects are stressed the numbers of sensitive organisms are reduced and organisms that are tolerant of higher temperatures and more sediment remain. Twenty seven South Coast Basin stream segments are indentified as impaired for biological criteria. Fine sediment appears to be a greater stressor to macroinvertebrate communities and only 41 percent of sites sampled by DEQ were in good biological condition for fine sediment stress. In addition, 33 percent of the biomonitoring sites were rated in fair biological condition for fine sediment stress which may be indicative of early signs of excess fine sediments. About 34 percent of sites showed poor conditions for temperature stress.

DEQ Community Assistance Programs

DEQ financial assistance programs have invested deeply in supporting actions to improve South Coast Basin water quality. These investments include nearly $1.5 million in section 319 funding which leveraged an additional $1 million in match. Approximately 64% of these 319 grant funds have implemented on-the-ground activities to improve water quality such as riparian

enhancement and sediment abatement projects, 14% focused on monitoring, 11% on condition surveys and planning primarily focusing on riparian and road and landing areas, and 4% on educational activities. DEQ has also provided over $21 million of State Revolving Fund (SRF) loans for the upgrade of older, poorly functioning waste water treatment facilities since the year 2000 and other facilities in the basin have applied for large SRF loans recently.

Actions and Opportunities

Monitoring and Data Management - Coordinated monitoring and improved data management and access are high priority actions. Facilitating yearly monitoring meetings with DEQ staff and with volunteers and partners will be a high priority. Evaluating the data needs of DEQ water quality programs, local volunteers, watershed councils, and other partners will help maximize the efficiency of field resources.

Forested Lands and the Forest Practices Act - Nearly 90 percent of the basin is forested and over half of these lands are privately owned and managed under the Forest Practices Act. State and federal forest lands are managed in a more conservative manner with longer harvest cycles and stronger water quality and habitat protections. Assuring adequate Forest Practices Act riparian protections and sediment controls are in place and are effectively implemented is extremely important.

The effect of forest harvesting on temperature and aquatic ecosystems in stream corridors is a significant natural resource concern in the basin. Legacy timber harvest has contributed to adverse impacts to riparian vegetation and stream channel stability. Conservation on private and industrial forest land, where timber production is the primary emphasis, is limited as a result of the short timber harvest cycle (40 to 60 years). Ownerships where medium to long term harvest cycles are employed offer more potential for conservation of forest biodiversity and habitat structure.

Point Sources and 401 Certified Activities - General permit TMDL nexuses are identified for log storage (dissolved oxygen), seafood processing (bacteria), confined animal feeding operations (bacteria), fish hatcheries (temperature), and suction dredging (temperature, turbidity, widening of stream channels, and the mobilization of elemental mercury). When related DEQ water quality permits are renewed adjustments to the monitoring requirements and conditions should be considered.

Minor point sources may require monitoring assistance in order to further characterize and address elevated metals or other contaminants in the effluent they discharge.

Water Quality 401 Certification TMDL nexuses include the management of hydromodified stream channels, in-stream gravel harvest, and streambank stabilization activities.

Community Assistance - Opportunities to secure funding for non-point source pollution reduction activities through the Sponsorship Option or the Green Project Reserve Fund will be highly sought after by municipalities and other entities that operate wastewater treatment facilities as upgrades are required in the future.

Intensive Agriculture - Cranberries, berries, and lily bulb production are the most intensive South Coast Basin agricultural activities. Cultivation of these crops includes tillage and relatively intensive nutrient and pesticide applications. Management complexities and low profit margins have hindered the adoption of conservation practices by some growers. In one

instance cranberry growers partnered with a local watershed council to begin to examine opportunities for mutually acceptable management options that are cost effective. Implementing a Pesticide Stewardship Partnership project in the South Coast Basin could help support grower efforts to improve pesticide management.

Grass/Pasture/Hay – Stream bank erosion and elevated water temperatures are priority concerns resulting from the lack of riparian buffers. Although progress is being made in this area it will take a significant amount of time for these riparian areas to recover to a fully functioning state.

Poor grazing management resulting in bare or sparsely vegetated areas can contribute to the runoff of pollutants such as bacteria. There are many small operators in the area and the level of management needed for high quality pastures is often not an objective of these small low profit hobby operations. The Oregon Department of Agriculture (ODA), Coos and Curry Soil and Water Conservation Districts (SWCDs), and the Natural Resource Conservation Service (NRCS) are focusing education and outreach efforts on the small farm agricultural community.

Water Quality Status Report

Purpose

The Department of Environmental Quality (DEQ) is undertaking a Watershed Approach (WA) to assist in managing water quality in the State of Oregon. This approach provides for a broad assessment of the status of water quality and other environmental indicators within a basin. . This status report begins to summarize DEQ's current knowledge of the water quality conditions for the five sub-basins that collectively comprise the South Coast Basin while the action matrix identifies priority actions and sets the stage for strategic implementation. Together the status report and action matrix allow for the adaptive management of water quality efforts in the South Coast Basin.

The status report and action matrix will help guide implementation actions to address the region's water quality issues, and will provide greater opportunities for internal DEQ sub-program alignment, stakeholder involvement, and interagency collaboration. This approach will eventually be implemented state-wide. Each DEQ region (Eastern, Western, and Northwest Oregon) will complete a status report and action matrix for one basin each year allowing the findings for the 15 Oregon basins to be revisited and updated on a five year basis.

Figure 1 – Water Quality Programs and Activities

1. **Integrated Water Resource Strategy**
2. **Water quality standards and assessment**
3. **Total maximum daily loads and water quality implementation plans**
4. **Wastewater control – Point Source Program**
    - **a. Industrial and domestic permitting**
    - **b. Stormwater**
    - **c. Pretreatment Program**
    - **d. Biosolids Program**
    - **e. Underground injection control**
    - **f. 401 certification – Removal/Fill Certification**
    - **g. 401 certification – Hydroelectric Certification**
    - **h. Onsite septic systems**
    - **i. Water reuse**
    - **j. Confined Animal Feeding Operations (CAFO)**
5. **Compliance and enforcement**
6. **Groundwater Program**
7. **Safe Drinking Water Act Implementation**
8. **Water quality monitoring**
    - **a. Ambient Monitoring Network**
    - **b. Biomonitoring**
    - **c. Compliance Monitoring**
    - **d. Senate Bill 737**
    - **e. Toxics Monitoring Program (TMP)**
    - **f. Beach Monitoring Program**
9. **Financial and technical assistance**
    - **a. Clean Water State Revolving Fund Loan Program**
    - **b Section 319 Grants - Nonpoint Source**

DEQ's Water Quality program primary functions and program activities have been grouped into the major categories shown in the figure to the right. Each category is described in more detail in the Status Report and this information is followed by identified action items and opportunities for alignment with other programs and partners. Action items, alignment opportunities and partnerships are assembled in the South Coast Basin Action Matrix Summary Table. Actions are grouped by how soon they should be implemented: the next eighteen months (N), within eighteen months to three years (M), or the next three to five years (L).

The South Coast Basin Watershed Approach is a work in progress. The status report and action plan should not be considered final products as they will need to be revised and updated through continued input and interaction from DEQ staff, affected agencies, and stakeholders.

This document builds on previous studies and assessments and attempts to summarize available information in a way that is useful for planning and identifying future actions. This report will be updated in the 2015 - 2017 window but new information will be utilized on a continual basis.

This report does not attempt to report groundwater or surface water conditions related to spills, industrial sites, underground tanks or other site specific pollution sources. Data on individual sites are available on the DEQ website as part of the Laboratory Analytical Storage and Retrieval Database (LASAR).

Setting

The South Coast Basin is located in southwestern Oregon and consists of five sub-basins or 4th field hydrological unit code (HUC) areas: Coos, Coquille, Sixes, Chetco, and a portion of the Smith. These sub-basins are located on the west side of the Siskiyou Mountains and in total contain over 1.9 million acres (2,973 square miles). The hydrologic unit system is a standardized watershed classification system developed by USGS. Hydrologic units are watershed boundaries organized in a nested hierarchy by size ranging from regions to your local watershed.

At the northern end of the basin, the Coos and Coquille rivers headwater in the Coast Range and flow across relatively flat, low gradient, marine terraces to the Pacific Ocean. In the southern portion of the basin numerous coastal frontal streams headwater primarily in the Klamath Mountain Province and discharge directly to the ocean. Ports are maintained at Coos Bay, Bandon, Port Orford, Gold Beach, and Brookings Harbor. Coos Bay provides deep draft access.

Habitats in the South Coast Basin are particularly diverse and include forest, grass and shrub lands, coastal redwood forest, and most of the world's habitat for Port Orford cedar. Flat, coastal terraces, extend from Bandon south to Cape Blanco and support unique shore pine forests, wetlands and cranberry bogs. Further south, the coastal headlands and off-shore rocks are among the most spectacular and pristine in Oregon.

Streams in these watersheds provide habitat for a wide variety of cold-water species including Coho and spring and fall Chinook salmon, summer and winter steelhead, multiple species of residential trout, amphibians, and other fish including Pacific

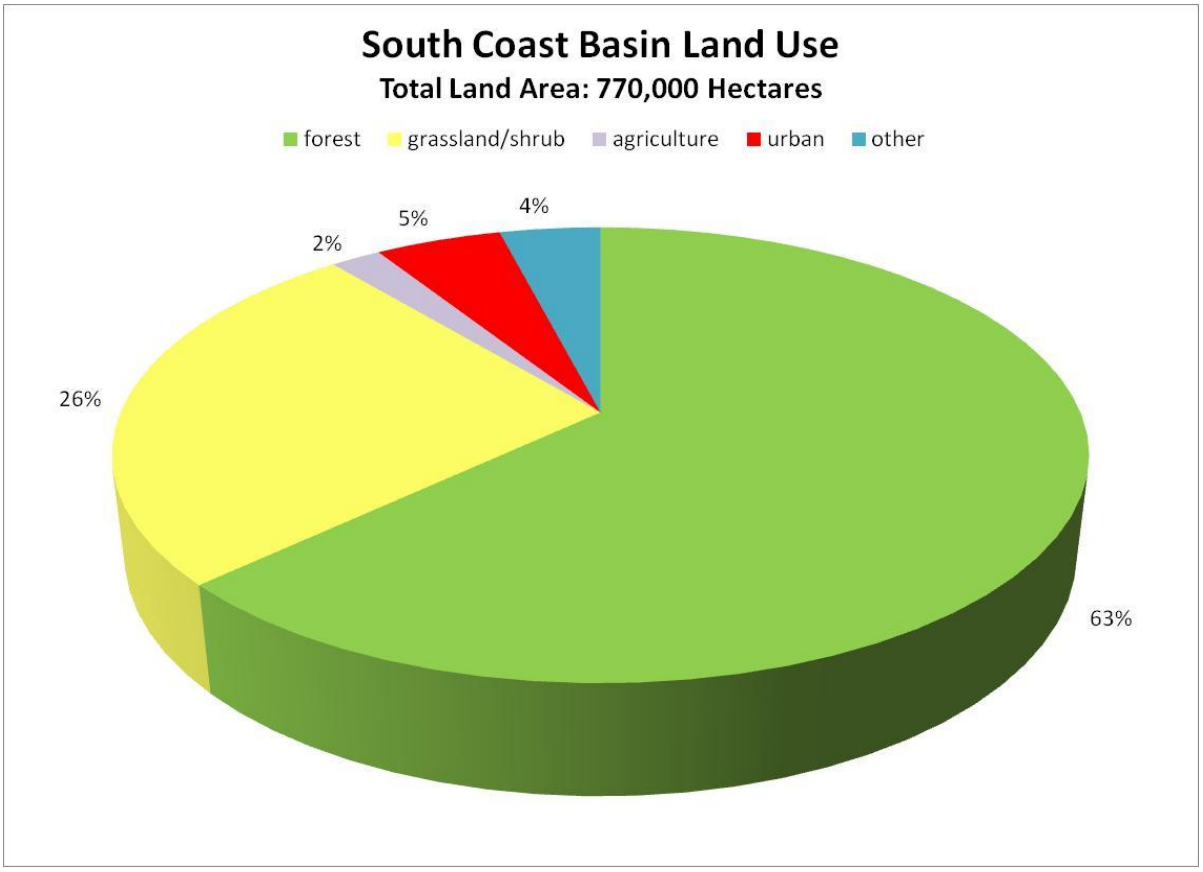
lamprey, green sturgeon, white sturgeon, speckled dace, and prickly sculpin. The basin's estuaries provide important habitat for marine mammals, birds and a wide variety of fish.

The South Coast Basin contains several areas identified by the Oregon Department of Fish and Wildlife (ODFW) as "core areas" for the recovery of coastal Coho salmon and is comprised of two discrete evolutionarily significant units (ESUs). The northern portion of the South Coast Basin is part of the Oregon Coast Coho ESU and the southern portion is part of the Southern Oregon/ Northern California ESU. Coho salmon and green sturgeon are listed as threatened under the Endangered Species Act. Other species of concern include Pacific Lamprey, Steelhead, Coastal Cutthroat Trout, and Chinook salmon.

Forestry, ranching, agriculture, commercial and recreational fishing, and tourism drive the economy of communities in the basin. Flat marine terraces have largely been converted to cranberry or lily production. The Coos and Coquille valleys historically were large timber producers along with cattle and dairy industries. Commercial shellfish harvesting occurs in select South Coast Basin estuaries. Commercial and recreational fishing and boating have been an important economic resource for generations. The South Coast Basin also contains numerous lakes which provide fishing, boating, swimming and other recreational opportunities.

The USGS 2006 National Land Cover Database (NLCD) Land Cover GIS layer was used to determine South Coast Basin land use. Land use in the basin is 63% forest, 26% grassland/shrub, 2% agriculture, 5% urban, and 4% other (USGS, 2006).

Figure 2 – South Coast Basin Land Use



The South Coast Basin is comprised of 36% federal lands and only 5% state ownership. The Chetco sub-basin is made up of 70% federal lands, Coquille 32%, Sixes 30%, and Coos only 11%. The majority of state ownership (86%) is the Elliott State Forest located in the Coos sub-basin. The graphic above likely under represents the extent of private timber lands because the USGS 2006 National Land Cover Database (NLCD) may have incorrectly classified recent clear cuts and early seral stage conifer regeneration areas as the shrub land cover. An earlier basin report stated that about 89% of the South Coast Basin is forested land (USDA, 1962). Appendix B provides additional detail regarding South Coast Basin Land Uses.

Figure 3 – Land Ownership Category

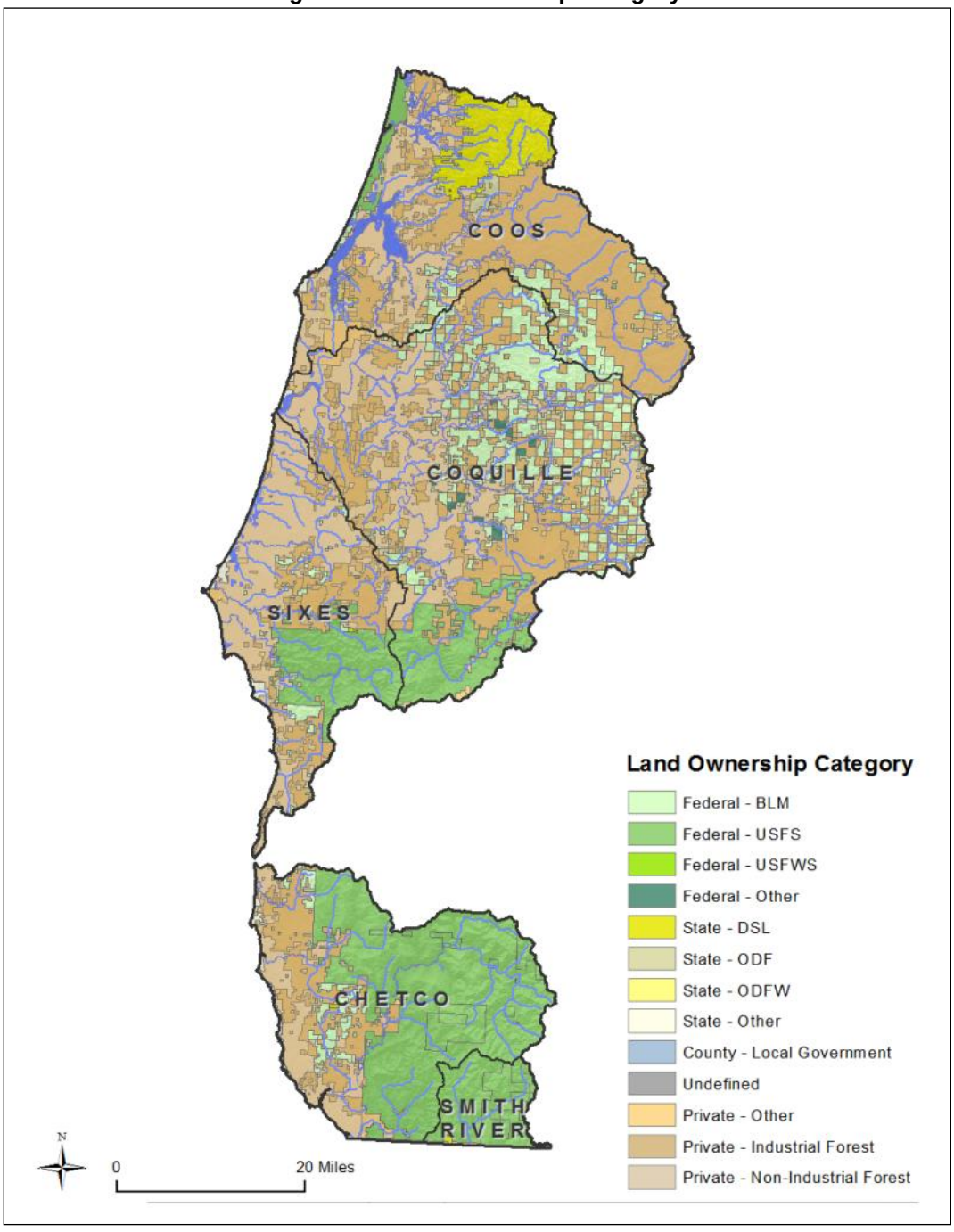
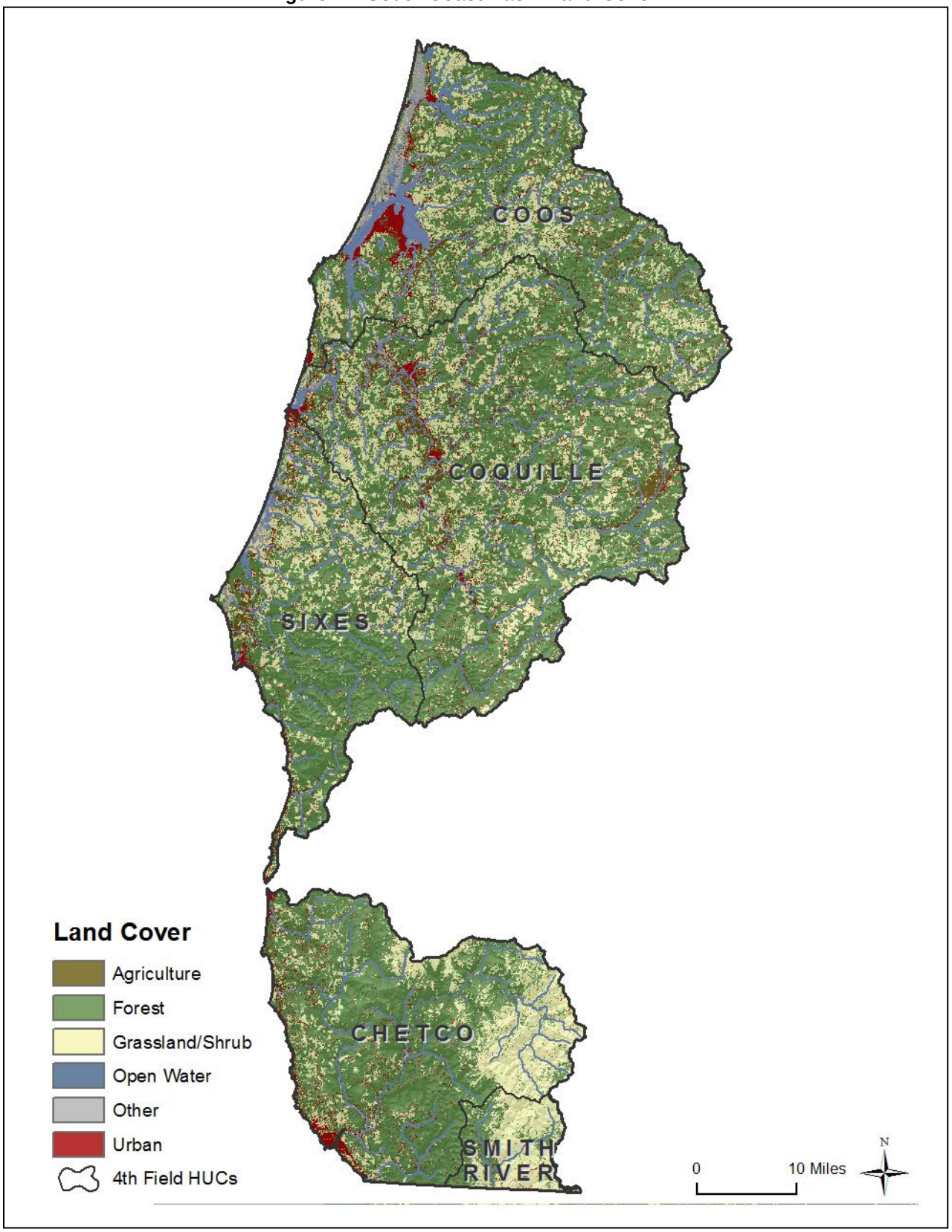


Figure 4 – South Coast Basin Land Cover



Beneficial Uses and Water Quality Pollutants of Concern

Surface water quality numeric and narrative standards have been developed to protect the following beneficial uses in the South Coast Basin (OAR 340-41-300A): public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, and aesthetic quality, hydropower, and commercial navigation and transportation. Groundwater quality standards are published in OAR 340-40-020, Tables 1-3 and OAR 340-40-090, Table 4-6.

Table 1 - Designated Beneficial Uses South Coast Basin OAR 340-041-0300, Table 300A

Beneficial Use	Estuaries and Adjacent Marine Waters	All Streams and Tributaries Thereto
Public Domestic Water Supply[1]		X
Private Domestic Water Supply[1]		X
Industrial Water Supply	X	X
Irrigation		X
Livestock Watering		X
Fish and Aquatic Life[2]	X	X
Wildlife and Hunting	X	X
Fishing	X	X
Boating	X	X
Water Contact Recreation	X	X
Aesthetic Quality	X	X
Hydro Power		X
Commercial Navigation and Transportation	X	

[1]With adequate pre-treatment (filtration and disinfection) and natural quality to meet drinking water standards.

[2]See figures 300A and 300B in OAR 340-41 for fish use designations for this basin.

In practice, water quality standards have been set at a level to protect the most sensitive beneficial uses and seasonal standards may be applied for uses that do not occur year-round. Cold-water aquatic life such as salmon and trout, also known as salmonids, are the most sensitive beneficial uses occurring in the watershed (DEQ, 1995). Other beneficial uses which are very sensitive to water quality impairments are aquatic life, public and private drinking water supply (both groundwater and surface water), and water contact recreation.

Parameters like temperature, dissolved oxygen, pH, sediment, biological criteria, and pesticides are examples of pollutants which can be limiting to fish rearing and spawning and to other aquatic life. Habitat and flow modification, while not technically considered pollutants are also of concern and impact sixty two stream segments in the basin.

Macroinvertebrate sampling of wadeable streams in the basin found 36% of sites were in most disturbed conditions. Fine sediment appears to be a greater nonpoint stressor to macroinvertebrate communities in the South Coast Basin than temperature. These sites are identified as impaired for biological criteria designed to protect aquatic life.

Bacteria, nitrates, turbidity, radon, and toxics are examples of pollutants which directly affect human health. There are over seventy streams or sections of streams identified as impaired for bacteria at levels above those acceptable for recreational contact and or shellfish growing in the Coos and Coquille sub-basins. Streams in the Sixes and Chetco sub-basins are generally meeting bacteria water quality standards. Bacterial impairments are broken down into two seasons; summer and fall winter spring. Because of this some streams may have more than one bacteria listing. In addition, there are eight beach bacterial impairments for water contact recreation on the 2010 303(d) list. In many cases bacteria levels are elevated primarily during runoff conditions. Aging wastewater treatment facilities in the Coquille sub-basin contribute to bacterial loading during storm events. Relatively, though, a larger portion of the bacterial load comes from non point sources of pollution (wildlife, livestock, urban runoff, on-site systems, pet waste, others)

Two lakes in the basin have had repeated health advisories posted due to harmful cyanobacteria or blue-green algae blooms (HABs) and several other lakes in the area potentially have these blooms. These blooms can affect the suitability of water for both recreation and drinking. Invasive weeds are limiting to fish and aquatic life, fishing, boating, water contact recreation, and aesthetic quality.

The Oregon Health Authority (OHA) continues to examine fish tissue chemical contaminant levels as data becomes available to determine if human health risks exist. Fish tissue data is limited but some information is available for metals, organics, and pesticides. Toxics Monitoring Program tissue results should be available in 2015.

Public water systems periodically exceed drinking water standards for a number of parameters including: volatile organic compounds, synthetic organic and inorganic compounds, turbidity, and bacteria. Low levels of steroids, hormones, and phthalate compounds (plasticizers) were found at some drinking water intakes indicative of upstream discharges of human and or animal wastes.

Water Quality Limitations and Total Maximum Daily Loads (TMDL)

The Clean Water Act requires the Department of Environmental Quality (DEQ) to periodically submit a water quality inventory report. The report is referred to as the Integrated Report. The Integrated Report provides information about overall water quality and the extent to which state waters provide for the designated beneficial uses. These beneficial uses include the protection and propagation of a balanced population of fish and wildlife, and allow recreational activities in and on the water (DEQ, 2012).

The Clean Water Act also requires the Department of Environmental Quality to identify state waters where existing pollution controls are not stringent enough to achieve state water quality standards. Where data show that a water quality is not supporting water dependent beneficial uses the waterbody is added to the state's 303d list. DEQ is then required to determine the sources and quantities of pollutants affecting the waterbody and how they vary over time. This information is then used to support the development of a Total Maximum Daily Load (TMDL). TMDLs describe the amount of each pollutant a water body can receive and not violate water quality standards (DEQ, 2012).

The Integrated Report also includes information about areas where water quality standards or criteria are attained and where insufficient data exists to determine the status of the water quality. In some cases a determination is made that a designated beneficial use is not

supported but a TMDL is not needed. For instance, flow and habitat modifications are identified as impairments to beneficial uses but the lack of flow and physical habitat are not considered to be pollutants. Adequate flow and habitat complexity are both parameters that affect stream temperatures so improving habitat complexity and increasing flows are strongly connected to achieving desired reductions in temperature (DEQ, 2012). .

More information about the methodology that is applied to determination when water quality limitations exist can be found in the document; Methodology for Oregon's 2010 Water Quality Report and List of Water Quality Limited Waters (DEQ, 2011).

DEQ is in the process of developing TMDLs that will address temperature, bacteria, dissolved oxygen, and sedimentation in the South Coast Basin. Jurisdictional entities are required to specify how they will manage and reduce pollutant loads as part of the implementation of a TMDL.

TMDLs have been approved for the Tenmile Watershed and the Upper portion of the South Fork Coquille River. Point source only TMDLs have been completed for the Coquille River mainstem and Garrison Lake. These TMDLs will be updated to include nonpoint sources. Additional information about TMDLs can be found on DEQ's website at South Coast Basin TMDLs.

The Upper South Fork Temperature TMDL requires actions be taken to limit thermal loading to surface water. The Tenmile Watershed TMDL requires actions be taken to limit sedimentation and nutrient loading. In general, TMDL loading capacities are expressed as pollutant loading limits plus a Human Use Allowance (HUA) for both point and nonpoint sources of pollution.

Data Sources and Interpretive Approaches

The following sections discuss the status of water quality impairments related to the specific beneficial uses human health and fish and aquatic life. Water quality trending for these uses and pollutants will also be discussed where the data are available. A wide variety of water quality data sources have been evaluated for inclusion and, where possible, have been used to derive site condition information and to help guide future regional monitoring activities. In some instances data is flagged as being available but not included at this time. These data will be assessed for inclusion as time allows during the update of this document.

A variety of approaches have been applied to assess South Coast Basin water quality conditions. The applied approaches yield differing perspectives and in combination, allow an improved understanding of overall water quality and the relative magnitude of impairments.

Table 2– Assessment Approaches and Application Summarized

Approach	Application
Box and Whisker Plot	Evaluate Temporal Variation
Trend Analysis	Evaluate the Overall Pattern of Change Through Time
Dissolved Oxygen Deficit	Evaluate the Presence and Magnitude of Oxygen Demanding Substances
Diel Fluctuations	Evaluate the Impact of Photosynthetic Processes on Dissolved Oxygen *Daylight Increases DO, DO Declines in the Evening Hours (See Appendix G)*

Box and Whisker Plots

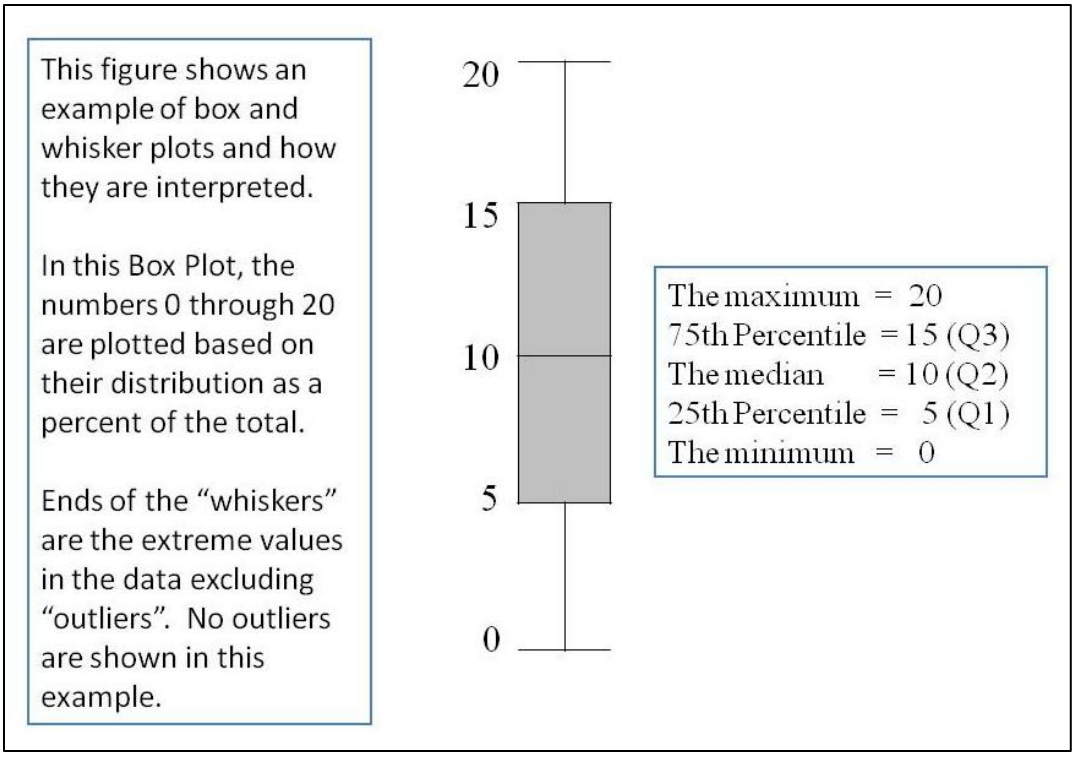
Box and Whisker Plots were developed at ambient monitoring sites where long term datasets are available. A box-and-whisker plot is a convenient way of graphically depicting groups of numerical data through their five-number summaries:

- the smallest observation (sample minimum)
- lower quartile (Q1),
- median (Q2),
- upper quartile (Q3), and
- the largest observation (sample maximum)

DEQ used monthly box-and whisker-plots to assess the temporal distribution of South Coast Basin ambient station water quality data for the period 1990 - 2011. Box and whisker plots illustrate the spread of a dataset at a site, including extreme values (outliers). Box and whisker plots use the median as a measure of central tendency and the interquartile range (IQR), the 25th percentile to 75th percentile, as a measure of dispersion. The IQR is the length of the box in the plot. An outlier is any value that lays more than one and a half times the length of the box from either end of the box.

Ambient station box and whisker plot results were summarized and depict values found to fall between the 25th and 75th percentiles (central tendency and dispersion). This range depicts what the water quality at the site is most of the time and excludes episodic excursions. For additional information, including graphics by site, please see Appendix G.

Figure 5 – Box-and-Whisker Plot



Trend Analysis Plots
Trend Analysis was conducted at ambient monitoring sites where long term datasets are available. The goal of trend analysis is to determine the overall pattern of change in a given parameter over time. The trend can be an indicator of whether water quality conditions are improving or declining and if so, how quickly or slowly the increase or decrease has occurred.

Trend analysis can also be utilized to compare one time period to another time period. This form of trend analysis is carried out in order to assess the level of an indicator before and after an event. Evaluating the water quality response to restoration activities over time could be accomplished by conducting what is sometimes called interrupted time series analysis. Trend analysis can also be used to compare one geographic area to another. When comparing the level of an indicator across geographic areas, only looking at one point in time can be misleading. For instance, water quality conditions can vary significantly from year to year. Analyzing a water quality trend over several years can give a more precise comparison of the discrete geographic areas.

Future condition projections may also be derived from trend analysis. Projecting rates into the future is a means of monitoring progress toward a water quality standard or target or simply providing an estimate of the frequency of a future water quality condition.

Statistical Significance of Trends
Trend plots may reflect biological variability and experimental imprecision. These factors can make it hard to distinguish real differences from random variability. Statistical rigor helps determine whether a trend is real, and to minimize the contribution of random variability. Statistical analyses are most useful when you are looking for differences that are small compared to experimental imprecision and biological variability.

In order to test whether there is a statistically significant trend, a p value is determined. The p value is a probability, with a value ranging from zero to one. It indicates what the probability that random sampling would lead to a difference between sample means as large (or larger) than were observed in the dataset. The linear trend in a dataset is considered to be statistically significant if the p-value is less than the customary cutoff of 0.05. If the P value is 0.05 there is a 5% chance of observing a difference as large as you observed even if the two population means are identical. Random sampling from identical populations would lead to a difference smaller than you observed in 95% of experiments and larger than you observed in 5% of experiments. A trend line is a straight line that connects two or more points. A positive sloping line is defined as an uptrend. A negative sloping line is defined as a downtrend.

TMDL Intensive Monitoring
DEQ's ambient monitoring program tracks water quality conditions throughout the state by scheduling the collection of grab samples. More intensive monitoring efforts are often initiated to expand upon spatially and temporally limited data sets to better characterize water quality conditions and support the development of TMDLs. Intensive continuous water quality studies were conducted to better understand and quantify the temporal and spatial variability of the following parameters:

- *Dissolved oxygen and pH* conditions; three day studies were conducted measuring and recording dissolved oxygen, conductivity/salinity, and pH continuously at 15 minute intervals.
- *Bacterial loading* due to runoff; samples were collected for analyses in conjunction with rainfall events during both the rising and falling hydrographs.

- Stream *temperatures*; continuous monitoring devices were deployed to measure temperature at ½ hour intervals during the period of interest. Flows were monitored in conjunction with these deployments in most cases.

Dissolved Oxygen Deficit
Dissolved Oxygen (DO) deficit was calculated for sites where continuous data sets were available. The percent saturation of DO in water is derived by applying factors to equalize values for water temperature, elevation, and barometric pressure. When there are no oxygen demanding substances or algal activity present, oxygen saturation values would be at 100%.

DO deficit represents the sum total of biochemical impacts on DO. For example, if a wastewater treatment plant effluent had a biochemical oxygen demand of 1 mg/L, and it were all exerted at once, dissolved oxygen values in the receiving water body would be reduced by 1 mg/L. DO deficit is derived by subtracting saturation DO values from DO values measured in the stream. Saturation DO is derived by dividing measured DO levels by calculated % saturation to determine what water column DO would be if fully saturated at the same location elevation, temperature, and barometric pressure. The example below illustrates how oxygen deficit is derived.

Measured water column DO = 6.4 mg/l

Decimal percent saturation = 0.84
(Note: saturation values over 100% are reduced to 100%)

DO saturation = (6.4/0.84) = 7.6 mg/l

DO deficit = (6.4 mg/l – 7.6 mg/l) = -1.2 mg/l

Where algal activity is present, oxygen is produced and may reduce DO deficits resulting from biochemical demand. When this condition is present, DO deficits may be decreased downstream as photosynthetic processes produce oxygen. The evaluation of DO deficit can provide insight into the presence and magnitude of oxygen demanding substances and their impact on water column DO levels.

Dissolved Oxygen and pH Diurnal Fluctuation - Photosynthetic Processes Periphyton, Phytoplankton, and Macrophytes
Excessive growth of photosynthesizing organisms can result in significant diurnal fluctuations in DO and pH which may adversely impact aquatic life and result in water quality standards violations. This growth can be observed in stream as; periphyton (attached diatom and algae assemblages), phytoplankton (algae and other small organisms which are suspended in the water column), and macrophytes (large rooted vascular plants, mosses, liverworts, and periphyton - such as long filaments of the green alga). Photosynthesis rates are controlled by nutrient concentrations and the availability of light (DEQ, 2000).

During the day, when macrophytes and algae photosynthesize and grow, carbon dioxide is consumed and oxygen is released into the water while at night respiration dominates and oxygen is removed from the water. Respiration occurs at a relatively constant rate both day and night and consumes oxygen and produces carbon dioxide. Respiration increases the hydrogen ion concentration, and consequently lowers the pH. The result is higher DO and pH values during daylight hours and lower DO and pH values during the night (DEQ, 2000).

Aquatic Life - Temperature

CONCERN: Fish and Aquatic Life – Temperature

Salmonids, and some amphibians, are highly sensitive to temperature. In particular, Spring Chinook and Coho salmon are among the most temperature sensitive of the cold water fish species in the South Coast Basins (DEQ, 1995). Oregon's water temperature criteria employ a logic that relies on using salmonid life cycles as the most sensitive indicator for the parameter temperature. As such, these criteria are referred to as the biologically based number criteria (BBNC). Additional information regarding Oregon's BBNC can be found in the June 1995 Temperature Standards Review document. Temperatures which protect these indicator species will also protect other species. Excessive summer water temperatures reduce the quality of rearing and spawning habitat for Chinook and Coho salmon, steelhead, and resident trout (ODEQ, 1995). Potential thermal pollutants include human-caused increases in solar radiation due to changes in riparian vegetation, stream channel widening, wastewater treatment facility effluent, flow modifications, and the management of channelized streams for drainage purposes.

Table 3 – Biologically Based Numeric Temperature Criterion

Use	Numeric Criteria (7-Day Average Maximum)	Season
Salmon and Steelhead Spawning	13.0 C/55.4 F	Varies by geography
Core Cold Water Habitat	16.0 C/60.8 F	Year around
Salmon and Trout Rearing and Migration	18.0 C/64.4 F	Year around
Salmon and Steelhead Migration Corridors	20.0 C/68.0 C	Year around

There were 110 individual temperature impairment listings in the South Coast Basin that were identified in the 2010 Water Quality Assessment (DEQ, 2012). Some streams may have more than one temperature listing because of segmentation and for exceeding both the rearing *and* the spawning criteria. Example box and whisker and trend temperature plots are shown below. Other sub-basin plots are summarized in tables and plots not shown here can be seen in appendix G.

Figure 6 – Floras Creek Temperature Box and Whisker Plot Example

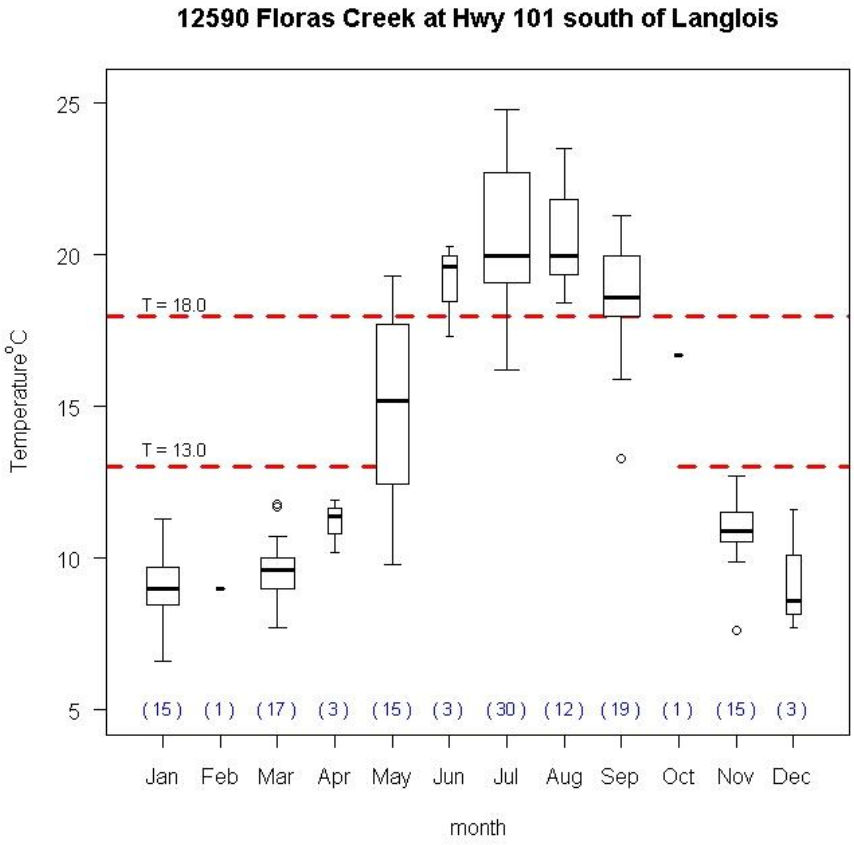


Figure 7 – Sixes River Temperature Trend Plot Example

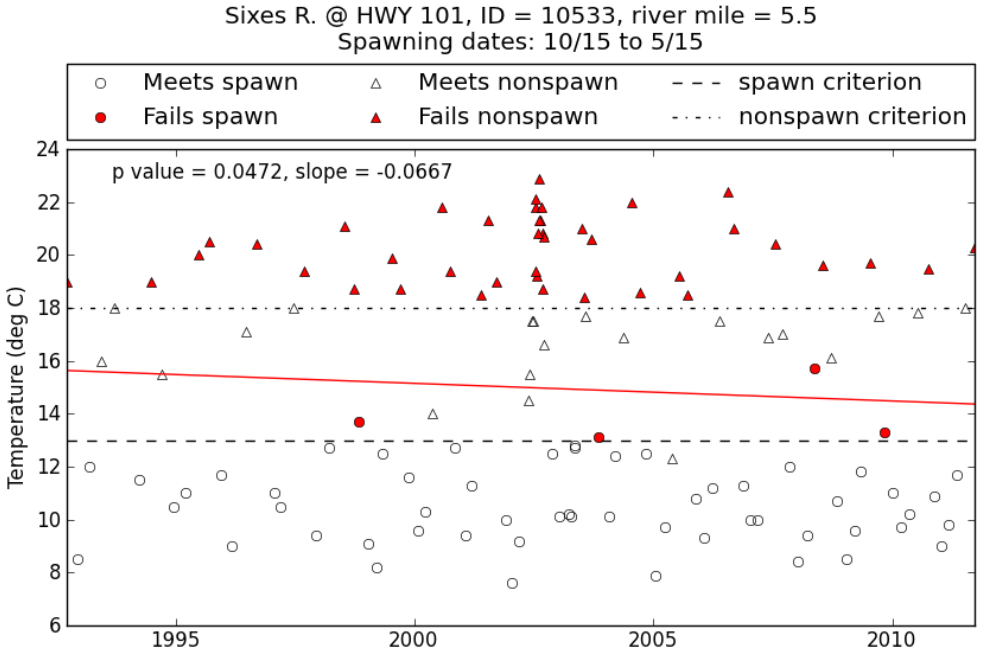


Table 4 – Ambient Station 1995 - 2010 Box and Whisker Plots Summarized – Temperature			
LASAR Number	**Site Name**	**Rearing Criteria Non Attainment**	**Spawning Criteria Non Attainment**
12590	Floras Creek @ Highway 101 South of Langlois	June, July, August, September	May
10533	Sixes River @ Hwy 101 Bridge		May
11905	Elk River @ Hwy 101		May, November
11493	Pistol River @ Pistol River Loop Road	June, July, August	Tidal - Not Applicable
11483	Chetco River @ USGS Gage RM 10	July, August	May
10537	Winchuck River 1.3 Miles upstream of Hwy 101		None
11485	Middle Fork Coquille River @ Hwy 42	June, July, September	May
10393	North Fork Coquille River @ Hwy 42		Tidal - Not Applicable
11486	South Fork Coquille River @ Broadbent	June, July, August, September	May, October
10596	Coquille River @ Sturdivant Park		Tidal - Not Applicable
13570	Millicoma River @ Rooke Higgins Boat Ramp *Estuarine June-October*		Tidal - Not Applicable
13574	S Fk Coos River Anson Rogers Br *Estuarine June-October*	*June, July, September*	Tidal - Not Applicable

Table 5 – Ambient Station 1995 - 2010 Trend Plots Summarized – Temperature		
LASAR Number	**Site Name**	**Significant Trend**
12590	Floras Creek @ Highway 101 South of Langlois	None
10533	Sixes River @ Hwy 101 Bridge	Cooling
11905	Elk River @ Hwy 101	
11493	Pistol River @ Pistol River Loop Road	
11483	Chetco River @ USGS Gage RM 10	
10537	Winchuck River 1.3 Miles upstream of Hwy 101	
11485	Middle Fork Coquille River @ Hwy 42	
10393	North Fork Coquille River @ Hwy 42	
11486	South Fork Coquille River @ Broadbent	
10596	Coquille River @ Sturdivant Park	
13570	Millicoma River @ Rooke Higgins Boat Ramp	None
13574	South Fork Coos River Anson Rogers Bridge	

Continuous Temperature Data Interpretation

Continuous monitoring of stream temperature has been widely implemented throughout the South Coast Basin by DEQ and various partners. These large continuous datasets are managed to derive information relating to water quality criteria attainment, the magnitude of the temperature limitation, and to provide insight into priority areas for the implementation of projects to address stream warming.

Oregon's BBNC are based upon temperature 7-day average maximum metrics. While attainment of Oregon's temperature criteria is an important area of focus, continuous

temperature data sets can also provide valuable information to further characterize thermal regimes. The derivation of this biologically pertinent information from temperature data is helpful to characterize and quantify management related changes in the thermal regime, is a useful tool to help determine restoration priorities, and helps to quantify fishery impacts.

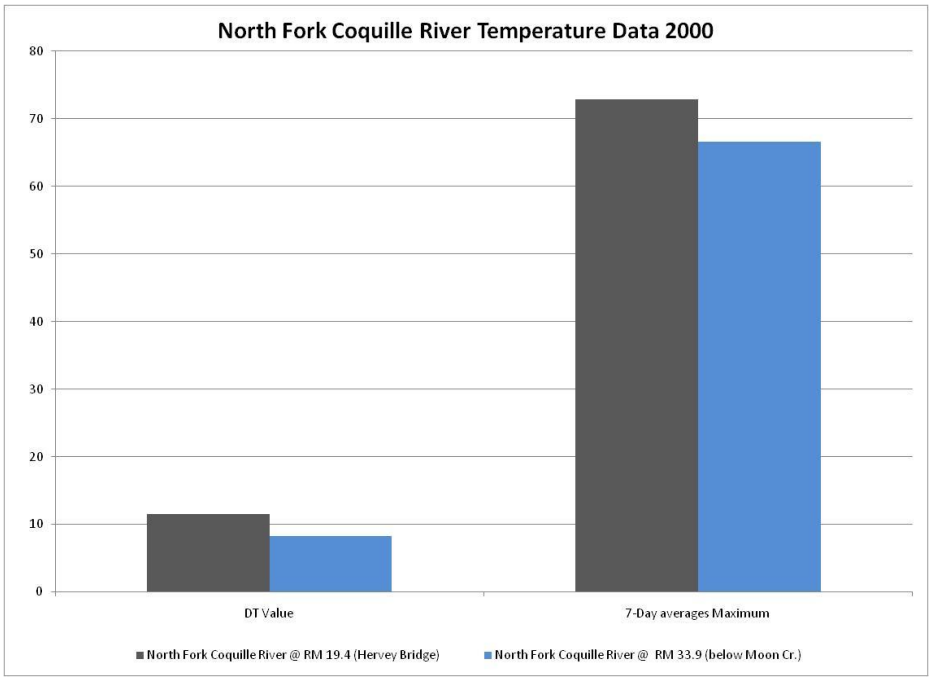
Metrics commonly derived from continuous temperature datasets include;

1. Seasonal maximum date and value
2. Seasonal minimum date and value
3. Seasonal maximum delta temperature date and value
4. 7 day average maximums date and value
5. 7 day average minimums value and delta temperature
6. Number of days when temperature exceeded 55, 64, and 70 degrees Fahrenheit
7. Number of hours when temperature exceeded 55, 64, and 70 degrees Fahrenheit

Temperature Data Metrics Example

The following figures utilize data from a North Fork Coquille River temperature study. In the first figure both sites exceed the DEQ temperature criteria and appear to be fairly comparable. The site depicted in gray has a larger temperature fluctuation or delta T (DT) than the site in blue during the 7-Day Average Max period. Headwater sites tend to have lower DT values as well as do sites located low in the river. This is because headwater sites often stay cooler throughout the day and sites lower in the watershed stay warmer throughout the day. Where DT's are large the water is cool in the mornings and warms during the day. This can represent a good area to consider implementing riparian improvement projects.

Figure 8 – Temperature Delta T and 7 Day Maximum Average Comparison



The next figures show 7 day average maximums as well as the amount of time each site spends at differing temperatures. Both sites exceed Oregon's BBNC and spend the entire period of record (27 days) with daily maximum temperatures over 55^{o} F. The site depicted in blue spends fewer days with temperatures are over 64^{o} F and has no days where temperatures exceed 70^{o}

F. Temperature at the site depicted in gray exceeds 70^{o} F, a condition that can become lethal to fish. The third graphic shows the hours each site spends at differing temperatures. Both sites spend the entire period of record (27 days) whit the temperature is over 55^{o} F. The site depicted in blue spends fewer hours where temperatures are over 64^{o} F. Unlike the site in gray the site in blue does not have any hours where temperatures exceed 70^{o} F. Time spent at given temperatures is a good way to evaluate the impacts on juvenile fish. Although both sites are identified as temperature impaired overall temperature stresses on fish are much lower at the site shown in blue than at the site shown in gray.

Changes to the temperature regime resulting from activities that increase solar loading can be analyzed at differing levels. Changes will often be seen in the days and hours spent assessment prior to the detection of changes in the 7-Day maximum average.

Figure 9 – Days Spent Temperature Comparison

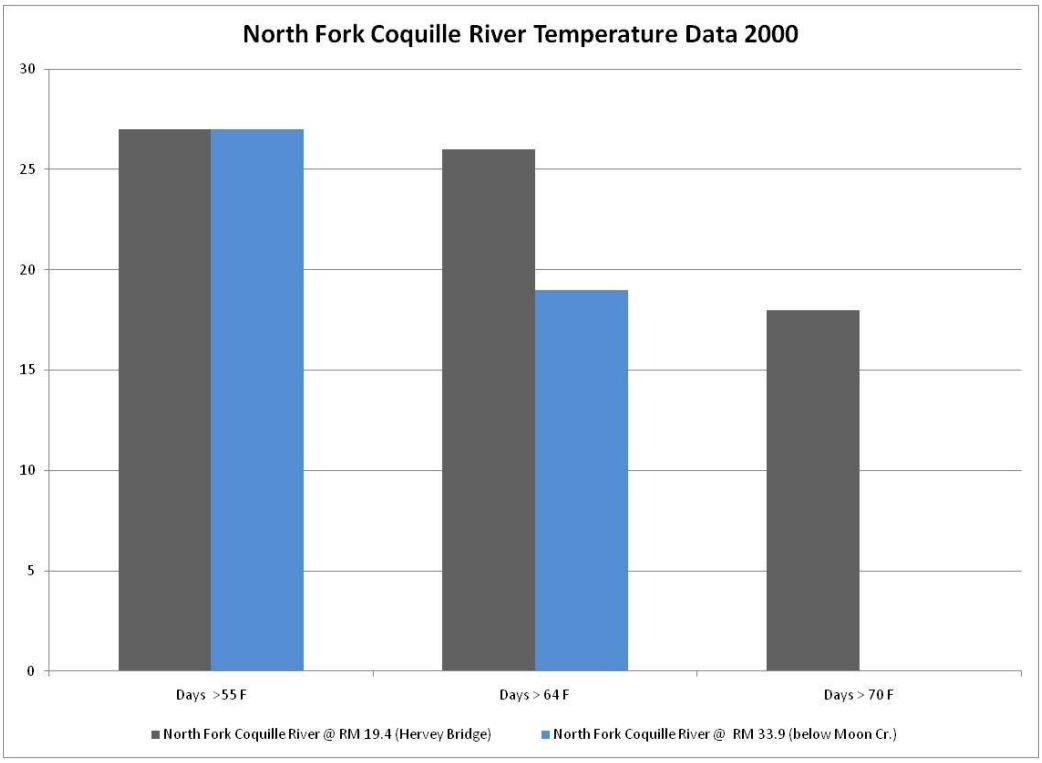
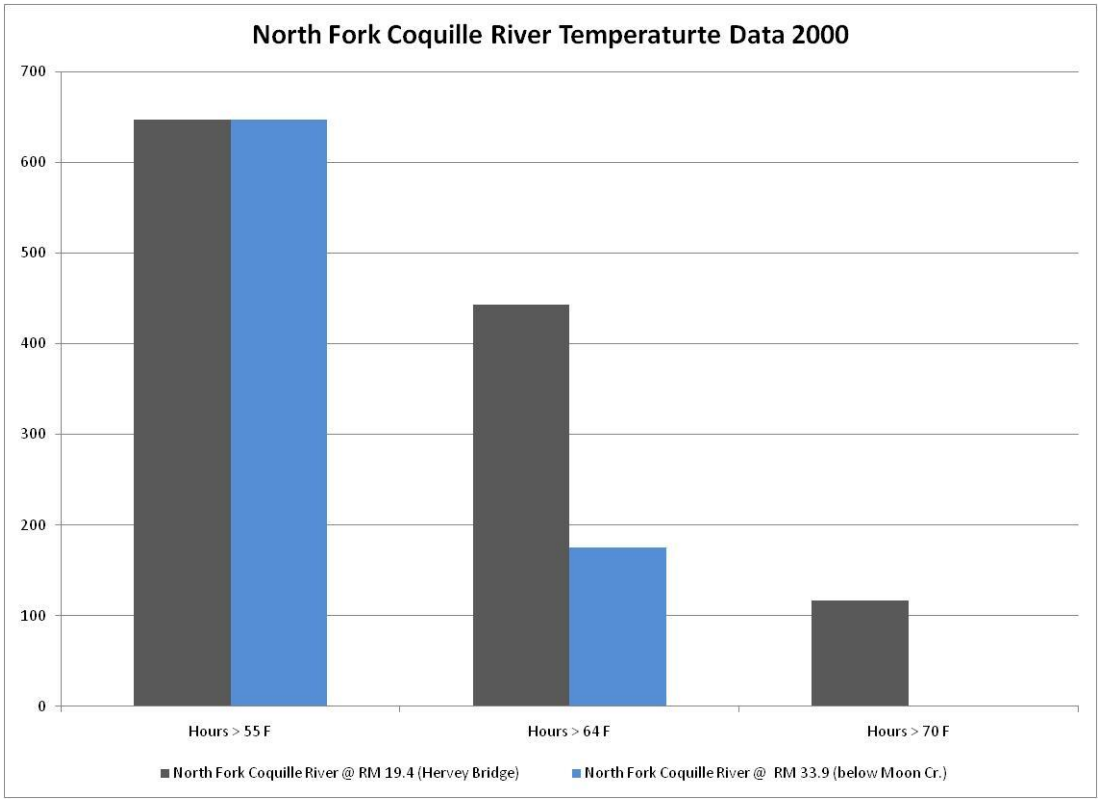


Figure 10 – Hours Spent Temperature Comparison



The tables below present temperature metrics derived from data collected in a 2010 South Fork Coquille River temperature study. Longitudinal monitoring for the river and its tributaries was conducted in order to better understand the temporal and spatial temperature regime of the river. DEQ has utilized this data to calibrate a predictive model to determine the temperature response that might be expected if shade and/or flow increased and if channel width to depth ratios decreased.

Additional temperature data is widely available throughout the South Coast Basin but have not yet been included in this report. ***As time allows, data from temperature, channel, and flow studies conducted in other areas should be added to this assessment.***

Table 6 – South Fork Coquille River Temperature Metrics

Site Name	Lat	Long	Start Date	Stop date	Seasonal Maximum		Seasonal Minimum		Seasonal Max ΔT		7-Day averages			
					Date	Value	Date	Value	Date	Value	Date	Maximum	Minimum	Δ T
South Fork Coquille River, River Mile 1.0, Myrtle Point boat ramp	-124.1474	43.0668	07/02/10	09/07/10	07/11/10	77.9	09/06/10	61.1	08/24/10	11.0	08/13/10	75.6	68.2	7.4
South Fork Coquille River at RM 2.8	-124.1469	43.0481	07/02/10	09/07/10	07/11/10	77.0	07/03/10	61.8	08/24/10	7.6	07/12/10	74.8	69.4	5.4
South Fork Coquille River at RM 4.8	-124.117	43.035	07/07/10	09/29/10	07/11/10	78.3	09/23/10	61.8	07/14/10	7.9	07/12/10	76.2	70.0	6.1
South Fork Coquille River at RM 6.9	-124.1371	43.0143	07/02/10	08/26/10	07/11/10	78.2	08/24/10	56.8	08/24/10	18.7	07/13/10	76.1	70.3	5.8
South Fork Coquille River 1M U/S Broadbent RM 10	-124.1472	43.0049	07/07/10	09/14/10	07/11/10	77.8	09/10/10	63.9	07/09/10	7.7	07/10/10	75.8	69.5	6.3
South Fork Coquille River at River Mile 16, Albert Powers State Park	-124.1326	42.9672	07/08/10	08/01/10	07/11/10	77.5	07/14/10	64.2	07/08/10	10.4	07/11/10	75.7	66.9	8.8
South Fork Coquille River at River Mile 19, Myrtle Grove State Park	-124.107	42.9484	07/08/10	09/06/10	07/11/10	81.1	09/06/10	61.0	08/24/10	15.7	08/14/10	79.3	67.3	12.1
So Fork Coquille River at RM 20.5	-124.1006	42.9399	07/09/10	09/14/10	08/16/10	78.2	09/06/10	59.6	08/24/10	14.0	08/14/10	77.0	67.7	9.3
South Fork Coquille River at River Mile 25, downstream of Baker Creek	-124.1114	42.9075	07/08/10	09/06/10	07/11/10	74.2	09/06/10	61.2	07/08/10	6.6	07/11/10	72.3	66.4	5.9
South Fork Coquille RM 27 1 Mile D/S of Powers STP	-122.5206	45.4958	07/08/10	09/06/10	08/13/10	80.0	09/06/10	58.0	08/24/10	15.9	08/14/10	78.8	66.0	12.8
South Fork Coquille River 50 ft. u/s of Powers STP (RM. 28.5)	-124.0738	42.8846	07/08/10	09/06/10	08/16/10	76.3	09/06/10	59.4	08/24/10	12.2	08/15/10	75.4	66.6	8.7
South Fork Coquille RM 30 at Airport Road (Powers)	-124.0636	42.8756	07/08/10	10/19/10	08/16/10	75.0	10/19/10	49.9	07/14/10	12.2	08/14/10	74.1	66.0	8.2
South Fork Coquille RM 35 at US Forest Service Boundary	-124.0326	42.8323	07/09/10	09/29/10	08/14/10	67.5	09/23/10	55.8	07/24/10	4.5	08/15/10	66.8	63.6	3.3
Tributaries to the South Fork Coquille River														
Catching Creek at Bridge 34	-124.1521	43.0528	07/02/10	09/07/10	07/11/10	71.0	09/06/10	57.5	07/14/10	5.6	07/11/10	69.1	64.5	4.6
Middle Fork Coquille River at RM 0.2 at Hwy 42 (Hoffman State Park)	-124.1132	43.0329	07/07/10	09/14/10	07/11/10	75.3	09/12/10	61.5	08/24/10	7.8	08/13/10	73.9	68.1	5.8
Rhoda Creek at Hwy. 542	-124.1364	43.0141	07/07/10	07/26/10	07/11/10	66.9	07/19/10	55.2	07/24/10	9.3	07/12/10	64.6	57.9	6.7
Yellow Creek at Mouth	-124.0961	42.9501	07/08/10	08/26/10	07/11/10	65.7	07/14/10	54.3	07/14/10	7.2	07/11/10	63.3	57.9	5.4
Baker Creek at mouth	-124.111	42.906	07/13/10	09/11/10	07/16/10	66.0	09/11/10	52.2	07/19/10	7.7	08/19/10	63.3	58.6	4.7
Woodward Creek at Gant Creek Road	-124.0759	42.8995	07/08/10	08/26/10	07/09/10	72.6	08/23/10	54.1	07/08/10	12.7	07/11/10	69.8	59.6	10.3
Powers STP final effluent	-124.0674	42.8882	07/13/10	10/19/10	08/16/10	73.8	10/14/10	58.8	08/24/10	8.3	08/14/10	72.6	66.8	5.9
Mill Creek at Mouth	-124.0647	42.8764	07/08/10	08/26/10	08/25/10	77.6	07/14/10	54.0	08/24/10	20.7	08/22/10	72.7	57.5	15.2
Hayes Creek at Mouth	-124.0583	42.8733	07/08/10	08/26/10	07/11/10	62.7	07/14/10	51.9	07/14/10	6.9	08/14/10	61.1	57.5	3.6

Table 7 – South Fork Coquille River Temperature Metric Continued

Site Name	Days >	Days >	Days >	Hours >	Hours >	Hours >	Warmest day of 7-day max		
	55 F	64 F	70 F	55 F	64 F	70 F	Date	Maximum	Minimum
South Fork Coquille River, River Mile 1.0, Myrtle Point boat ramp	68	68	62	1631.5	1592.5	696.5	08/13/10	77.0	68.7
South Fork Coquille River at River Mile 2.80	68	68	59	1631.5	1600.0	792.5	07/11/10	77.0	71.2
South Fork Coquille River at River Mile 4.8	85	85	61	2039.5	1989.5	963.5	07/11/10	78.3	72.4
South Fork Coquille River at RM 6.9	56	56	50	1343.5	1242.0	665.0	07/11/10	78.2	72.9
South Fork Coquille River 1M U/S Broadbent RM 10	70	70	58	1679.5	1678.0	978.0	07/11/10	77.8	71.3
South Fork Coquille River at River Mile 16, Albert Powers State Park	25	25	24	599.5	599.5	339.0	07/11/10	77.5	69.5
South Fork Coquille River at River Mile 19, Myrtle Grove State Park	61	61	60	1463.5	1431.0	735.0	08/16/10	80.8	67.7
South Fork Coquille River at RM 20.5	68	68	63	1631.5	1498.5	608.0	08/16/10	78.2	68.4
South Fork Coquille River at River Mile 25, downstream of Baker Creek	61	61	43	1463.5	1428.5	397.0	07/11/10	74.2	69.2
South Fork Coquille RM 27 1 Mile D/S of Powers STP	61	61	56	1463.5	1279.0	426.0	08/13/10	80.0	65.8
South Fork Coquille River 50 ft. u/s of Powers STP (RM. 28.5)	61	61	47	1463.5	1272.0	355.0	08/16/10	76.3	66.4
South Fork Coquille RM 30 at Airport Road (Powers)	104	82	48	2412.0	1397.5	305.5	08/16/10	75.0	66.9
South Fork Coquille RM 35 at US Forest Service Boundary	83	42	0	1991.5	527.0	0.0	08/14/10	67.5	64.1
Tributaries to the South Fork Coquille River									
Catching Creek at Bridge 34	68	59	2	1631.5	764.5	8.5	07/11/10	71.0	66.2
Middle Fk Coquille River at RM 0.2 at Hwy 42 (Hoffman State Park)	70	70	53	1679.5	1588.5	491.0	08/13/10	75.2	68.5
Rhoda Creek at Hwy. 542	20	9	0	479.5	33.5	0.0	07/11/10	66.9	60.7
Yellow Creek at Mouth	50	3	0	1180.5	20.0	0.0	07/11/10	65.7	61.0
Baker Creek at mouth	61	4	0	1426.0	12.5	0.0	08/18/10	64.1	58.5
Woodward Creek at Gant Creek Road	50	23	4	1194.5	158.5	21.5	07/09/10	72.6	60.3
Powers STP final effluent	99	94	37	2375.5	2083.0	228.5	08/16/10	73.8	66.8
Mill Creek at Mouth	50	44	13	1190.5	266.0	31.5	08/25/10	77.6	57.9
Hayes Creek at Mouth	50	0	0	1125.5	0.0	0.0	08/13/10	61.5	57.0

Cold Water Refuge

Fish and other aquatic organisms have ranges of thermal tolerance. Increases in water temperature may require sensitive organisms to move to cooler areas during warmer periods of the day. The size of cold water refuge limits the number of fish that can be held. Larger cold water refuge areas can hold more fish during periods of the day with higher temperatures. The time that the stream spends at unfavorable temperatures during a day determines the time that sensitive organisms, like juvenile fish, need to occupy cold water refuge areas.

When the time spent at different temperatures is evaluated it can provide important information about the need for and use of cold water refuge. In the previous North Fork example, fish present in the Hervey Bridge area likely depend on cold water refuges more than individuals present in the below Moon Creek area. As combined stressors are applied to fish, the location and size of refugia become critically important.

Table 8 – Modes of Thermally Induced Cold Water Fish Mortality

Modes of Thermally Induced Fish Mortality[1]	Temperature Range	Time to Death
Instantaneous Lethal Limit – Denaturing of bodily enzyme systems	> 90°F	(> 32°C) Instantaneous
Incipient Lethal Limit – Breakdown of physiological regulation of vital bodily processes, namely: respiration and circulation	70°F - 77°F	(21°C - 25°C) Hours to Days
Sub-Lethal Limit – Conditions that cause decreased or lack of metabolic energy for feeding, growth or reproductive behavior, encourage increased exposure to pathogens, decreased food supply and increased competition from warm water tolerant species	64°F - 74°F	(20°C - 23°C) Weeks to Months

[1]Brett, 1952; Hokanson et al, 1977; Bell, 1986

Rainbow trout were observed exhibiting size hierarchy in occupying a cold-water refuge, with the largest individual occupying in the coldest thermal zone (Ebersole, 2001).

The 2012 EPA *Primer for Identifying Cold-Water Refuges to protect and Restore Thermal Diversity in Riverine Landscapes* determined that "Critical aspects of the natural thermal regime that should be protected and restored include the spatial extent of cold-water refugia (generally defined as waters that are 2°C colder than the surrounding water), the diurnal temperature variation, the seasonal temperature variation (i.e., number of days at or near the maximum temperature), and shifts in the annual temperature pattern" (EPA, 2012).

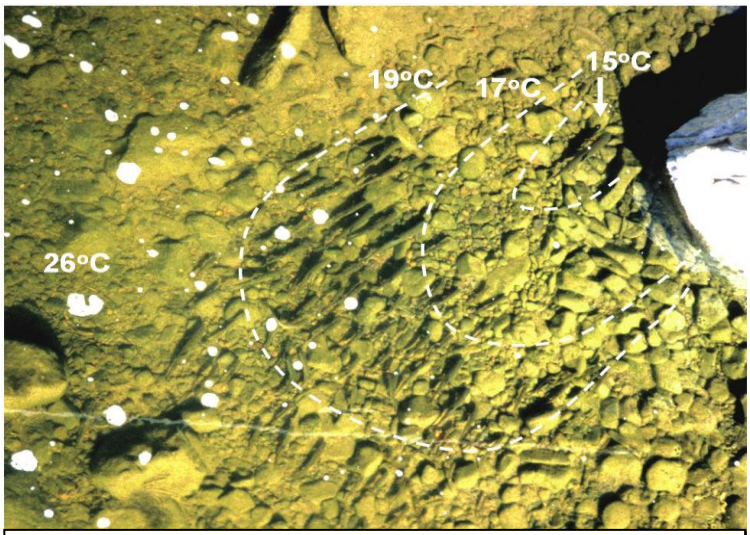


Figure 11 – Rainbow Trout in Joseph Creek. Photograph taken by J. Ebersole in 1994 (EPA, 2012)

DEQ defines "Cold-Water Refugia as those portions of a water body where or times during the diel temperature cycle when the water temperature is at least 2°C colder than the daily

maximum temperature of the adjacent well-mixed flow of the water body." (OAR 340-041-0002 [10]).

Migration Corridor Temperature Refugia Criteria

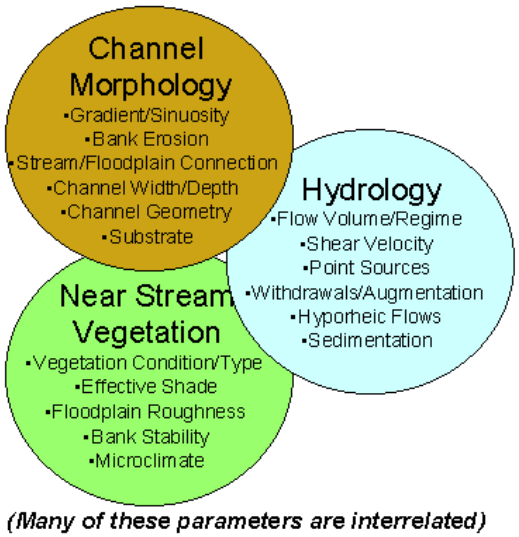
The lower Coquille River mainstem is identified as a Migration Corridor. "Migration Corridor" means those waters that are predominantly used for salmon and steelhead migration during the summer and have little or no anadromous salmonid rearing in the months of July and August. http://www.deq.state.or.us/wq/rules/div041/fufigures/figure300a.pdf (OAR 340-041-0002 [37])

The seven-day-average maximum temperature of a stream identified as having a migration corridor may not exceed 20.0 degrees Celsius (68.0 degrees Fahrenheit). In addition, these water bodies must have coldwater refugia that are sufficiently distributed so as to allow salmon and steelhead migration without significant adverse effects from higher water temperatures elsewhere in the water body. (OAR 340-041-0028 [4d])
http://www.deq.state.or.us/wq/standards/temperature.htm

Environmental Influences on Temperature

Stream temperature is influenced by natural factors such as climate, geomorphology, hydrology, and vegetation. Human or anthropogenic heat sources may include the discharge of heated water to surface waters, increases in the amount of sunlight that reaches the water's surface due to the loss shade from streamside vegetation, changes to stream channel form, reductions in natural stream flows, and the reduction of cold water inputs from groundwater.

Figure 12 – Factors That Affect Stream Temperature Dynamics



Parameters that affect stream temperature can be grouped as near stream land cover or vegetation, channel morphology and hydrology. Many of these stream parameters are interrelated (i.e., the condition of one may impact one or more of the other parameters). These parameters affect stream *heat transfer processes* and stream *mass transfer processes* to varying degrees. Temperature dynamics are influenced by air convection, bed conduction, evaporation, and both long and short wave radiation. The analytical techniques employed to evaluate stream temperature can be designed to include all of the parameters that affect stream temperature provided that available data and methodologies allow accurate quantification (Boyd et al, 2003).

Figure 13 – Lack of Riparian Vegetation and the Widening of Stream Channel

The amount of solar energy that actually reaches the surface of a stream is determined by many factors including the position of the sun in the sky, cloud cover, local topography, stream aspect, stream width, and streamside vegetation. Streams generally warm in a downstream direction as they become wider and streamside vegetation is less effective at shading the surface of the water. Also, the cooling influences of ground water inflow and the impact of smaller tributaries have less of an impact downstream as a stream becomes larger. Greater reach volumes are associated with a reduction in stream sensitivity to natural and human sources of heat. Heat energy delivered by sunlight hitting the surface of the water is a primary cause of stream heating. As the channel widens more surface area is available to intercept heat energy. Riparian shade is a primary mechanism for preventing the delivery of the sun's heat energy to the water column.

South Coast Basin temperature TMDLs will determine system potential effective shade, improvements that might be expected in channel morphology (decrease in width to depth ratios), and the potential to augment instream flows. These factors are called surrogate measures and improvements in these areas can be practically tracked to meet the thermal load allocations for nonpoint sources. Point source thermal loading will be managed through Individual waste load allocations for each facility.

The Coquille River shade assessment quantified both current and potential shade conditions as well as the potential to increase shade by stream reach. These results were then summarized by major forks and their tributaries. This assessment can be a valuable tool to determine the potential to reduce thermal load through a specific riparian enhancement action.

Table 9 – Existing and Potential Shade Targets

Watershed	Current Shade	Target Shade	Potential Shade Increase
Middle Fork Coquille River Shade Summary			
Camas Valley	86	97	11
Large Tributaries	83.6	96.3	12.7
Middle/Lower Mainstem	57.5	75.5	18
Mainstem and Tributaries Middle Fork Coquille River	80	97	17
North Fork Coquille River Shade Summary by Land Use			
Forest Lands	87	95	8
Agricultural and Rural Residential Lands	69	85	16
Mainstem and Tributaries North Fork Coquille River	81	91	10
Lower South Fork Coquille River (mainstem only)			
Forest	27%	45%	18%
Agricultural and Rural Residential Lands	15%	39%	24%
All	16%	40%	24%
Dement Cr. and tributaries			
Forest	85%	93%	8%
Agricultural and Rural Residential Lands	76%	90%	14%
All	83%	93%	10%
Yellow Cr. and tributaries			
Forest	91%	94%	3%

Table 9 – Existing and Potential Shade Targets			
Watershed	**Current Shade**	**Target Shade**	**Potential Shade Increase**
Agricultural and Rural Residential Lands	80%	92%	12%
All	87%	93%	6%
Hayes Cr. and tributaries			
Forest	84%	93%	9%
Agricultural and Rural Residential Lands	85%	92%	7%
All	84%	93%	9%
Mainstem Coquille River and Direct Tributaries Shade Summary by Land Use			
Tributary Forest Lands	86.6	97.2	10.6
Tributary Agricultural and Rural Residential Lands	51.9	90.6	38.7
Lower Mainstem Coquille River	7.2	25.7	18.5

(Follansbee with CWA, 2002, 2003, 2006; Clearwater BioStudies, Inc., 2003)

Shade assessments such as this one are widely available in the South Coast Basin but have not been included here. ***As time allows shade assessments conducted in other areas of the basin should be added.***

Aquatic Life - Turbidity

CONCERN: Elevated Turbidity Adverse Impacts to Fish and Aquatic Life

Suspended sediments can be quantified using a measure of turbidity that measures the penetration of light into water. Increased suspended sediments have been known to adversely affect coho salmon behavior, physiology, and cause death.

Natural turbidity contributions occur from gully, and channel erosion, mass wasting (landslides), road runoff, and the deposition of organic materials or dust into waterways. Vegetation absence or loss from natural attrition, windthrow, fire, and/or seismic events, along with precipitation (or wind) events can increase soil erosion and contribute to hydraulic (or airborne) transport of turbidity-causing sediments into waterways (DEQ, 2010).

The quality of landslide (or debris-flow) materials from steeper, un-harvested headwater areas tends to be a mix of wood, rock, and soil. The wood and rock in the system can create sediment traps, and build channel complexity that reduces hydraulic impacts to the channel bottom and walls, and attenuate or prevent downstream effects from sediments that might otherwise cause increasing turbidity and further erosion (DEQ, 2010).

'Natural' levels of sedimentation and turbidity may be increased from historic times in channels where systems have been modified such that wood and complexity have been removed from channels or prevented from entering channels, or where wetlands and channel-adjacent braided channels and have been filled or cut off from the main channel. Flow connectivity with the floodplain and wetlands is also important in removing or filtering sediments and turbidity from the main channel (DEQ, 2005).

Organisms that form the base of the food chain are called primary producers. These organisms directly influence food available for invertebrates and fish. Increased turbidity has been shown

to influence aquatic primary production by decreasing available light to plants. Increased turbidity can influence the presence and diversity of invertebrate species directly or through indirect adverse impacts on primary productivity (DEQ, 2005).

Elevated turbidity in streams and lakes has been shown to affect primary productivity (growth of algae and submerged macrophytes) in streams, lakes, and estuaries. However, increased photosynthetic efficiency can temporarily counteract this effect, although potentially at a cost to growth. Research conducted in New Zealand indicates that algal production is decreased at turbidity levels of 8 NTU as compared to clear (1 NTU conditions). Turbidity also has been found to limit growth of macrophytes in lakes; however, there is insufficient data to determine a specific turbidity level that would correspond to decreased growth. In Oregon estuaries, research has examined how turbidity may affect growth of eelgrass (*Zostera marina*). EPA has recommended water clarity criteria to protect eelgrass growth in the Yaquina Bay Estuary, but not in other estuaries due to additional data needs and the influence of other variables, such as salinity. (DEQ, 2014)

Direct turbidity effects to fish are mostly visibility-related, causing behavioral changes with respect to maneuverability or migration, feeding, predation, and/or escape. Behavioral effects could lead to use impairment through physiological or population effects by reduced or less efficient feeding leading to reduced growth, avoidance and habitat abandonment, interspecific competition, or other effects. Indirect effects to fish include food-chain impacts discussed above with respect to reductions in primary and secondary productivity including macro-invertebrate densities (DEQ, 2005).

Turbidity decreases reactive distance, the distance at which fish detect and orient themselves toward prey. Studies indicate that this effect, in turn, results in decreased feeding success in salmonids in short trials and in decreased growth after exposures to moderate turbidities (20 NTU) after two or three weeks. There is uncertainty as to what the minimum effect level is for decreased growth in salmonids, as even the lowest turbidities tested in studies resulted in significant effects. Studies indicate that salmonids exposed to moderately high turbidity levels in natural settings are able to feed in the benthos, although possibly at a lower rate and with increased energy expenditure due to a more active foraging strategy. (DEQ, 2014)

Some studies indicate that fish populations are impaired (decreased density, smaller, or lack of sediment intolerant fish) in areas with chronic turbidity; however these studies lack sufficient data that could be useful for setting a water quality standard for turbidity. (DEQ, 2014)

A few studies have linked increased turbidity with other behavioral effects in fish, such as changes in territorial behavior, avoidance of turbid water, and increases in blood sugar levels; however, in some cases, it may be difficult to separate the visual effects from direct effects of suspended sediment. (DEQ, 2014)

Several studies have documented the use of turbid waters by juvenile fish as cover from prey. Some of these studies also have shown that streamside vegetation appears more important than “cloudiness” as cover. Moreover, models indicate that the use of “cloudy” water is more than offset by the loss of feeding efficiency, unless accompanied by an increase in food availability. (DEQ, 2014)

Increased turbidity is correlated with various metrics of decreased benthic macroinvertebrate abundance and diversity, as well as populations of zooplankton. There are two ways in which

turbidity may affect such populations: 1) turbidity may reduce food availability for primary consumers by limiting primary production and 2) increased turbidity and suspended sediment may increase drift of macroinvertebrates due to clogging of benthic habitat. Studies in Oregon indicate that macroinvertebrate abundance and diversity are affected at turbidities of approximately 4-8 NTU as compared to reference conditions (1-2 NTU). Studies at the lower end of this range focus on abundance and diversity of Ephemeroptera, Plecoptera, and trichoptera (EPT) species. However, DEQ data indicate that there is fairly weak correlation between the presence and abundance of these species and indices of biological integrity for fish. As a result, there is some uncertainty in this range (4-8 NTU) as far as the extent to which they affect aquatic life. (DEQ, 2014)

Table 10 Ambient Site Turbidity Summary Information

Site Description	Number of Samples	Average NTU	Maximum NTU	Minimum NTU
Winchuck River 1.3 miles U/S Hwy 101	161	8	250	<1
Chetco River @ USGS Gage	172	11	210	<1
Elk River @ Hwy 101	132	12	210	<1
Sixes River @ Hwy 101	156	21	510	<1
Pistol River @ Pistol Loop Road	162	24	860	<1
Floras Creek @ Hwy 101	147	26	1000	<1
North Fork Coquille River	140	11	56	1
South Fork Coquille River @ Broadbent	154	11	177	<1
Middle Fork Coquille River	148	14	189	<1
Coquille River @ Sturdivant Park	178	17	184	2
Millicoma River @ Rooke Higgins BR	93	6	22	1
South Coos River @ Anson Rogers Br.	97	7	36	1

Aquatic Life - Dissolved Oxygen, pH, and Nutrients

CONCERN: Inadequate Dissolved Oxygen to Support Fish and Aquatic Life

Adequate concentrations of dissolved oxygen (DO) are important for supporting fish, invertebrates, and other aquatic life. Some aquatic species, such as the salmonids, are very sensitive to reduced concentrations of dissolved oxygen. The level of dissolved oxygen needed to support the life stages of aquatic organisms varies and can be generally be associated with specific seasons. For example, the early life stages of salmonids, typically occurring during late fall to early spring; require higher oxygen levels than other life stages. Other fish and invertebrates have similarly variable needs depending on life stages (DEQ, 1995b).

Adequate intergravel dissolved oxygen levels are needed for developing embryos in salmonid redds, where they lay their eggs. The intergravel dissolved oxygen can vary based upon several factors including surface water dissolved oxygen concentrations, the percentage of fine sediment in gravels, sediment oxygen demand, and the oxygen demand of the eggs. Less oxygen is needed at higher stream velocities. Direct measurement of intergravel dissolved oxygen levels is challenging but is the best measure of the potential impacts on the embryos. For cold-water dependent early fish life stages, reductions in dissolved oxygen may result in mortality or reduced size of emerging juveniles (DEQ, 1995b). ***South Fork Coquille River Intergravel DO data are not presented here but should be added to this assessment as time allows.***

For other life stages of cold-water fish and aquatic life the sub lethal effects of reduced dissolved oxygen can include reduced swim speed and growth, food conversion efficiency, and mortality of sensitive invertebrates may occur. Juvenile salmonids exhibit avoidance behavior, selecting areas of higher oxygen concentration (DEQ, 1995b).

Dissolved oxygen and pH levels can vary throughout the day due to changes in temperature, photosynthesis, and respiration. The minimum dissolved oxygen levels that occur in a daily cycle are important in determining effects to the aquatic community (DEQ, 1995b). Measures designed to reduce nutrient loading will be necessary to reduce diurnal fluctuations caused by instream algal and periphyton community photosynthesis (EPA, 2000).

Improvements in dissolved oxygen conditions should also be realized as a result of implementing Temperature TMDLs. As stream temperatures decrease, the amounts of oxygen that can remain dissolved in water increases and the amount of oxygen consumed by biological processes decreases.

Table 11 – South Fork Coquille River Dissolved Oxygen Criteria (OAR 340-41)

Class	Concentration and Period[1] (All Units are mg/L)				Use/Level of Protection
	30-D	7-D	7-Min	Min	
Salmonid Spawning		11.0[2,3]		9.0[3] 8.0[4]	Principal use of salmonid spawning and incubation of embryos until emergence from the gravels. Low risk of impairment to cold-water aquatic life, other native fish and invertebrates.
Cold Water	8.0[5]		6.5	6.0	Principally cold-water aquatic life. Salmon, trout, cold-water invertebrates, and other native cold-water species exist throughout all or most of the year. Juvenile anadromous salmonids may rear throughout the year. No measurable risk level for these communities.

Note: *Shaded* values present the absolute minimum criteria, unless the Department believes adequate data exists to apply the multiple criteria and associated periods.

[1] 30-D = 30-day mean minimum as defined in OAR 340-41-006. 7-D = 7-day mean minimum as defined in OAR 340-41-006. 7-Min = 7-day minimum mean as defined in OAR 340-41-006. Min = Absolute minimums for surface samples when applying the averaging period, spatial median of IGDO.

[2] When Intergravel DO levels are 8.0 mg/L or greater, DO levels may be as low as 9.0 mg/L, without triggering a violation.

[3] If conditions of barometric pressure, altitude and temperature preclude achievement of the footnoted criteria, then 95 percent saturation applies.

[4] Intergravel DO criterion, spatial median minimum.

[5] If conditions of barometric pressure, altitude, and temperature preclude achievement of 8.0 mg/L, then 90 percent saturation applies.

Dissolved oxygen and pH exceedances have been documented throughout the South Coast Basin with four pH and thirty two dissolved oxygen impairments identified as needing a TMDL in the 2010 Water Quality Assessment. These impairments are seen in both streams and in estuaries and have been identified as an important limiting factor for salmonids in the sub-basins smaller estuaries. Summaries of DO box and whisker and trend plots are provided below. Plots can be seen in Appendix G.

Nutrient samples were collected in conjunction with intensive and ambient monitoring activities. These data will be useful deriving nutrient load reductions that may be required to meet surface water dissolved oxygen criteria. ***These data are not presented here but should be added to this assessment as time allows.***

Table 12 – Ambient Station 1995-2010 Box and Whisker Plots Summarized – DO

LASAR Number	Site Name	Rearing Criteria Non Attainment	Spawning Criteria Non Attainment
12590	Floras Creek @ Hwy 101 So of Langlois	July, August, September	January, March, April, October, November
10533	Sixes River @ Hwy 101 Bridge	Attains	January, March, April, May, November, December
11905	Elk River @ Hwy 101	Attains	November, December
11483	Chetco River @ USGS Gage RM 10	July, September	November
10537	Winchuck Rvr 1.3 Miles U/S of Hwy 101	September	January, April, November, December
11485	Middle Fork Coquille River @ Hwy 42	July, September	November
10393	North Fork Coquille River @ Hwy 42	July, September	Tidal - Not Applicable
11486	South Fork Coquille River @ Broadbent	July, August, September	November
10596	Coquille River @ Sturdivant Park	July, September	Tidal - Not Applicable
13570	Millicoma Rvr @ Rooke Higgins Bt Rmp	July, September	
13574	S Fork Coos River Anson Rogers Bridge	None	
11493	Pistol River @ Pistol River Loop Road	July, August, September	

*Estuarine in summer and fall

Table 13 – Ambient Station 1995-2010 Trend Plots Summarized – Dissolved Oxygen

LASAR Number	Site Name	Significant Trend
12590	Floras Creek @ Highway 101 South of Langlois	Declining
10533	Sixes River @ Hwy 101 Bridge	None
11905	Elk River @ Hwy 101	
11493	Pistol River @ Pistol River Loop Road	
11483	Chetco River @ USGS Gage RM 10	Declining
10537	Winchuck River 1.3 Miles upstream of Hwy 101	
11485	Middle Fork Coquille River @ Hwy 42	None
10393	North Fork Coquille River @ Hwy 42	
11486	South Fork Coquille River @ Broadbent	
10596	Coquille River @ Sturdivant Park	
13570	Millicoma River @ Rooke Higgins Boat Ramp	
13574	South Fork Coos River Anson Rogers Bridge	

Details about the derivation and implications of dissolved oxygen can be seen in the *Data Sources and Interpretive Approaches* section of this document. A single site, Winchuck River upstream of USFS boundary, did not show a dissolved oxygen deficit. The Isthmus Slough at Millington showed the largest dissolved oxygen deficit.

Table 14 – TMDL Three Day Intensive Monitoring Summarized – Dissolved Oxygen Deficit

LASAR Number	Site Name	Average DO Deficit (mg/L)
29542	Floras River at White Elephant Bridge	-0.68
35082	Floras Creek at Floras Creek Road*	-0.89
12590	Floras Creek @ Highway 101 South of Langlois	-1.62
34295	Sixes River U/S Beaver Ck	-0.82
32819	Sixes River @ Hwy 101	-0.95
NA	Sixes River U/S Orchard Hole	-0.80
29550	Sixes River U/S Hughes House (Marine Influence)	-0.98
28912	Sixes River Estuary (Marine Influence)	-0.94
23753	Hunter Creek at Mateer Bridge	-1.9
23753	Hunter Creek at Mateer Bridge	-1.7
32021	Hunter Creek at RV Park	-1.6
25444	Hunter Creek at 101 Bridge	-0.2
10535	Pistol River upstream of Hwy 101 (Marine Influence)	-0.46
10535	Pistol River upstream of Hwy 101	-0.09
32023	Pistol River upstream of Ismert Creek	-2.32
32023	Pistol River upstream of Ismert Creek (double deploy)	-0.78
11493	Pistol River at Pistol River Loop Road (Tidal Backwater, Some Marine Influence)	-1.50
36228	Winchuck River near Hwy. 101 (Marine Influence)	-1.81
10537	Winchuck River 1.3 miles u/s of Hwy. 101	-0.64
32024	Winchuck River u/s of USFS Boundary	0
34882	SF Coos River d/s Daniels Ck - Estuarine	-1.86
33077	SF Coos River Near RM 10 - Estuarine w/ Periods of Freshwater	-2.15
33076	SF Coos River Near RM 13 - Freshwater	-0.98
13216	WF Millicoma River u/s of Fish Hatchery	-1.10
36053	WF Millicoma River at RM. 6.6	-1.16
13569	WF Millicoma River at Allegany (Tidal Backwater)	-2.08
13570	Millicoma River @ Rooke-Higgins Boat Ramp (Marine Influence)	-1.98
33075	Lower Isthmus Slough	-2.26
13540	Upper Isthmus Slough	-2.46
13386	Isthmus Slough @ Marker # 43 (Summer)	-1.22
13386	Isthmus Slough @ Marker # 43 (Fall)	-1.16
13388	Isthmus Slough @ Eastside Bridge (Summer)	-1.59
13388	Isthmus Slough @ Eastside Bridge (Fall)	-1.25
33075	Isthmus Slough U/S Transmission Lines (Summer)	-1.66
33075	Isthmus Slough U/S Transmission Lines (Fall)	-1.39
13540	Isthmus Slough @ Millington (Summer)	-3.29
13540	Isthmus Slough @ Millington (Fall)	-1.81

Table 14 – TMDL Three Day Intensive Monitoring Summarized – Dissolved Oxygen Deficit		
LASAR Number	**Site Name**	**Average DO Deficit (mg/L)**
20394	SF Coquille River 50' US of WWTP Outfall	0.8
34447	SF Coquille River 1 Mile DS of WWTP Outfall	0.3*
36253	SF Coquille River US Hayes Bar Boat Launch	0.8
25760	SF Coquille River @ Myrtle Grove State Park	1.1

*Photosynthetic processes downstream of the Power WWTP outfall likely reduce the DO deficit at this site (DEQ, 2001b).

Summaries of pH box and whisker and trend plots are provided below. Plots can be seen in Appendix G.

Table 15 – Ambient Station 1995-2010 Box and Whisker Plots Summarized – pH Criteria		
LASAR Number	**Site Name**	**Attainment/Period of Non Attainment**
12590	Floras Creek @ Highway 101 South of Langlois	Attains
10533	Sixes River @ Hwy 101 Bridge	
11905	Elk River @ Hwy 101	
11493	Pistol River @ Pistol River Loop Road	July, August
11483	Chetco River @ USGS Gage RM 10	Attains
10537	Winchuck River 1.3 Miles upstream of Hwy 101	
11485	Middle Fork Coquille River @ Hwy 42	
10393	North Fork Coquille River @ Hwy 42	
11486	South Fork Coquille River @ Broadbent	
10596	Coquille River @ Sturdivant Park	
13570	Millicoma River @ Rooke Higgins Boat Ramp	
13574	South Fork Coos River Anson Rogers Bridge	

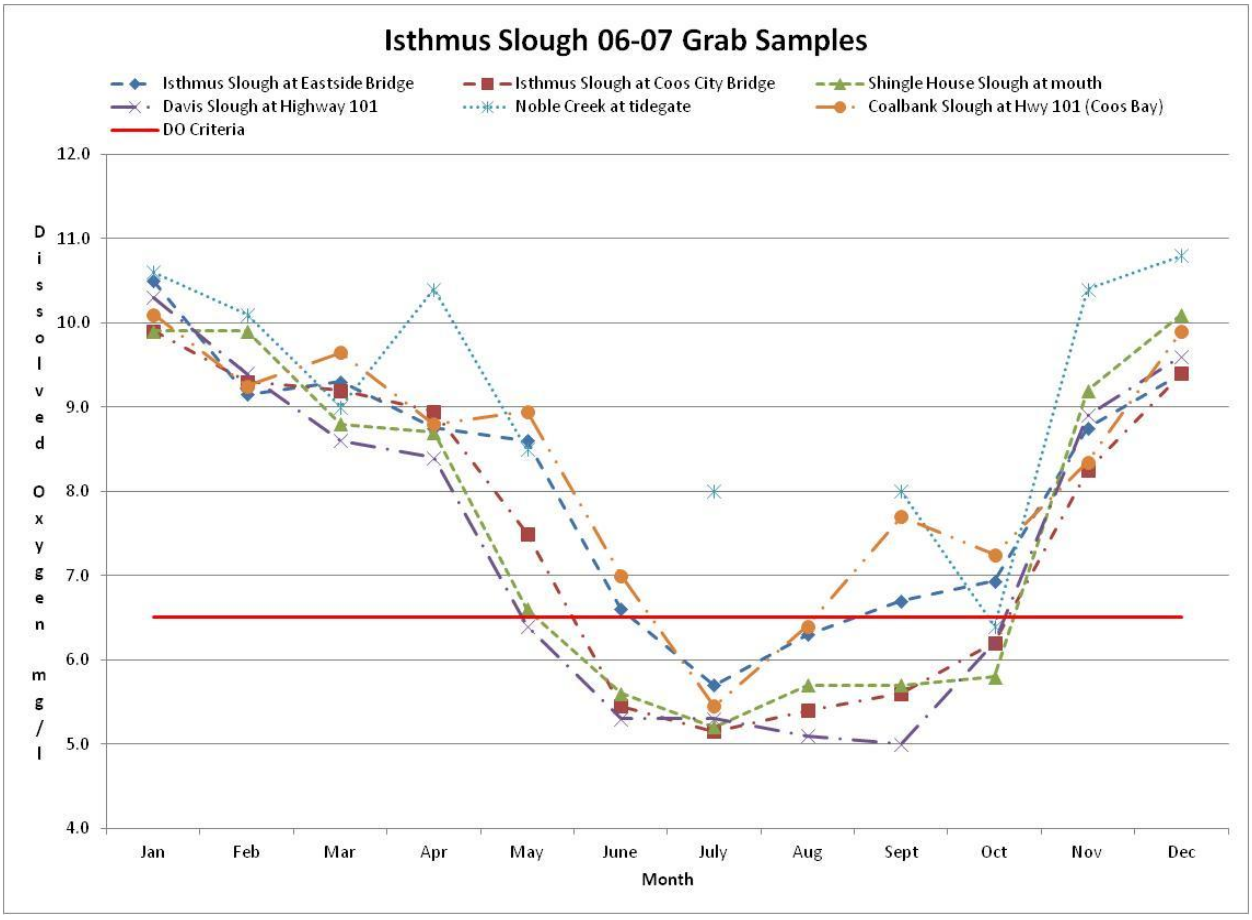
Table 16 – Ambient Station 1995-2010 Trend Plots Summarized – pH		
LASAR Number	**Site Name**	**Significant Trend**
12590	Floras Creek @ Highway 101 South of Langlois	None
10533	Sixes River @ Hwy 101 Bridge	
11905	Elk River @ Hwy 101	
11493	Pistol River @ Pistol River Loop Road	
11483	Chetco River @ USGS Gage RM 10	
10537	Winchuck River 1.3 Miles upstream of Hwy 101	Declining
11485	Middle Fork Coquille River @ Hwy 42	None
10393	North Fork Coquille River @ Hwy 42	
11486	South Fork Coquille River @ Broadbent	
10596	Coquille River @ Sturdivant Park	
13570	Millicoma River @ Rooke Higgins Boat Ramp	
13574	South Fork Coos River Anson Rogers Bridge	

Isthmus Slough Surface Water Quality Sampling

In 2006 and 2007 an intensive water quality study was conducted in Isthmus Slough and its tributaries in preparation for developing a TMDL for dissolved oxygen. This effort has provided a dataset unique to Isthmus Slough which is discussed here. Six Isthmus Slough sites were sampled at the following frequencies in 2006 through 2007.

Table 17 – 2006–2007 Isthmus Slough Water Quality Sampling Sites		
LASAR #	**Site Name**	**Frequency**
13388	Isthmus Slough @ Eastside Bridge	2 X/Month
13389	Isthmus Slough @ Coos City Br.	
11884	Coalbank Slough @ mouth (Hwy 101)	
13583	Shinglehouse Slough @ Mouth	1 X/Month
25997	Davis Slough @ Mouth	
28998	Noble Slough @ Tidegate	

Figure 14 – Isthmus Slough Dissolved Oxygen Grab Samples 2006 – 2007



Field Measured dissolved oxygen values declined below the estuarine dissolved oxygen criteria (6.5 mg/l) in the summer months at all sites. As solar loading increases water temperatures, decomposition rates, and oxygen demand also increase. Regressions analyses of the data

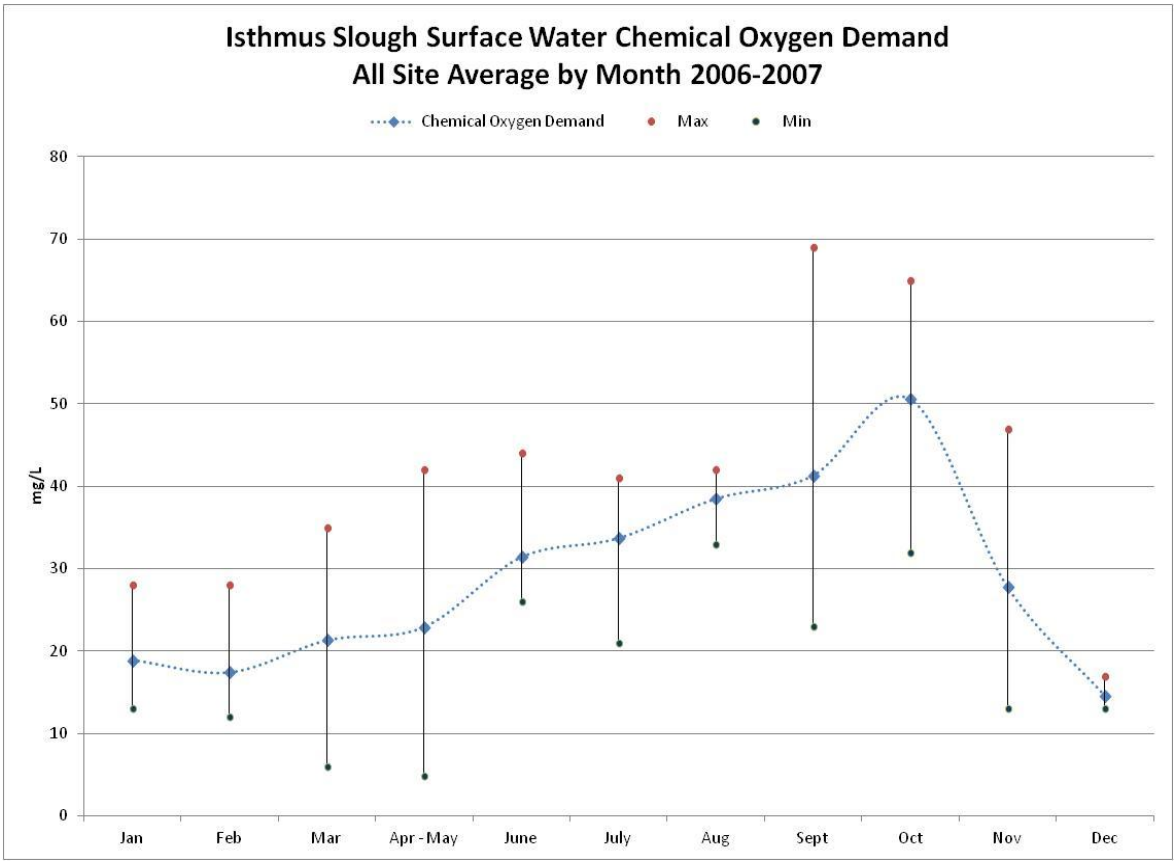
indicate that temperature, chemical oxygen demand, dissolved orthophosphate as P, total phosphorus, and total kjeldahl nitrogen correlate closely with dissolved oxygen.

Chemical Oxygen Demand (COD)

Natural organic wastes and detritus act as a food source for water-borne bacteria. Bacteria consume DO to decompose organic materials, thus reducing the amount of DO present for fish. Biochemical oxygen demand (BOD) measures the oxygen required for these bacteria to bio-degrade organic material and certain inorganic materials over a given time period. The amount of oxygen required to chemically degrade both minerals and organic matter is termed chemical oxygen demand (COD). Both terms are applied to the level of reducing material present from a combination of natural and anthropogenic sources. COD is greater than BOD for any given sample and there are no established benchmarks or criterion. The higher the COD, the higher the amount of pollution is. Typically COD is less than 20 mg/l in unpolluted waters (UNESCO/WHO/UNEP, 1992, 1996).

Isthmus Slough has the highest surface water COD in the South Coast Basin with COD values peaking in late September through October. This is likely due to elevated organic loading of carbonaceous material into the slough.

Figure 15 – Isthmus Slough Chemical Oxygen Demand



Human Health Related Data

Ecotourism is an important part of the area economy. Fishing, crabbing, boating, and harvesting of clams are popular activities in the Coos Bay and Coquille estuaries. Ecotourism brought nearly 7 million dollars to the Coos County economy in 2010. Maintaining water quality sufficient to support these activities is important to the local economy.

Bacteria, toxics (e.g., metals, pesticides), sediment (in the form of turbidity) and nitrates are pollutants that can directly affect people's health. In the South Coast there are three principle ways in which people can be exposed to these pollutants: via recreational contact such as swimming, boating, and fishing, the consumption of fish, oysters, clams and crabs, and through surface and ground water drinking water sources.

Coos Bay supports commercial oyster cultivation and harvest as well as the commercial sub-tidal harvest of clams. Recreational clamming occurs in many of the basin's estuaries and in a few areas along the ocean's shore. Commercial shellfish harvesting in Coos Bay is periodically closed during periods of high rainfall due to elevated bacterial runoff and when partially treated or untreated sewage enters Coos Bay. Recreational clam harvesters are advised only in the case of partially treated or untreated sewage discharges,

Water contact advisories have also been issued at several ocean beaches due to episodic bacterial contamination. Sample results indicate that bacterial recreational contact standards are exceed in many streams and bays but there is currently no entity managing advisories for these waterbodies. Sources of bacterial contamination can include livestock, failing on-site septic systems, urban runoff and wildlife.

Elevated turbidities in public drinking water occasionally result in the issuance of health advisories. Elevated nitrate concentrations in groundwater are a potential concern in areas serving as public drinking water sources. Toxics have been identified as a potential concern in the basin and could affect the surface water supplies as well as fish and aquatic life but little data is available to assess the risk.

Tenmile and Sru Lakes have episodic hazardous algal blooms requiring health advisories. These algae are capable of utilizing atmospheric nitrogen and as such are not limited by nitrogen availability in surface water. Controlling phosphorus loading through reducing sedimentation and the implementation of lakefront management activities is often required to begin to control hazardous algal blooms. Introduced fish have also been show to preferentially graze zooplankton which can result in algal community dominance shifts and stocked fish mortality and benthic grazing habits also contribute to nutrient loading in lakes. This makes fishery management an important consideration in both Sru and Tenmile lakes.

Human Health – Recreational Contact Bacteria

CONCERN – Recreation Contact: *E. coli,* and Other Pathogens

Water contact recreation and public and private drinking water supply are beneficial uses sensitive to pathogenic organisms, including bacteria. In Oregon, *Escherichia coli (E. coli)*, Fecal coliform and Enterococcus bacteria are used as indicator organisms for assessing the potential for the presence of pathogens and impairments in fresh, estuarine, and marine waters respectively.

There were forty two bacteria impairment listings for water contact recreation on the 2010 303(d) list in the Coos and Coquille sub-basins. Bacterial listings are broken down into two seasons; summer and fall winter spring. Because of this some streams may have more than one bacteria listing. A review of ambient bacterial data for the Sixes and Chetco sub-basins finds that these sub-basins are generally meeting bacteria water quality standards.

Summaries of E. coli box and whisker and trend plots are provided below. Plots can be seen in Appendix G.

Table 18 – Ambient Station 1995-2010 Box and Whisker Plots Summarized – E. Coli Bacteria

LASAR Number	Site Name	Recreational Contact Criteria Non Attainment
12590	Floras Creek @ Highway 101 South of Langlois	December
10533	Sixes River @ Hwy 101 Bridge	None
11905	Elk River @ Hwy 101	December
11493	Pistol River @ Pistol River Loop Road	None ***Note: Does not attain shellfish growing waters criteria***
11483	Chetco River @ USGS Gage RM 10	None
10537	Winchuck River 1.3 Miles upstream of Hwy 101	December
11485	Middle Fork Coquille River @ Hwy 42	April, November
10393	North Fork Coquille River @ Hwy 42*	February, November, December
11486	South Fork Coquille River @ Broadbent	February
10596	Coquille River @ Sturdivant Park	January, February, March, April, November, December
13570	Millicoma River @ Rooke Higgins Boat Ramp	None
13574	South Fork Coos River Anson Rogers Bridge	None

*The North Fork Coquille does not support shellfish growing based upon extended periods of fresh water conditions. A beneficial use adjustment is needed.

Table 19 – Ambient Station 1995-2010 Trend Plots Summarized – Bacteria

LASAR Number	Site Name	Significant Trend
12590	Floras Creek @ Highway 101 South of Langlois	None
10533	Sixes River @ Hwy 101 Bridge	
11905	Elk River @ Hwy 101	
11493	Pistol River @ Pistol River Loop Road	
11483	Chetco River @ USGS Gage RM 10	Increasing
10537	Winchuck River 1.3 Miles upstream of Hwy 101	
11485	Middle Fork Coquille River @ Hwy 42	Declining
10393	North Fork Coquille River @ Hwy 42	None
11486	South Fork Coquille River @ Broadbent	
10596	Coquille River @ Sturdivant Park	Declining
13570	Millicoma River @ Rooke Higgins Boat Ramp	
13574	South Fork Coos River Anson Rogers Bridge	None

Bacterial data was evaluated and log mean, single sample maximums and percent reductions needed to meet the recreational contact bacterial standard were summarized. The recreational contact log mean criteria states that a log mean of 126 colonies/100mL with a minimum of five samples is acceptable and the maximum criteria is no single sample over 406 colonies/100mL. The % reduction shows the reduction in bacterial levels needed to meet both recreation contact standard criteria. The number of samples is shown as N.

In order to meet the shellfish growing standard bacterial levels may need to be reduced beyond that required to meet recreational contact criteria. For additional information please reference the fish and shellfish consumption section of this document.

Table 20 – Coquille River Recreational Contact Bacterial Summary

River Mile	Station Description	log mean *E. coli* /N	Maximum *E. coli*	% Reduction log mean/max
Trib. @ RM 23.2	Cunningham Creek at County Park Confluence with Coquille River	583/21	6131	78/93
Trib. @ RM 0.7	Calloway Ck, Cunningham Ck trib.	295/20	2420	57/83
0.9	Cunningham Creek upstream of Coquille HS and Fish Hatchery	37/249	2420	0/83
4.2	Cunningham Crk @ Hungry Hollow Br	211/24	2419	40/83
0.3	North Fork Coquille River at Hwy 42	59/121	1553	0/74
4	NF Coquille River at Cooper Bridge	102/28	1467	0/72
10.3	NF Coquille River at Bennett Park	61/24	436	0/7
21.7	NF Coq Rvr @ Rock Prairie County Pk	62/24	461	0/12
30.5	NF Coquille River Below Laverne Park	30/14	98	0/0
32	NF Coquille River U/S of Lavern Pk	29/9	457	0/11
Trib. @ RM 33.4	Moon Crk at conf with NF Coquille Rvr	17/23	579	0/30
35.7	NF Coquille River @ County Bridge #2	17/22	109	0/0
1	SF Coq Rvr @ Myrtle Point Bt Rmp*	82/28	980	0/59
Trib. @ RM 2	Catching Creek at Bridge 34	356/26	4884	64/92
4.8	South Fork Coquille River	77/11	1414	65/71
10	SF Coquille River at Broadbent	28/130	1274	0/68
16.5	SF Coquille Rvr at Albert Powers St Pk	36/24	1733	0/77
19	SF Coquille Rvr at Myrtle Grove St Pk	26/20	238	0/0
25	SF Coquille Rvr D/S of Baker Creek	24/25	1203	0/66
26.7	SF Coq Rvr 1 mi. D/S of Powers STP	50/26	1120	0/64
31.5	S Fk Coquille Rvr at Orchard St Pk	11/25	83	0/0
0.2	MF Coq Rvr @ Hwy 42 (Hoffman SP)	32/32	1273	0/68
7.5	Middle Fork Coquille River	55/24	384	0/0
18	Middle Fork Coquille River	28/25	656	0/38

Table 20 – Coquille River Recreational Contact Bacterial Summary				
River Mile	**Station Description**	**log mean *E. coli* /N**	**Maximum *E. coli***	**% Reduction log mean/max**
26	MF Coquille Rvr @ Bear Ck Rec. Area	34/24	1986	0/80
29.75	Middle Fork Coquille River	155/24	2420	19/83
0.8	Coquille Bay at Bandon Bt Launch-Conc. Pier	14/45	708	0/43
Trib. @ RM 0.9	Ferry Creek at mouth	29/87	1986	0/80
1.7	Ferry Creek D/S of ODFW Hatchery	41/14	248	0/0
3.5	Coq Bay @ Bullards Beach SP Bt Rp	20/97	1273	0/68
6	Coquille Estuary at Rocky Pt Bt Rp	21/74	866	0/53
Trib. @ RM 8	Bear Creek @ RM 0.8 @ Hwy 42S (Coq trib)	145/26	1300	13/69
Trib. @ RM 11.5	Lampa Creek @ RM 0.3 @ Hwy 42S (Coq trib)	162/26	1274	22/68
15	Coquille River at Riverton Boat Ramp	36/29	770	0/47
23.5	Coquille River at Sturdivant Park Dock	48/132	2419	0/83
33	Coquille River at River Mile 33.0	50/26	1120	0/64

Table 21 – Coos Sub-basin Recreational Contact Bacterial Summary				
Site Type	**Sample Description**	**log mean *E. coli* /N**	**Maximum *E. coli***	**%Reduction log mean/max**
Coos Bay Direct Tribs and Sloughs	Catching Slough at mouth	30/11	213	0/0
	Catching Sl at dock D/S of Stock Sl	12/3	20	
	Catching Slough at Lone Tree Bridge	208/19	2489	39/84
	Ross Slough at road (tidegate)	107/2	160	0/0
	Ross Slough at Ross Slough Road	298/20	24196	31/98
	Stock Slough at mouth	253/20	8664	50/95
	Willanch Creek at mouth (tidegate)	122/12	512	0/21
	Willanch Branch near Coos Bay	99/8	3076	0/87
	Willanch Creek at Mile Post #2 (third br)	146/5	211	14/0
	Coalbank Slough at Hwy 101 (Coos Bay)	51/20	238	0/0
	Coalbank Slough at tidegate	134/21	1789	6/77
	Coos Rvr at Allegany Road Br (Eastside)	45/9	98	0/0
	SF Coos River at Anson Rogers Br	15/90	160	
	Millicoma River at Riverside Pub & Lodge	23/3	64	
	Millicoma Rvr at Rooke-Higgins boat ramp	18/87	172	
	Kentuck Creek at mouth (U/S of tidegate)	146/20	2419	14/83
	Mettman Creek at mouth	162/19	1314	22/69

Table 21 – Coos Sub-basin Recreational Contact Bacterial Summary				
Site Type	**Sample Description**	**log mean *E. coli* /N**	**Maximum *E. coli***	**%Reduction log mean/max**
	Larson Creek at mouth	323/16	4611	61/91
	Larson Creek at first bridge U/S of mouth	622/19	9800	80/96
	Larson Ck at second bridge U/S of dairy	19/19	189	0/0
	Sullivan Creek at mouth	87/19	2419	0/83
	Palouse Creek at mouth	75/20	1515	0/73
	Palouse Creek at first bridge U/S of mouth	410/4	1092	69/63
	Palouse Creek at Mile Post 4	175/4	341	28/0
	Palouse Creek at Elliott Keyhole	58/2	108	0/0
	Pony Creek So of North Bend High School	200/21	743	37/45
	Pony Slough at Coca Cola bottling plant	111/21	1670	0/76
	Isthmus Slough at Eastside Bridge	27/15	259	0/0
	Shingle House Slough at mouth	28/19	471	0/14
	Davis Slough at Highway 101	32/19	294	0/0
	Noble Creek at tidegate	98/20	1259	0/68
	Coos Bay at entrance to Haynes Inlet at Marker #1	26/8	328	0/0
	Haynes Inlet at Clausen Dock	10/4	148	
	Hollow Stump Creek upstream of tidegate	5/3	41	
	North Slough at mouth (Causeway Bridge)	34/11	850	0/52
	North Slough U/S of tidegate	146/20	2143	14/81
Coos Bay Estuary	Cooston Channel at south end	19/9	41	0/0
	Coos Bay at mouth of Marshfield Channel	36/10	292	
	Coos Bay at City Dock	26/5	63	
	Coos Bay at Pierce Point Channel	34/10	98	
	Coos Bay at Silver Point 3	29/10	75	
	Coos Bay at Silver Point 4,5,6	21/10	98	
	Coos Bay at Silver Point 7	20/10	85	
	Coos Bay at Silver Point 8,9	34/10	199	
	Coos Bay at Jordan Point	14/14	148	
	Coos Bay at Mkr #23 (Henderson Marsh)	15/15	86	
South Slough	So Sl @ entrance to Charleston Bt Basin	10/3	10	
	Charleston Boat Basin At East End	10/5	29	
	Joe Ney Slough at Crown Point Bridge	22/8	52	
	South Slough 50 yds w of Joe Ney Slough	197/3	146	
	So Sl at Buoy #10 – Charleston Triangle	15/3	41	
	South Slough at Hallmark Fisheries	15/3	41	

Table 21 – Coos Sub-basin Recreational Contact Bacterial Summary				
Site Type	**Sample Description**	**log mean *E. coli* /N**	**Maximum *E. coli***	**%Reduction log mean/max**
	South Sl at Hanson's Landing (new dock)	21/9	86	
	South Sl at head of Sengstacken Slough	23/3	41	
	South Slough at head of Wincher Slough	24/8	135	
	South Slough at w side Of Vallino Island	27/3	75	
	Days Creek upstream of tidegate	87/13	1785	0/77
	South Slough in Browns Cove	14/3	31	0/0
	Winchester Ck at Winchester Creek Bridge	114/13	816	0/50
Point sources	Pacific Choice effluent, Coos	524/7	2359	76/83
	Hallmark Seafood, Coos	797/11	48384	84/99

Waste water treatment plants (WWTP) in the Coquille Sub-basin suffer from inflow and infiltration as well as treatment plant inadequacies which result in the bypass of partially treated effluent during storm events. These facilities are in the process of upgrading infrastructure to alleviate these problems. These small cities discharge relatively small volumes when compared to flows in receiving waterbodies and bacterial loads in these areas are comprised of WWTP effluent, natural background, and non point sources. Analyses indicate that even without contributions from WWTPs significant bacterial reductions are needed from non point sources to support safe recreational contact.

The Sixes and Chetco sub-basins do not have municipal WWTPs that discharge to streams. Bacteria loading in water bodies where no point sources are present are comprised exclusively of wildlife and nonpoint sources. Streams in these sub-basins are generally meeting bacteria standards.

DEQ plans to continue working with key partners to reduce both point source and nonpoint source bacteria loading through the implementation of best management practices (BMPs), monitoring, and education and outreach. Nonpoint source implementation projects include improved management of livestock wastes, the correction of cross connections between sanitary sewers and stormwater sewers, management of on-site waste water treatment systems, installation of stormwater control facilities, and the development of education programs focusing on pet owners and streamside landowners.

DEQ recently developed rules to implement actions to address existing onsite system maintenance. These rules will promote the inspection of onsite systems at time of property transfer by trained/certified inspectors. DEQs ability to address existing onsite system maintenance issues should improve through time as we implement these new rules. The success of this approach depends heavily on the real estate community and on the prospective purchaser's level of interest is in assuring the on-site system is functional. Because the new rules only apply at the time of property transfer continued outreach, education, and financial incentives for homeowners operating onsite systems is critical.

Bacterial intensive sampling studies implemented during storm events provide additional insight into the amount of rainfall needed to trigger bacterial loading, longitudinal stream loading, and

the period of time needed for bacterial levels to decline. ***This data is not presented here but should be added to this assessment as time allows.***

CONCERN: Beaches Enterococcus and Other Pathogens

Oregon Beach Monitoring Program

The Beaches Environmental Assessment and Coastal Health (BEACH) Act directs the U.S. Environmental Protection Agency to fund beach monitoring for bacteria. The Oregon Beach Monitoring Program (OBMP) is a partnership between the DEQ and the Oregon Health Authority (OHA) to monitor marine waters along Oregon's coastline for *Enterococcus,* an indicator of fecal contamination. High levels of *Enterococcus* bacteria are associated with the presence of other infectious microbes. Sources of *Enterococcus* are the same as other fecal bacteria (storm water runoff, animal and seabird waste, failing septic systems, sewage treatment plant spills, and boating waste).

The OBMP considers the south coast portion of the sampling locations to range from the Umpqua River at Winchester Bay to the California border at Crissey Field State Park. Most of the sampled beaches are state parks, county parks, or public waysides. OBMP samples these beaches twice a month during the summer season.

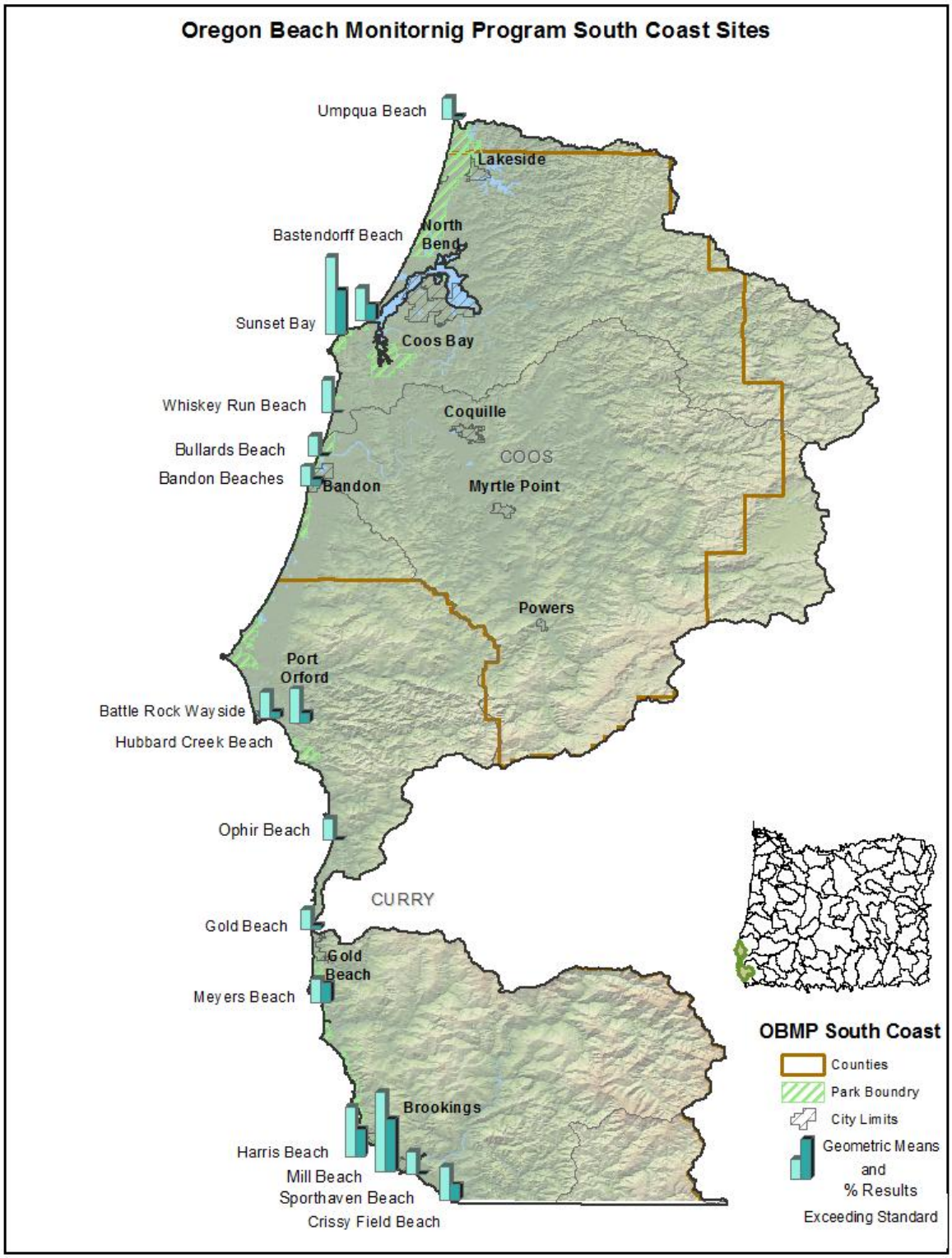
The OBMP collected 268 samples at about 40 locations at 10 beaches on the south coast of Oregon in 2011. Just over 1% (3) of those sample results exceeded the recreational contact water quality standard. The average south coast sample result during the 2011 season was 26 cfu/100mL and the geometric mean was just over 10 cfu/100ml. Altogether from August of 2002 to September of 2011, OBMP collected 3980 samples at fifty locations on sixteen Oregon south coast beaches. Of those results, 4.4% exceeded the recreational water quality standard. Some samples are collected upstream of ocean mixing zone sample sites from fresh or brackish water flowing across the beach. These fresher water samples are not considered when issuing water contact advisories by the OHA but can help to identify sources of bacteria to the ocean. About 8% of all (marine and fresher) south coast sample results exceeded the recreational contact water quality standard. During the summer of the 2011 season advisories were issued for issued for Sunset Bay and Harris Beach State Park. Many park managers now leave cautionary signs posted during the entire rainy period when no bacterial sampling is being conducted.

Oregon Beach Monitoring Program Sampling Site Selection (OHA, 2010)
Beach selection is based on public use information, public input, potential pollution sources, and previous monitoring data (EPA, 2002). Sampling locations are re-evaluated every other year. Resources limit the program to sampling 15-20 recreational beaches per season. The program attempts to balance the sampling resources across the north, middle, and south Oregon coast. The program utilizes bacteria test results and beach use data to ensure resources are being applied to priority public health beaches. In instances where data is not collected the program assesses GIS, permit and land use data, public and agency comments, and complaint history to determine if a beach should be added. This process has resulted in the addition of 33 more beaches to the 59 beaches that were originally on OBMP's list of interest. (DEQ, 2006)

Table 22 – Oregon Beach Monitoring Program South Coast 2011 Beach List				
Beach Description	**Total Number of Samples**	**Overall Geometric Mean**	**Percent Exceeding Standard**	**Swimmers Per Sample**
BASTENDORFF BEACH - COOS BAY	**908**	**10**	**4.96**	**1.03**
Bastendorff Beach at the Jetty	195	7	1.54	
Bastendorff Beach 400m south of jetty	187	6.54	1.07	
Bastendorff Beach at Minor Creek	195	10.86	4.10	
Bastendorff Beach 250m S of Minor Cr	164	6.55	0	
Miner Creek 200m Upstream	167	33.60	19.16	
SUNSET BAY SP BEACH - COOS BAY	**1067**	**23.45**	**13.21**	**1.62**
Sunset Bay at North Beach Access	198	13.17	6.57	
Sunset Bay at Restroom	201	14.77	5.47	
Sunset Bay at the mouth of Big Creek	351	27.08	14.53	
Big Creek at Sunset Bay Bridge	317	38.39	20.82	
BANDON BEACHES - BANDON	**96**	**6.05**	**2.08**	**1.68**
Bandon South Jetty	40	6.03	2.50	
Bandon Wayside Beach-Face Rock	56	6.07	1.79	
BATTLE ROCK BEACH - PORT ORFORD	**96**	**8.25**	**2.08**	**1.16**
Battle Rock Wayside	96	8.25	2.08	
HUBBARD CREEK BEACH - PORT ORFORD	**417**	**10.54**	**3.12**	**0.23**
Hubbard Beach 50m N of Hubbard Cr	97	8	2.06	
Hubbard Cr between Hwy 101 and Beach	100	13.89	5	
Hubbard Cr Beach at Hubbard Cr	123	13.06	4.88	
Hubbard Cr Beach S of Hubbard Cr	97	7.94	0	
GOLD BEACH	**78**	**6.33**	**1.28**	**0.55**
Rogue River 900m Upstream	10	6.16	0	
Gold Beach at the South Jetty	58	6.39	1.72	
Gold Beach 250m S of S Jetty at Memorial	10	6.16	0	
HARRIS BEACH STATE PARK - BROOKINGS	**571**	**15.47**	**8.58**	**1.91**
Harris Beach State Park at Harris Creek	134	32.10	22.39	
Harris Cr Upstream	84	50.32	13.10	
Harris Beach SP west of parking lot	103	9.10	1.94	
Harris Beach SP East of Goat Island	85	6.61	1.18	
Harris Beach SP at South Beach Trail	46	7.20	2.17	
Harris Beach in Mid CR	8	53.78	0	
Harris Beach SP at Eiler Creek	78	7.78	2.56	
Harris Beach in S Cr	8	89.32	25	
Harris Beach SP at S Cr	25	12.53	0	

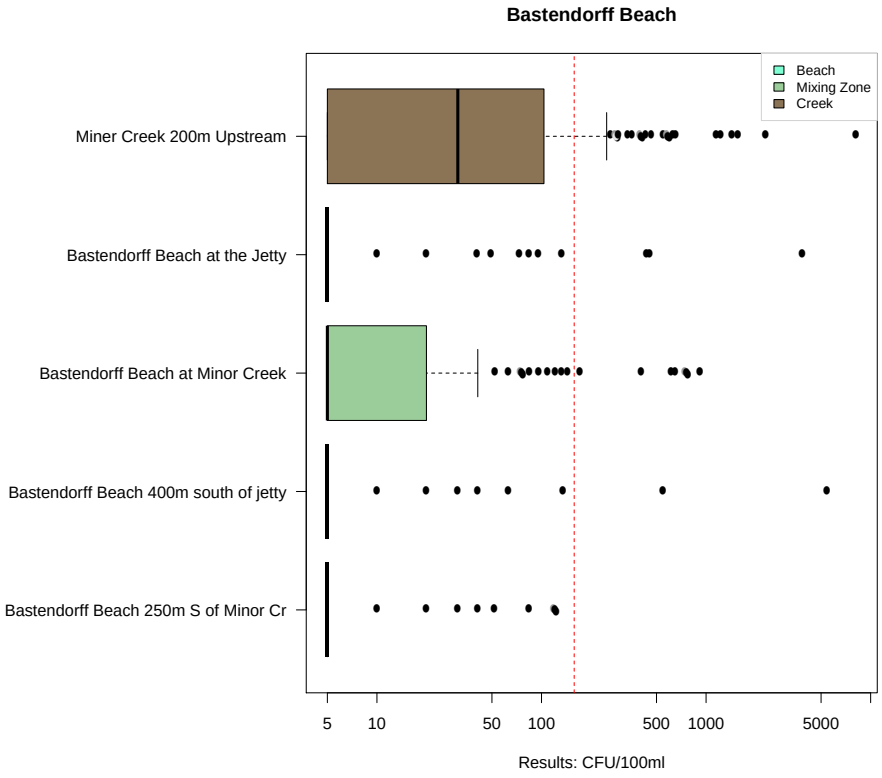
Table 22 – Oregon Beach Monitoring Program South Coast 2011 Beach List				
Beach Description	**Total Number of Samples**	**Overall Geometric Mean**	**Percent Exceeding Standard**	**Swimmers Per Sample**
SPORTHAVEN BEACH - BROOKINGS	**99**	**6.84**	**0**	**2**
Sporthaven Beach at the Restroom	32	6.16	0	
Sporthaven Beach Middle Site	33	7.60	0	
Sporthaven Beach at Beachside Hotel	34	6.83	0	
CRISSEY FIELD SP BEACH - BROOKINGS	**65**	**10.12**	**4.62**	**1.06**
Crissey Field SP Beach 50m N of the Winchuck River	12	6.44	0	
Crissey Field SP Beach 450m Upstream Winchuck R	18	31.38	16.67	
Crissey Field SP Beach 50m S of the Winchuck River	15	5.74	0	
Crissey Field SP Beach at Winchuck River	20	7.33	0	

Figure 16 – Oregon Beach Monitoring Program South Coast Sites



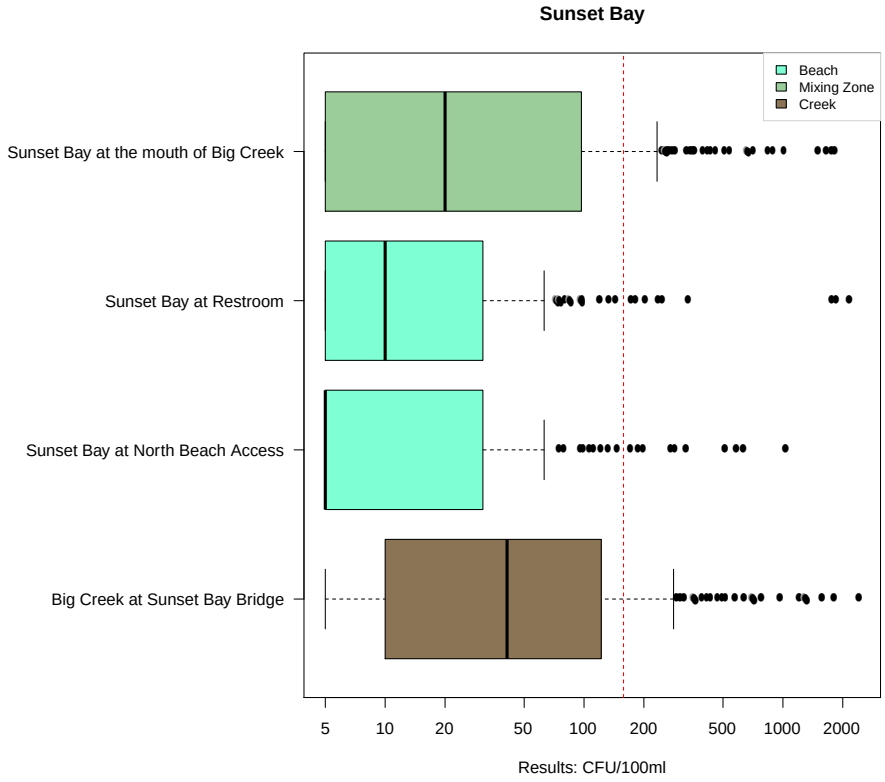
Bastendorff Beach - OBMP has been collecting samples at Bastendorff Beach County Park since 2002 and almost 5% of sample results exceeded the recreational water quality standard. That percent of high results is close to the overall exceedance rate for the beaches the program samples. Minor Creek exceeded the water contact standard a little more than 19% of the time while 4% of sample results were over the standard at the mixing zone at the mouth of Minor Creek and less than 2% of results from the rest of the Bastendorff sites were over the standard. There is a campground south of Minor Creek and visitors walk the beach from Oceanside RV Park to the south jetty. There are often people walking dogs on the beach and Bastendorff is a popular surfing spot. Surfers and paddle boarders use the area south of Minor Creek and the break off of the south jetty depending of conditions. Shore birds gather at the mouth of Minor Creek, sometimes hundreds of them. Minor Creek will sometimes pool up behind a sand drift and cause a large bathing area for gulls, pelicans, oyster catchers, plovers, and smaller shorebirds. Occasionally sea lions will rest on the beach near Minor Creek. Rarely, a dead sea lion is observed near Minor Creek.

Figure 17 – Bastendorff Beach Sample Results Boxplot



Sunset Bay - Big Creek flows in to Sunset Bay at the southern end and samples are taken at the creek ocean mixing zone and a few hundred meters upstream at the footbridge. Over nine sampling seasons, about 21% of samples from the footbridge over Big Creek exceeded the standard while 15% exceeded the standard at the mixing zone at the mouth of Big Creek. Samples from collected the middle site (north of the Big Creek ocean mixing zone) and the north site exceeded the standard about 6% and 7% of the time respectively. Localized runoff from a forested area, parking areas, private residential lots, and two small drainages may be bacterial sources to the north side of the bay. The north drainage flows during most of the fall, winter, and spring rainy months while the middle drainage only contains water immediately after substantial rainfall events.

Figure 18 – Sunset Bay Sample Results Boxplot

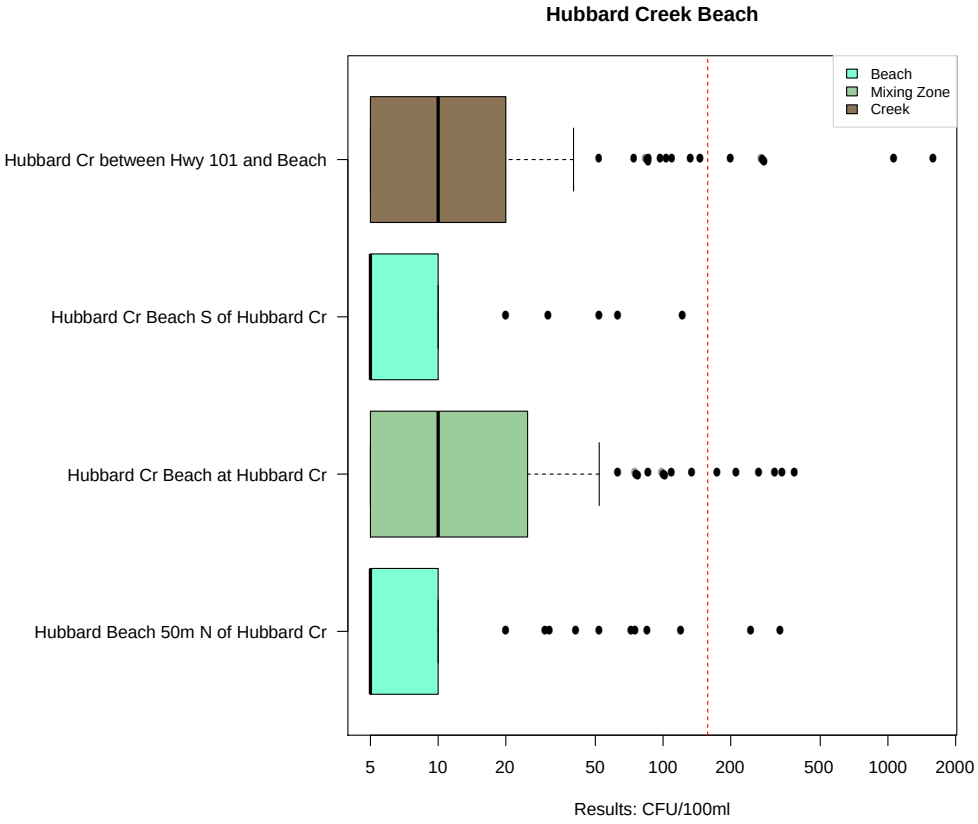


Bandon Area - Bandon Face-Rock Wayside Beach and the Bandon south jetty beach sampling has occurred since 2003. The Bandon south jetty site is influence by bacterial loading from the Coquille River. There is only localized runoff during heavier rain events at the Bandon Face-Rock Wayside Beach. A single 2008 water contact advisory was issued for these Bandon Beaches. These beaches have not exceeded the recreational water quality standard since, or before 2008.

Port Orford Area – Battle Rock State Wayside and the beach at Hubbard Creek have been sampled since 2003. Parking area and other localized runoff may affect sample results at the Battle Rock Wayside. Samples are collected at the ocean mixing zone of that runoff. Sample results were just over the water contact standard in June 2008 and a few times over the standard in August 2010 although the results are most often below the test detection limit.

Hubbard Creek flows on to the beach about 1km south of Battle Rock wayside and about 5km north of Humbug Mountain State Park. Hubbard Creek Beach is a popular surfing area and occasionally people drive vehicles on the beach between the wayside and Humbug Mountain and others are observed fishing in the ocean or in Hubbard Creek. Surfers are most often observed just north of the creek. Since 2003 the program has collected more than 400 samples at Hubbard Creek Beach and just over 3% of those samples exceeded the water contact standard. Samples collected at the creek ocean mixing zone and from Hubbard Creek between the ocean and Oregon Coast Highway exceeded the standard almost 5% of the time. The non-mixing zone ocean samples exceeded the standard 2% of the time at the north location and the south location has never exceeded the recreational water quality standard. Overall six of the exceedances were in the mixing zone, four were in the creek, and two were at the north marine water site.

Figure 19 – Hubbard Creek Beach Sample Results Boxplot



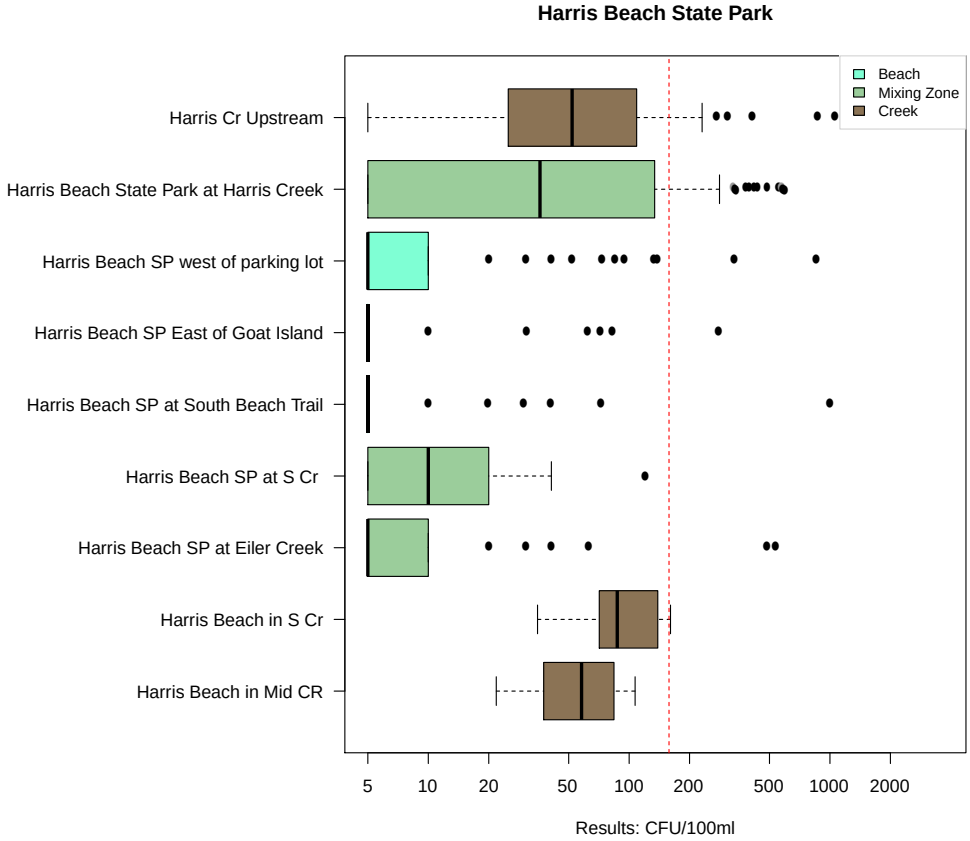
Gold Beach - Nearly seventy eight samples have been collected at Gold Beach near the mouth of the Rogue River and more than forth at Hunter Creek Wayside about 4km south of the Rogue River since 2003. A June 30, 2008 sample result from the south side of the south jetty exceeded the recreational water quality standard. Most of the beach use near the jetty is fishing, either from the shore or from boats in the river. There are usually seals and sea lions north of the parking area upriver from the beach. The Rogue River is mixed use upstream from the collection sites.

Hunter Creek Beach samples were collected at the mouth of Hunter Creek a few hundred meters west of the bridge at the Oregon Coast Highway. There is a rocky hill at the wayside and Hunter Creek sometimes moves south and forms a pool near the base of that hill. The pool can be covered with an algae bloom during the warm months. People have been observed swimming in the pool when there is less algae in the water.

Harris Beach - A water contact advisory was issued for Harris Beach State Park on September 1, 2011 based upon samples collected just south of the ocean Harris Creek mixing zone. Samples collected from the ocean mixing zone at the mouth of Harris Creek and upstream in Harris Creek are more likely to exceed the standard with exceedance rates of 22% and 13%. Less than 2% of the sample results from the ocean south of the Harris Creek mixing zone exceeded the standard during the same period. Samples are also collected at Harris Beach at the mouth of Eiler Creek closer to highway 101. Those sample results exceeded the standard during about 3% of sampling events. Harris Creek is the north drainage and is comprised of industrial forest-land, houses with private water supplies and individual septic systems, and a

lumber mill. Eiler Creek drains the west edge of the Brookings airport, a subdivision, and a portion of Harris Beach State Park.

Figure 20 – Harris Beach State Park Sample Results



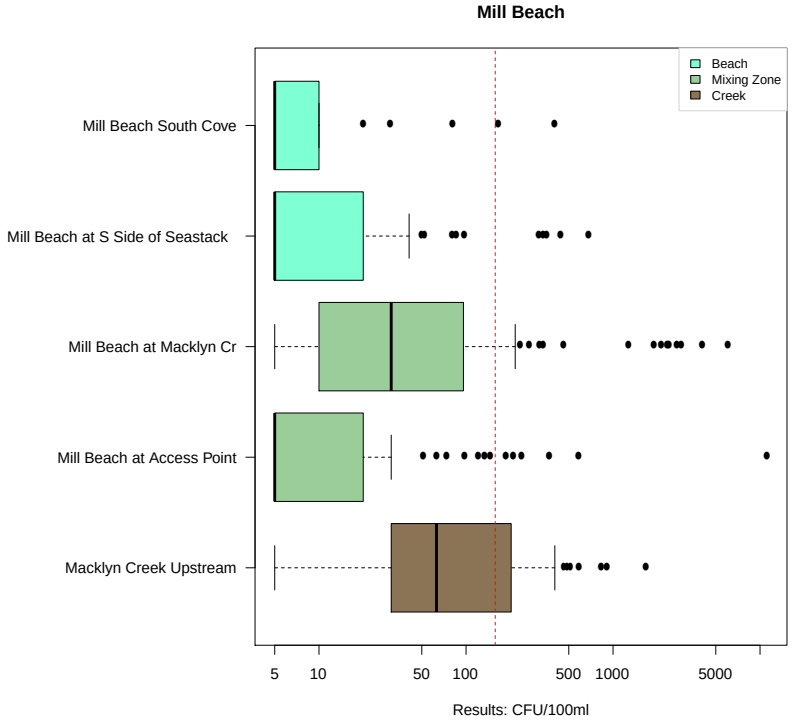
Crissey Field Sate Park - OBMP collected sixty five samples at Crissey Field State Park during the 2010 and 2011 sampling seasons and none of these samples exceeded the bacteria criteria. Winchuck River estuary samples did exceed the bacterial standard in August of 2010 and 2011. During low flow periods the Winchuck River becomes bar bound and forms a pool which drains to the beach in a sub surface manner. When the pool is present samples are collected from the pool. Visitors to the park are often walking along the shore, sometimes walking dogs, and fishing from the beach on the north side of the river. Several species of shorebirds have been observed near the mouth of the Winchuck including gulls, pelicans, cormorants, plovers, and oyster catchers. Crissey Field State Park is on the south side of the river and there are private residences on the north side.

Discontinued Beach Sites

Mill Beach - OBMP collected almost five hundred samples at Mill Beach and Macklyn Creek from 2002 until 2009. Of those samples, 16% of the results were over the recreational water quality standard. Of the high results, 89% of those were from Macklyn Creek and the mixing zone at the mouth of the creek. More than half of the high results were from brackish or fresh water samples taken from the mouth of Macklyn Creek. In 2007 there was an increase in the percent of samples exceeding the recreational water quality standard. In 2008 Brookings city employees found and repaired some sewer lines that were improperly hooked up and draining in to Macklyn Creek. Samples results from June 2009 were over the recreational water quality

standard in Macklyn Creek, the mixing zone at the mouth of the creek, and the north site at Macklyn Cove. Another sample from Macklyn Creek taken September 2009 was also over the standard. OBMP checked sample results by splitting samples with local municipal employees from 2006 – 2008. Other animals were observed on Mill Beach including immature and adult seals and sea lions, shore birds including gulls and oyster catchers, bullfrogs in Macklyn Creek, and a dead gray whale at the mouth of Macklyn Creek. Occasionally body boarders were seen surfing at Mill Beach. Thick marine vegetation in the surf break was observed some seasons. OBMP removed Mill Beach from the sampling schedule in 2009 because there was low beach use relative to other beaches in the Brookings area.

Figure 21 – Mill Beach Sample Results



Whiskey Run Beach was sampled during the 2003 and 2004 seasons and one sample was collected in November 2008. None of the 15 samples collected at Whiskey Run exceeded the recreational water quality standard. Two of the samples got close to the standard, one in 2003 and one in 2008.

Bullards Beach was sampled in 2003 and 2004 and there were no high results from any of those 15 samples. The highest result was 52 while all but two were non-detects. The Bullards Beach sample collection site is about 2.5km north of the Coquille River Lighthouse. Few people have been observed in the ocean during sampling events.

Ophir Beach was sampled during the 2003 – 2004 sampling seasons. The sample results were low with nine non-detects and five sample results at the test detection limit. Ophir Beach is more than 8km of beach about 10km north of Gold Beach. Euchre Creek flows across the north end of the beach.

Meyers Beach was sampled during the 2003 – 2004 seasons. No bacteria were detected in all but three of the seventeen samples collected. A July 2003 sample collected from the ocean Meyers Creek mixing zone was over the recreational water quality standard.

Sporthaven Beach - OBMP collected ninety nine samples at Sporthaven Beach since 2002. Sporthaven Beach was not on the sampling schedule from 2005 until 2009 to make room for investigating other beaches because high bacteria levels have not been found here. There is no storm outflow or creek that flows to any of the sample sites on Sporthaven Beach. Tuttle Creek drains from the hills on the east side of the Oregon Coast Highway to the Chetco boat basin. Visitors are often seen at the beach during sample collection but the beach drops off quickly so it can be a challenging spot to wade. People have been observed body boarding and kite flying.

Current status of Oregon ocean beaches and historical data can be found at the following locations; EPA Beach Advisory and Closing On-line Notification (BEACON) website http://watersgeo.epa.gov/beacon2/, Oregon Health Authority Beach Water Quality website http://public.health.oregon.gov/HealthyEnvironments/Recreation/BeachWaterQuality/, DEQ Beach Monitoring website http://www.deq.state.or.us/lab/wqm/beachpgm.htm, and at the Oregon Coastal Atlas website http://www.coastalatlas.net/

Special Studies

CWA Section 319 funding was applied to two special studies focused on better understand potential sources of bacteria loading to Sunset Bay and Mill and Harris Beaches. The studies also sought to determine factors relevant to the initiation of bacterial delivery and to the duration of elevated levels of bacteria.

Both studies identified diverse sources of bacteria that may contribute to elevated concentrations of enterococcus bacteria. The combination of spatial and temporal observations of bacteria counts observed indicated that the primary sources of bacterial contaminants are terrestrial in origin. Fecal indicator bacteria are delivered into Sunset Bay via fresh water discharged by Big Creek and into Harris and Mill beaches from urban stormwater runoff.

The Sunset Bay study found that the greatest counts of enterococcus bacteria occurred at the mouth of Big Creek during the driest months (July to October, 2007), and bacteria counts within the mouth of Big Creek exhibited a general increase over the dry season. Elevated bacterial levels also appeared to be delivered by freshwater runoff initiated by early fall first rainfall events and potentially from state park surface drainage systems. The correlation between Enterococcus counts in marine waters and bacterial loading from terrestrial sources was very strong. About 83% of the variability in MPN counts of Enterococcus within the surf zone at Sunset Bay can be attributed directly to the loading of bacteria from the mouth of Big Creek (Rumrill, 2008).

The Harris and Mill beaches special study found that bacterial loads correlate well with housing density suggesting sources of bacterial contamination were human related. Both studies concluded that additional monitoring to identify bacterial sources is needed and that the development of modeling tools to examine environmental interactions would be useful. In addition, more information is needed regarding the survival and reproduction of indicator bacterial outside of the intestinal tracts of warm blooded animals (Burris, 2008).

Action and Alignment Opportunities (Beach Program)

ACTION: Implement bacterial source control measures. Commonly applied bacterial source control measures should be effective in reducing bacterial loading to these beaches. For urban areas these measures might include the elimination of combined sewers, initiation of pet waste management programs, application of low impact land development techniques to interrupt bacterial delivery, and septic maintenance programs. For Sunset Bay, beneficial bacterial reduction measures might include livestock exclusion and State Park patron education and outreach regarding campground bacterial management measures (pet waste, food scrap management, healthy riparian conditions, etc).

ACTION: Initiate source assessment monitoring where beaches had been identified as water quality limited on the 2010 303 (d) list in preparation for the development of TMDLs.

Estuary Condition

CONCERN: Sediment, and Fish Tissue Chemical Contaminants

Coos Bay Toxics Study

EPA's Near Coastal Waters Program began funding the Coos Bay Toxics Study in 1992. The study was designed to screen and characterize levels of chemical contaminants in Coos Bay sediments and fish tissue. The study was conducted in two phases with bay wide sediment and tissue sampling continuing through 1995. A local, federal, and state funding partnership continued shellfish tissue butyltin testing until mid 1998. **Coos Bay Toxics Study results are presented here and information about butyltin in Coos Bay fish tissue can be found in the Human Health Related Data, Chemical Contaminants section of this document.**

DEQ's Toxics Monitoring Program sampled water, sediment, and tissue in 2013 and these results are pending release and will be presented in a subsequent report at some time in the future. Additional information about the TMP and sampling conducted in Cos Bay in 2013 can be found in the Toxics Monitoring Program section of this document.

Contaminants in Sediments

DEQ's Water Quality Division does not have sediment criteria or standards although DEQ's Cleanup Program does apply sediment screening criteria. Sediment sample results were compared to Sediment Quality Guidelines (SQG) derived by the NOAA Status and Trend Program (NOAA, 1999). The SQGs are based on the database assembled by Long et al. (1995), Effects Range Low (ERL) and Effects Range Moderate (ERM). Screening values were calculated for nine trace metals, 13 individual PAHs, three classes of PAHs, and three classes of chlorinated organic hydrocarbons.

The SQGs are intended for ranking sediment chemical contaminant levels of potential concern based on measures of biological effects. Two values were indentified for each compound, an "Effects Range-Low" (ERL), indicative of contaminant levels below which adverse effects rarely occur and an "Effects Range-Median" (ERM), indicative of contaminant levels above which adverse effects frequently occur (NOAA, 1999). The SQGs are non-regulatory guidelines for use in interpreting sediment chemical data. They are not intended for use as regulatory criteria or standards, cleanup or remediation targets, discharge attainment targets, or as pass-fail criteria for dredged material disposal decisions (NOAA, 1999).

Because there is no NOAA SQG for butyltin compounds the EPA recommended screening value of 30 ug/kg (EPA, 1996) was applied. Tributyltin's (TBT) adverse impacts on the aquatic environment are well documented and include direct mortality, reduced larval growth, sexual abnormalities, reproductive failure, shell or chamber thickening, immune system dysfunction, nervous system disorders, and skin and eye disorders (EPA, 1996).

The tables below summarize chemical contaminants detected in Coos Bay sediments during the Coos Bay Toxics Study. The tables do not depict information regarding compounds tested for and not detected. Information about what was not detected provides valuable baseline information and should be accessed to inform future sediment sampling. Sediment results at or exceeding NOAA's effects range low thresholds and/or the EPA recommended screening value for tributyltin are highlighted in Tables 23-28.

Table 23 – Coos Bay Toxics Study Sediment Metal Detects (1992-1995) (ppm dry weight)

Site Description	Cr	Zn	Pb	As	Cd	Hg	Ni	Cu	Ba	Co
NOAA Biological Effects ER-L (effects range low) ER-M (effects range median)	**81 370**	**150 410**	**46.7 218**	**8.2 70**	**5 9**	**0.15 0.71**	**20.9 51.6**	**34 270**	**NA**	**NA**
Reference Site (Winchester Ck)	46	67	<10	<20	<1	<0.08	27	12	41	7
Isthmus Slough Boat Ramp	30	85	ND	ND	ND	ND	19	16	110	10
Isthmus Slough @ Shinglehouse	44	78	ND	ND	ND	ND	**30**	16	31	8
Isthmus Slough @ GP Channel	57	91	ND	ND	ND	ND	**34**	22	40	10
Coalbank Slough	36	81	10	ND	ND	ND	**26**	21	38	7
Catching Slough @ bridge	48	92	ND	ND	ND	ND	**44**	32	190	18
Coos River @ 2 mi. above Chandler	35	66	ND	ND	ND	ND	**21**	11	42	8
North Slough	49	79	ND	ND	ND	ND	**35**	18	33	9
Kentuck Inlet	52	86	ND	ND	ND	ND	**49**	21	39	14
Pony Slough	46	68	ND	ND	ND	ND	**34**	12	26	ND
Charleston Triangle	36	41	ND	ND	ND	ND	**30**	9	20	ND
North Spit @ Jordan Cove	34	47	ND	ND	ND	ND	**24**	11	27	ND
Coos Bay STP #2	30	34	ND	ND	ND	ND	**30**	6	20	ND
Charleston Small Boat Basin	18	33	ND	ND	ND	ND	15	9	11	ND

ND = non detect, NA = not analyzed

Table 24 – Coos Bay Toxics Study Sediment Organic Detects (1992-1995) (ppb wet weight)

Site Description	Total PCB's	Total PAH's	HPAH total	LPAH total
NOAA Biological Effects ER-L (effects range low) - ER-M (effects range median)	**22.7 - 180**	**4022 - 44792**	**1700 - 9600**	**552 – 3160**
Reference Site (Winchester Ck)	ND	2258	**1786**	216
Isthmus Slough Boat Ramp	ND	444	261	183
Isthmus Slough @ Shinglehouse	ND	ND	ND	ND

Table 24 – Coos Bay Toxics Study Sediment Organic Detects (1992-1995) (ppb wet weight)				
Site Description	**Total PCB's**	**Total PAH's**	**HPAH total**	**LPAH total**
NOAA Biological Effects ER-L (effects range low) - ER-M (effects range median)	**22.7 - 180**	**4022 - 44792**	**1700 - 9600**	**552 – 3160**
Isthmus Slough @ Bridge	ND	ND	ND	ND
Coalbank Slough	ND	1605	1540	391
Catching Slough @ bridge	ND	268	224	44
Coos River @ 2 mi. above Chandler	ND	207	180	27
North Slough	ND	ND	ND	ND
Kentuck Inlet	ND	ND	ND	ND
Pony Slough	ND	ND	ND	ND
Charleston Triangle	ND	**4369**	**3464**	**940**
Charleston Small Boat Basin	NA	NA	NA	NA
North Spit @ Jordan Cove	ND	648	271	363
Coos Bay STP #2	ND	ND	ND	ND
ND = non detect, NA = not analyzed				

Table 25 – Coos Bay Toxics Study Sediment Organic Detects (1992-1995) (ppb wet weight)				
Site Description	**Phenanthrene**	**Acenaphthene**	**Fluorene**	**Anthracene**
NOAA Biological Effects ER-L (effects range low) - ER-M (effects range median)	**240 - 1500**	**16 - 500**	**19 - 540**	**85.5 - 1100**
Reference Site (Winchester Ck)	127	ND	25	64
Isthmus Slough Boat Ramp	17	ND	10	17
Isthmus Slough @ Shinglehouse	ND	ND	ND	ND
Isthmus Slough @ Bridge	152	ND	ND	ND
Coalbank Slough	135	ND	40	27
Catching Slough @ bridge	34	ND	ND	ND
Coos River @ 2 mi. above Chandler Br.	13	ND	7.2	ND
North Slough	ND	ND	ND	ND
Kentuck Inlet	ND	ND	ND	ND
Pony Slough	ND	ND	ND	ND
Charleston Triangle	**672**	**50**	83	59
Charleston Small Boat Basin	NA	NA	NA	NA
North Spit @ Jordan Cove	135	**27**	40	13
Coos Bay STP #2	ND	ND	ND	ND
ND = non detect, NA = not analyzed				

Table 26 – Coos Bay Toxics Study Sediment Organic Detects (1992-1995) (ppb wet weight)			
Site Description	**Acenaphthylene**	**Napthalene**	**Benzoflouranthenes**
NOAA Biological Effects ER-L (effects range low) - ER-M (effects range median)	**44 - 640**	**160 - 2100**	**NA**
Reference Site (Winchester Ck)	ND	ND	ND
Isthmus Slough Boat Ramp	ND	139	ND
Isthmus Slough @ Shinglehouse	ND	ND	ND
Isthmus Slough @ Bridge	ND	**177**	ND
Coalbank Slough	27	135	170
Catching Slough @ bridge	ND	10	ND
Coos River @ 2 mi. above Chandler	ND	7.2	ND
North Slough	ND	ND	ND
Kentuck Inlet	ND	ND	ND
Pony Slough	ND	ND	ND
Charleston Triangle	9	67	ND
Charleston Small Boat Basin	NA	NA	NA
North Spit @ Jordan Cove	13	135	ND
Coos Bay STP #2	ND	ND	ND
ND = non detect, NA = not analyzed			

Table 27 – Coos Bay Toxics Study Sediment Organic Detects (1992-1995) (ppb wet weight)		
Site Description	**Benzo(g,h,i)perylene**	**Benzo(a)pyrene**
NOAA Biological Effects ER-L (effects range low) - ER-M (effects range median)	**NA**	**430 - 1600**
Reference Site (Winchester Ck)	ND	ND
Isthmus Slough Boat Ramp	ND	177
Isthmus Slough @ Shinglehouse	ND	ND
Isthmus Slough @ Bridge	121	ND
Coalbank Slough	82	405
Catching Slough @ bridge	ND	168
Coos River @ 2 mi. above Chandler	ND	122
North Slough	ND	ND
Kentuck Inlet	ND	ND
Pony Slough	ND	ND
Charleston Triangle	50	83
Charleston Small Boat Basin	NA	NA
North Spit @ Jordan Cove	ND	69
Coos Bay STP #2	ND	ND
ND = non detect, NA = not analyzed		

Table 28 – Coos Bay Toxics Study Sediment Organic Detects (1992-1995) (ppb wet weight)			
Site Description	**Indeno(1,2,3-c,d)**	**Dibenzofuran**	**Tributyltins**
NOAA Biological Effects ER-L (effects range low) - ER-M (effects range median)	**NA**	**NA**	**EPA Recommend Screening Level 30 ug/kg**
Reference Site (Winchester Ck)	ND	ND	**53**
Isthmus Slough Boat Ramp	ND	ND	27
Isthmus Slough @ Shinglehouse	ND	ND	**71**
Isthmus Slough @ Bridge	ND	ND	**35**
Coalbank Slough	ND	0.5	**219**
Catching Slough @ bridge	ND	ND	ND
Coos River @ 2 mi. above Chandler	ND	ND	ND
North Slough	ND	ND	**40**
Kentuck Inlet	ND	ND	**62**
Pony Slough	ND	ND	**58**
Charleston Triangle	59	6	**112**
Charleston Small Boat Basin	NA	NA	**92**
North Spit @ Jordan Cove	ND	1	21
Coos Bay STP #2	ND	ND	**49**
ND = non detect, NA = not analyzed			

Coos Bay Toxics Study and EPA sediment sampling led DEQ to focus source control and environmental cleanup efforts at five local ship repair and fabrication facilities (Hillstroms, Mid-Coast Marine, Kelly Boatworks, Port of Coos Bay, and SAUSE Brothers/Southern Oregon Marine). Sediment TBT levels at these shipyard facilities initially exceed screening values (EPA, 1996).Sediment contaminate levels varied by facility and included, metals (chromium, zinc, lead, arsenic, mercury, nickel, and copper), polycyclic aromatic hydrocarbons, and polychlorinated biphenyls (PCB) were detected above ERM levels at several locations. In December 1998, EPA deferred cleanup oversight of Mid-Coast Marine, Southern Oregon Marine and the Port of Coos Bay sites to DEQ's Cleanup Program. By 2003 sediment cleanup removal actions had been conducted under DEQ oversight at the three deferred shipyard sites, significantly improving sediment quality at these sites.

Clean up actions have been implemented at all five of the Coos Bay shipyard sites. Three locations are no longer used for ship repair and best management practices have been instituted at the other two locations. Sediment quality is currently being re-evaluated at the Mid-Coast Marine and Port of Coos Bay sites under the oversight of DEQ's Cleanup Program.

Information about past and current cleanup activities, current site conditions, and site status of these sites can be accessed through DEQ's Environmental Cleanup Site Information (ECSI) database: Oregon DEQ: Search Environmental Cleanup Site Information (ECSI) Database. Coos Bay ship repair facility site numbers are: Hillstroms – #1174, Mid-Coast Marine – #1906, Kelly Boatworks – #1907, Southern Oregon Marine – #1908, and Port of Coos Bay Boat Yard – #1905.

Contaminants in Finfish and Shellfish

Finfish and shellfish also were analyzed as part of the Coos Bay Toxics Study in an effort to better understand chemical contaminant levels in Coos Bay fish and the potential risk to fish consumers. These results are shown in the tables below. Contaminants found in fish tissue were below levels of concern based upon Oregon Health Authority consumption rates of four meals per month or 30 grams/day (OHA, 2013).

In 2010, EPA disapproved the majority of DEQ's human health toxics criteria stating that the criteria values were based on a fish consumption rate that was too low (17.5 grams/day) to protect many fish consumers in Oregon. After an extensive review of the fish consumption rates, DEQ revised the human health toxics criteria based on a higher per capita fish consumption rate of 175 grams/day. DEQ is working with OHA regarding ways to better inform entities with higher consumption rates about contaminants of concern in Coos Bay shellfish.

Table 29 – Coos Bay Toxics Study Tissue Organic Detects (1992-1995) (wet weight)							
Year	**Site Description**	**Media**	**DDT,DDD,DDE ppm**	**Endosulfan Sulfate ppm**	**Bis(2-ethylhexyl) phthalate ppm**	**Napthalene ppm**	**Isopherone ppm**
1992	Charleston Triangle	Clams	ND	ND	ND	ND	ND
1992	Charleston Bridge	Clams	ND	ND	ND	ND	ND
1992	Port of CB	Clams	ND	ND	ND	ND	ND
1992	CB STP # 2	Clams	ND	ND	ND	ND	ND
1992	North Slough	Clams	ND	ND	ND	ND	ND
1992	No Spit @ Jordan Cove	Clams	ND	ND	ND	ND	ND
1992	Umpqua @ Gardiner	Clams	ND	ND	ND	ND	ND
1992	CB Silver Point # 8	Oyster	ND	ND	ND	ND	ND
1993	Joe Ney Slough	Oyster	0.011	ND	ND	ND	ND
1993	So Sl Browns Cove	Oyster	0.006	ND	13.1	ND	ND
1993	So Sl Browns Cove (QA)	Oyster	0.008	ND	2.1	ND	ND
1992	Catching Slough	Bass	ND	ND	ND	ND	ND
1992	Isthmus Slough	Bass	0.008	ND	ND	ND	ND
1992	Catching Slough (QA)	Bass	0.014	0.008	ND	ND	ND
1993	South Slough	Crab Tissue	ND	ND	ND	ND	ND
1993	CB So Marshfield Ch	Crab Tissue	0.002	ND	9.9	ND	ND
1993	CB T Dock	Crab Tissue	0.003	ND	7.1	ND	ND
1993	CB T Dock (QA)	Crab Tissue	0.005	ND	ND	ND	ND
1993	South Slough	Crab Shell	ND	ND	0.68	0.25	ND
1993	CB So Marshfield Ch	Crab Shell	ND	ND	ND	0.25	ND
1993	CB T Dock	Crab Shell	ND	ND	ND	ND	0.45
1993	CB T Dock (QA)	Crab Shell	ND	ND	ND	0.26	ND

Table 30 – Coos Bay Toxics Study Tissue Inorganic Detects (1992-1995) (ppm wet weight)													
Year	**Site Description**	**Media**	**Cadmium**	**Mercury**	**Selenium**	**Nickel**	**Chromium III (a)**	**Arsenic (b)**	**Copper**	**Zinc**	**Manganese**	**Barium**	**Lead**
1992	Charleston Triangle	Clams	0.09	ND	ND	1.3	0.98	0.2	1.3	10.6	2.8	0.7	0.1
1992	Charleston Bridge	Clams	0.13	ND	ND	1.12	1.4	0.11	3.64	7	3.2	0.7	0.2
1992	Port of Coos Bay	Clams	0.19	ND	ND	2.61	3.48	0.31	2.3	10.4	20.9	2.1	0.6
1992	Coos Bay STP # 2	Clams	0.17	ND	ND	1.47	2.01	0.14	1.1	7.9	9	1.1	0.2
1992	North Slough	Clams	0.04	ND	ND	0.66	0.79	0.066	2.2	13.2	25.1	0.8	0.2
1992	North Spit	Clams	0.06	ND	ND	0.98	1.4	0.12	2	15.4	5	1.1	0.3
1992	Umpqua Bay @ Gardiner	Clams	0.05	ND	ND	0.74	0.85	0.15	1.6	11.7	36	2.9	0.1
1992	CB Silver Point # 8	Oyster	0.52	ND	ND	ND	0.12	0.1	9.9	114	9.9	ND	0.1
1992*	CB Silver Point # 1	Oyster	0.86	0.02	ND	0.18	0.4	1.77	17.5	191	NA	0.075	0.077
1992*	CB Silver Point # 8.1	Oyster	1.1	0.01	0.45	0.22	0.38	1.08	18.8	138	NA	0.117	0.076
1992*	CB Silver Point # 8.2	Oyster	0.96	0.01	0.29	0.25	0.41	0.97	16.7	123	NA	0.122	0.068
1992*	CB Silver Point # 9	Oyster	0.97	0.01	0.14	0.19	0.28	0.837	24.8	189	NA	0.08	0.058
1993	Joe Ney Slough	Oyster	0.6	0.04	ND	ND	ND	0.15	15	240	3	ND	ND
1993	So Sl Browns Cove	Oyster	0.35	0.03	ND	ND	ND	ND	6.9	115	2.3	ND	ND
1993	So Sl Browns Cove (QA)	Oyster	0.5	0.03	ND	ND	0.19	1.25	7.5	138	2	ND	ND
1992	Catching Slough	Bass	ND	0.17	ND	ND	0.05	0.03	0.5	4.1	0.2	ND	ND
1992	Isthmus Slough	Bass	0.02	0.19	ND	ND	0.15	0.04	0.5	4.5	0.3	ND	0.2
1992	Catching Slough (QA)	Bass	ND	0.2	ND	ND	0.025	0.025	0.5	4.5	0.4	ND	ND
1993	South Slough	Crab Tissue	0.2	0.2	ND	ND	ND	1.1	9.6	42.8	0.4	ND	ND
1993	CB So Marshfield Ch	Crab Tissue	ND	0.05	ND	ND	ND	0.16	9.3	31	1.1	ND	ND
1993	CB T Dock	Crab Tissue	0.28	0.24	ND	ND	ND	1.1	9.4	41	0.28	ND	ND
1993	CB T Dock (QA)	Crab Tissue	0.09	0.19	ND	ND	ND	0.94	11	43	0.28	ND	ND
1993	South Slough	Crab Shell	ND	ND	ND	ND	ND	ND	0.64	2.2	7.7	4.5	ND
1993	CB So Marshfield Ch	Crab Shell	ND	ND	ND	ND	ND	ND	3.9	4.1	126	9.2	ND
1993	CB T Dock	Crab Shell	ND	ND	ND	ND	ND	ND	3.9	5.7	15	7.2	ND
1993	CB T Dock (QA)	Crab Shell	ND	ND	ND	ND	ND	ND	2.1	5.6	7.1	5.6	ND

(a) Total Chromium Values Used, (b) FDA, 1993, Inorganic Arsenic = 10 % Total Arsenic, * Sampled by Hallbuck Marine as part of NPDES Requirements

Coastal Environmental Monitoring and Assessment Program (CEMAP)

The federal Clean Water and Coastal Monitoring Acts require states to monitor, assess, and report coastal resource conditions. Many of Oregon's estuaries were sampled during the summer between 1999 and 2006 as part of the Coastal Estuary Monitoring and Assessment Program (CEMAP).

Table 31 – Estuary Survey Objectives
Assess estuaries based on standardized, measured, resource condition indicators
Collect baseline data for use in future trend analyses.
Develop, improve, and validate methods.

Table 32 – CEMAP Estuary Survey-Parameters Sampled	
General habitat condition	depth, temperature, salinity, pH, dissolved oxygen, total suspended solids, light transmittance, sediment characteristics
Water quality	nutrients, chlorophyll a
Pollutant exposure	sediment contaminants, fish tissue contaminants, sediment toxicity
Benthic condition	diversity and abundance of benthic infauna and fish species, and fish pathology

A total of three hundred sixty nine sites were sampled in Oregon and, of those sites, sixty seven were within the South Coast Basin. The majority of the South Coast Basin sampling was conducted in Coos Bay. Six sites were sampled in the Coquille estuary and a single site was sampled in each of the Sixes and Chetco estuaries. Detailed site descriptions and location information can be found in Appendix E. Coos Bay sample sites are mapped in the figure below.

CEMAP Whole Fish Sample Results

As part of the CEMAP program sampling various species of whole fish were sampled and analyzed. Because fish are not commonly consumed whole, these sample results cannot be directly compared with OHA screening values designed to protect human health. Rather, sample results represent the overall body burden of contaminants present in the fish sampled. The Department plans to work with the Oregon Health Authority at some time in the future to further interpret this data in regard to human health.

Figure 22 – Coos Bay CEMAP Program Sample Sites

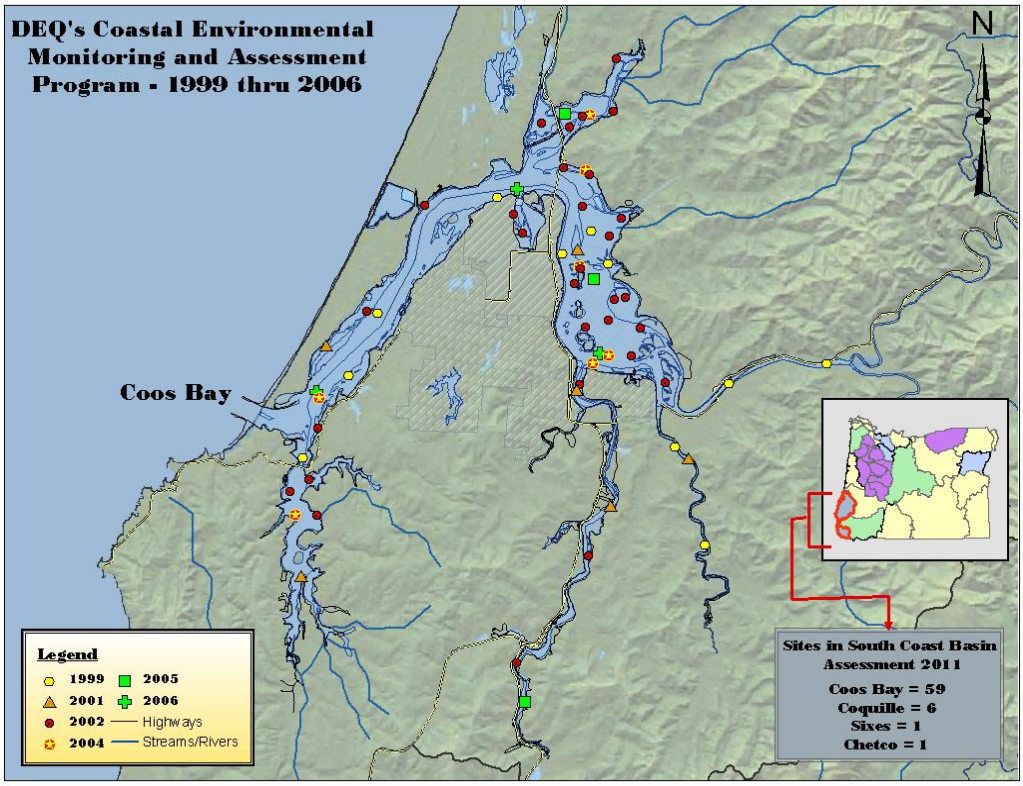


Figure 23 – Coos Bay CEMAP Fish Tissue Metal Results

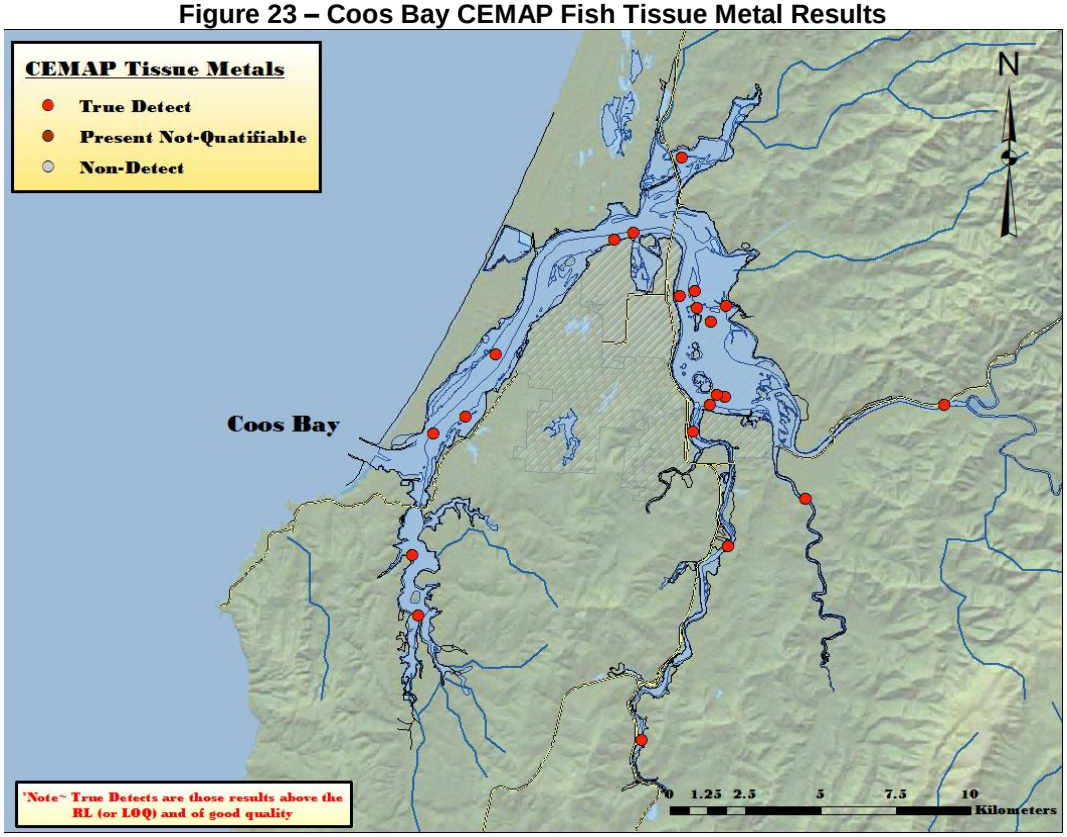


Figure 24 – Coos Bay CEMAP Fish Tissue PCB and Fire Retardent Results

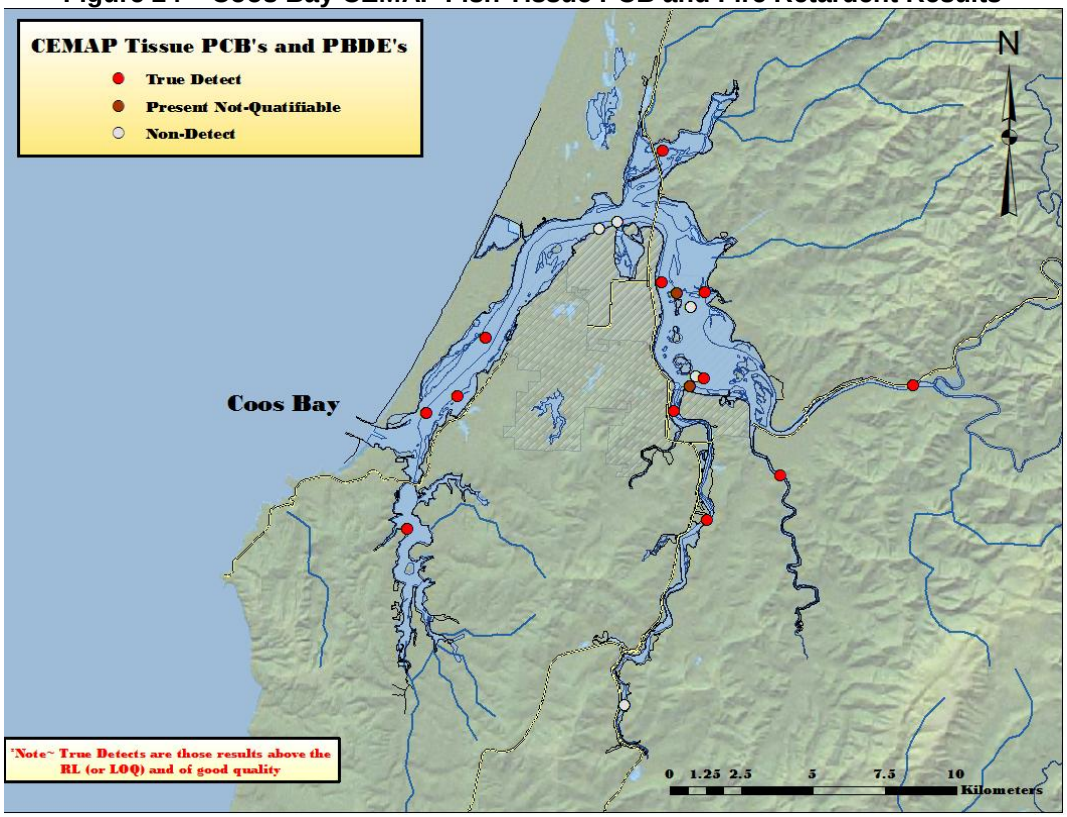
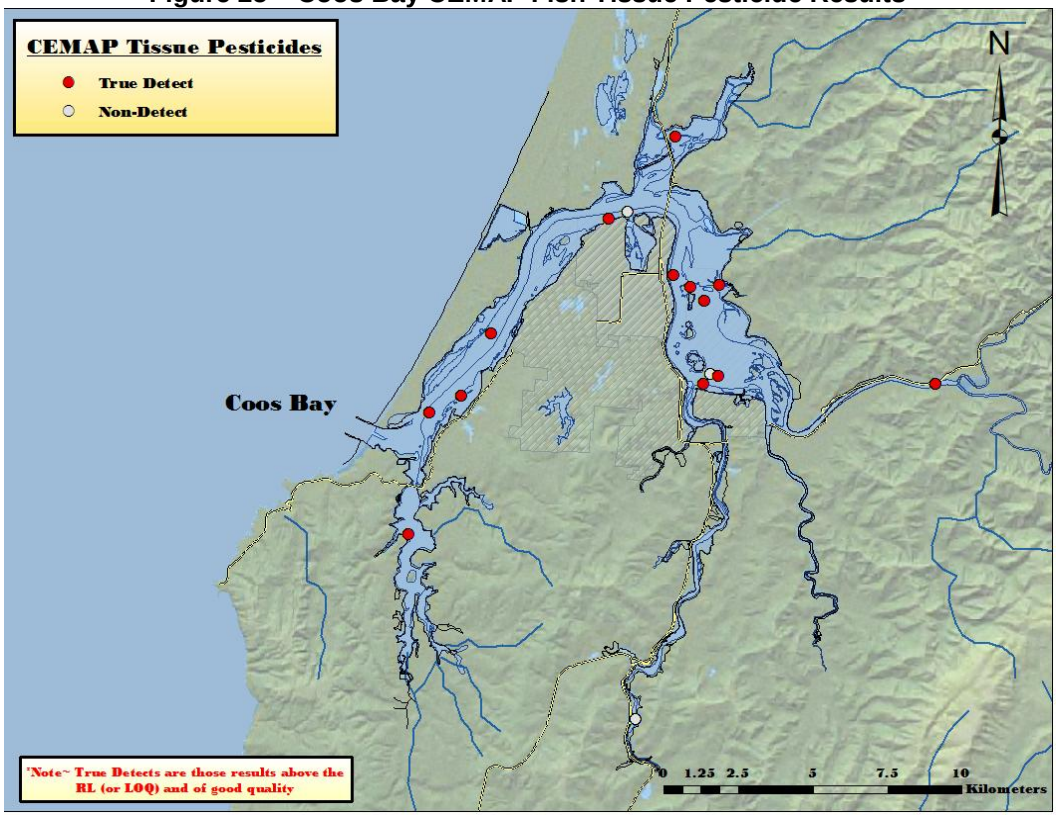


Figure 25 – Coos Bay CEMAP Fish Tissue Pesticide Results



Sediment Quality
As part of this assessment, data collected through the CEMAP program was compared to select criteria and benchmarks. Data from the CEMAP program, by design, was intended to collect data representative of conditions in the bay as a whole, and not necessarily characterize areal contamination or known hotspots. These data do support the characterization of conditions at the randomly selected sites. Only true detects, compounds found at levels above the reporting limit, are used. Compounds detected below reporting limits are not used here but may provide insight into future sampling needs as analytical reporting limits improve.

CEMAP Sediment Contaminate Results
Sediment sample results were again compared to Sediment Quality Guidelines (SQG) derived by the NOAA Status and Trend Program (NOAA, 1999). See the Coos Bay toxics Study, Contaminants in Sediments section. The SQGs are intended for ranking sediment chemical contaminant levels of potential concern based on measures of biological effects. Two values were indentified for each compound, an "Effects Range-Low" (ERL), indicative of contaminant levels below which adverse effects rarely occur and an "Effects Range-Median" (ERM), indicative of contaminant levels above which adverse effects frequently occur (NOAA, 1999). The SQGs are non-regulatory guidelines for use in interpreting sediment chemical data. They are not intended for use as regulatory criteria or standards, cleanup or remediation targets, discharge attainment targets, or as pass-fail criteria for dredged material disposal decisions (NOAA, 1999).

Because there is no NOAA SQG for butyltin compounds the EPA recommended screening value of 30 ug/kg (EPA, 1996) was applied. Tributyltin's (TBT) adverse impacts on the aquatic environment are well documented and include direct mortality, reduced larval growth, sexual abnormalities, reproductive failure, shell or chamber thickening, immune system dysfunction, nervous system disorders, and skin and eye disorders (EPA, 1996).

In addition, the State of Washington has established marine, low salinity, and freshwater sediment management standards (Chapter 173-204 Washington Administrative Code). These standards currently contain two sets of numeric chemical criteria that apply to marine sediments. The "no effects" level is used as a sediment quality goal for Washington State sediments, and the "minor adverse effects" level is used as an upper regulatory level for source control and cleanup decision making.

CEMAP sediment contaminant levels were compared to both the NOAA SQGs and the State of Washington sediment management standards. The following tables and figures illustrate the relationship of Coos Bay sediment quality to these guidelines and standards. Sites in the Coquille, Sixes, and Chetco watersheds were not mapped but interpretive narrative is provided. Coos Bay true detects, results above the reporting limits (level of quantification, LOQ) and of good data quality, are shown in the figures below.

Figure 26 – Coos Bay CEMAP Sediment Metals Results

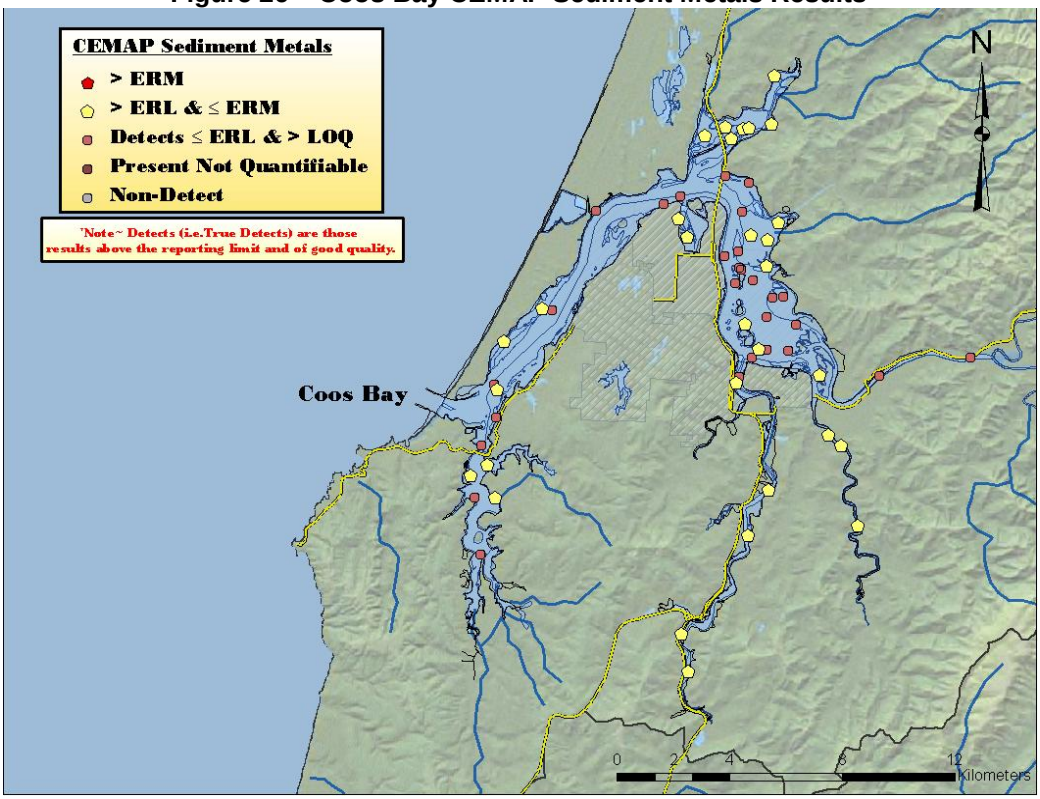


Figure 27 – Number of Sites with Metals Detection

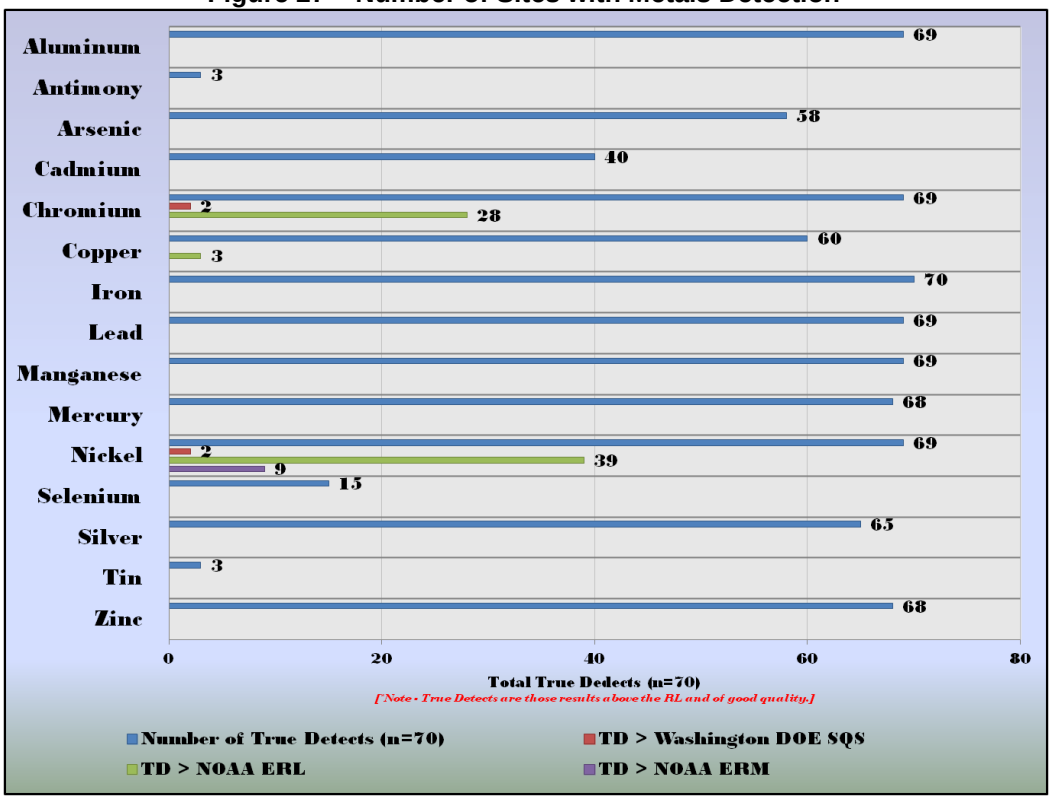


Figure 28 – Coos Bay Copper, Chromium, Arsenic, and Nickel ERLs Exceeded

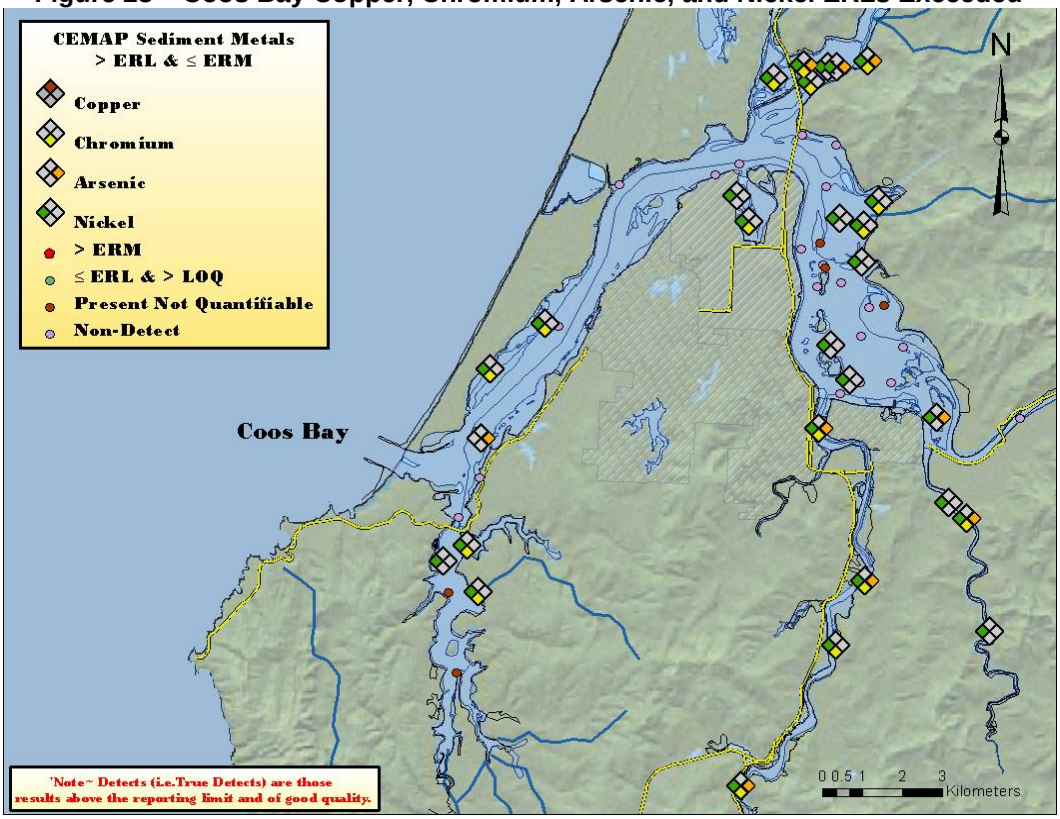


Figure 29 – Coos Bay CEMAP Polynuclear Aromatic Hydrocarbon Results

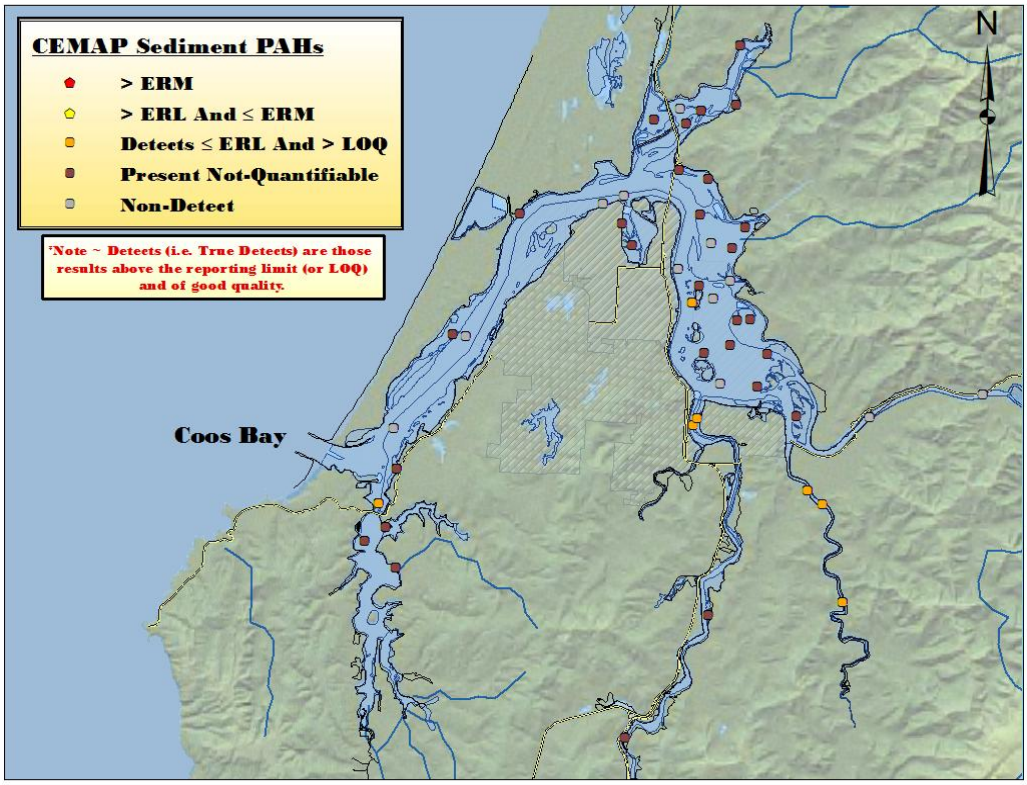


Figure 30 – Coos Bay CEMAP Sediment PCB and Flame Retardant Results

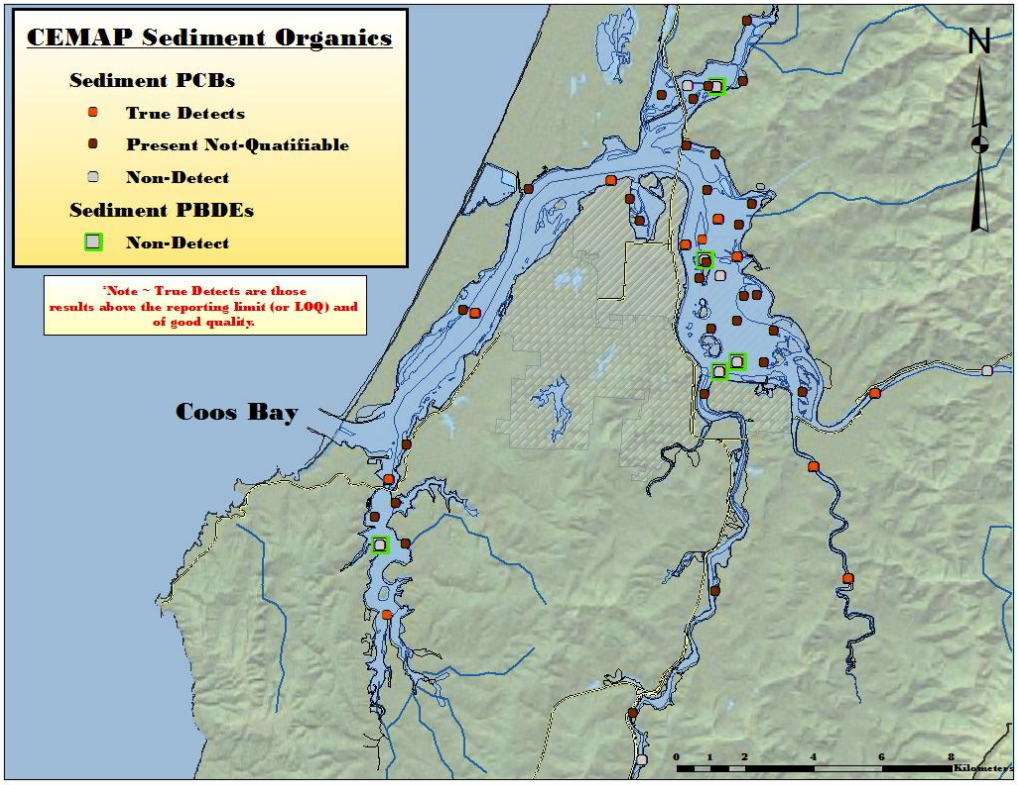


Figure 31 – Coos Bay CEMAP Sediment Pesticide Results

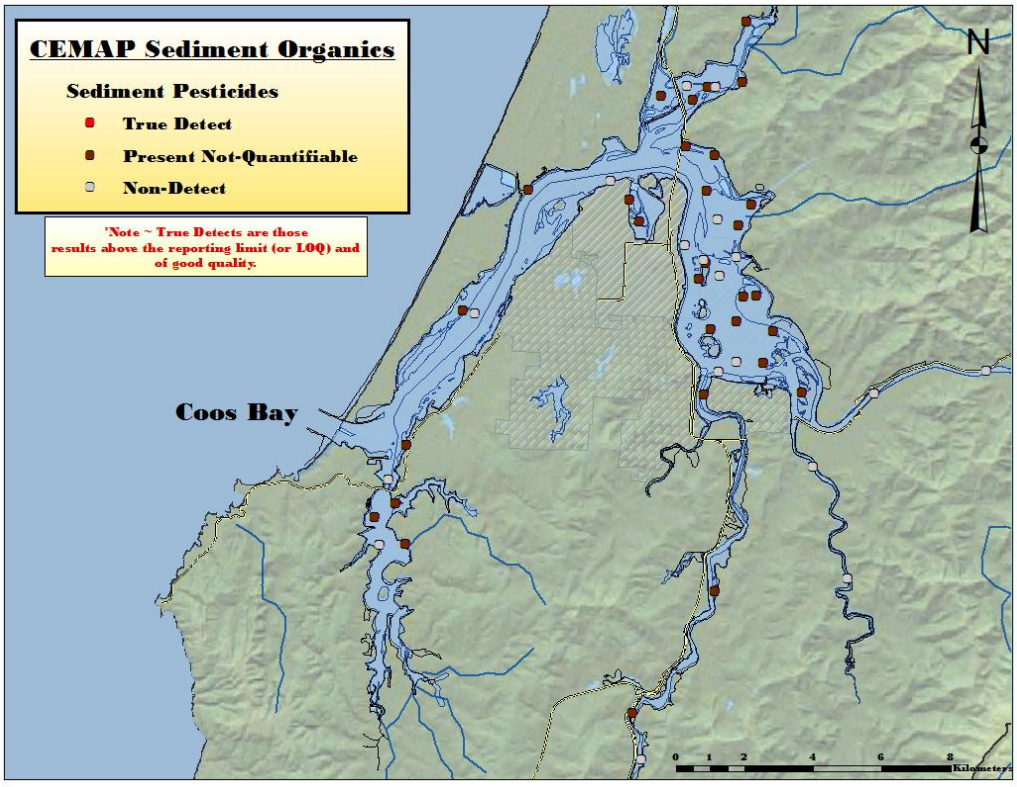


Table 33 – CEMAP 1999-2006 Sediment Pesticide True Detects Summarized

Analyte	True detects (>RL) 70 sites total	Min	Max	Average	Variance	Standard Deviation
Aldrin	0	—	—	—	—	—
Alpha-Chlordane	0	—	—	—	—	—
Dieldrin	0	—	—	—	—	—
Endosulfan I	1	2.03	2.03	2.03	—	—
Endosulfan II	2	0.90	1.51	1.21	0.19	0.43
Endosulfan Sulfate	0	—	—	—	—	—
Endrin	1	1.01	1.01	1.01	—	—
Endrin Aldehyde	0	—	—	—	—	—
Endrin Ketone	0	—	—	—	—	—
Heptachlor$_3$	1	3.25	3.25	3.25	—	—
Heptachlor epoxide$_3$	1	1.26	1.26	1.26	—	—
Hexachlorobenzene	4	2.13	10.00	4.21	14.91	3.86
Lindane (gamma-BHC)	0	—	—	—	—	—
Mirex	0	—	—	—	—	—
Toxaphene	0	—	—	—	—	—
Trans-Nonachlor	2	1.26	2.80	2.03	1.19	1.09
2,4'-DDD	3	1.01	1.35	1.16	0.03	0.18
2,4'-DDE	0	—	—	—	—	—
2,4'-DDT	1	3.78	3.78	3.78	—	—
4,4'-DDD	2	1.11	1.51	1.31	0.08	0.28
4,4'-DDE	15	1.10	20.25	4.03	25.76	5.08
4,4'-DDT	1	1.55	1.55	1.55	—	—
Total DDT	22	0.9	15.7	3.8	19.5	4.4

Sediment Total Organic Carbon (TOC)

TOC is a natural component in estuary sediments and is the result of the degradation of organic matter. Human sources can significantly elevate the level of TOC in sediments and high levels can change benthic community structure toward dominance of pollution-tolerant species (Pearson and Rosenberg, 1978). Highly organic sediments can result in the depletion of water column oxygen levels adversely impacting aquatic life. The re-suspension of highly organic sediments can result in the depletion of water column oxygen levels adversely impacting aquatic life.

In Coos Bay sediment, TOC content is rated as good (2%) at twenty three sites, fair (2-5%) at five sites, and poor (5%) at two sites. This information is graphically depicted in the figure below.

The review of Coos Bay sediment TOC data indicates that Isthmus Slough sediments have the highest TOC levels in both Coos Bay and the State of Oregon. Only the Coos Bay in-bay dredge material disposal site near the Southwest Regional Airport had comparable values. The Isthmus Slough at Millington site has the highest nutrient and total organic carbon values when compared to other Isthmus Slough area sediment samples. The Isthmus Slough at Millington site appears to have been impacted by organic loading more than other areas that were sampled.

During a 2006 TMDL study, Isthmus Slough sediment TOC values were found to be high near a shipyard, historic lumber processing areas, and at the Millington log storage area. Elevated sediment total organic carbon was also measured in North Creek (north side of Coos Bay).

Figure 32 – Coos Bay CEMAP Sediment Total Organic Carbon Content

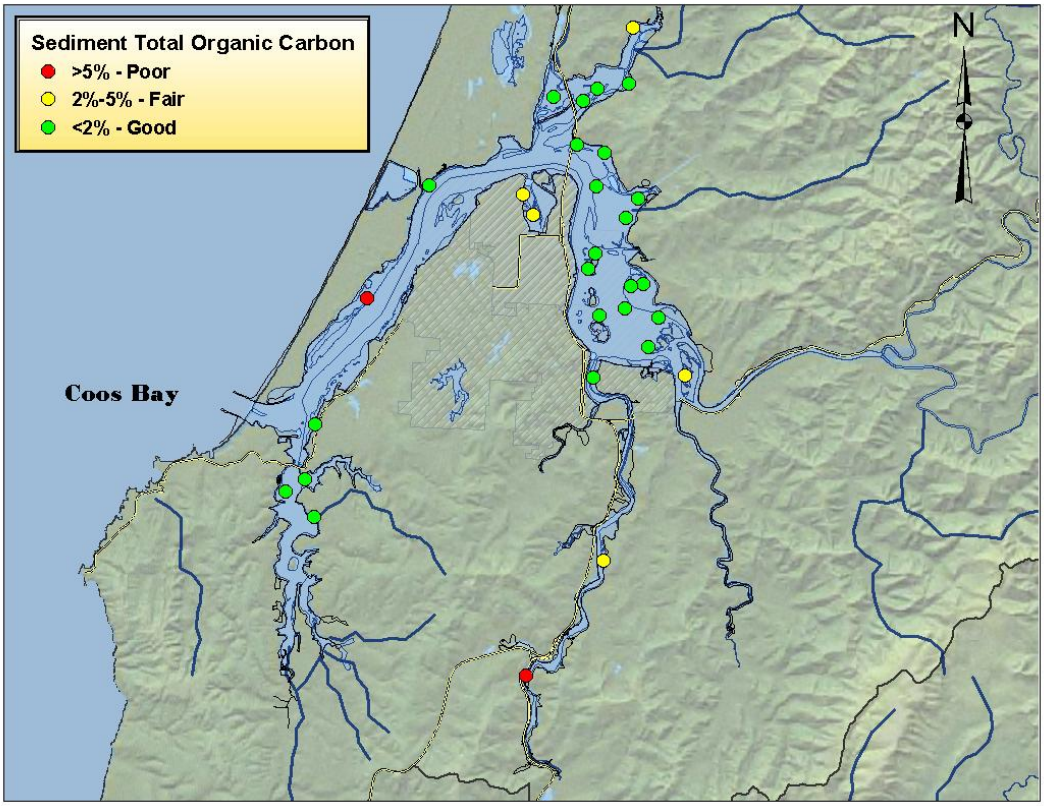


Table 34 – 1990s Coos Bay Toxics Study Sediment - Top Five %Total Organic Carbon		
LASAR Number	**Site Name**	**% Total Organic Carbon**
13630	Isthmus Slough at Georgia Pacific Pond Inlet	21
13631	Isthmus Slough 200 yards downstream of New Mid-Coast Marine	12.7
13540	Isthmus Slough @ Millington	6.5
13586	North Creek at Hwy 101	6.4
13627	Isthmus Slough at Old Mid-Coast Marine (north side)	5.2

Table 35 – 2006 TMDL Study - Isthmus Slough Sediment Chemistry								
LASAR Number	**Site Name**	**%**			**mg/kg wet**			**% Total Organic Carbon mg/kg dry**
		Solids	**Sand**	**Silt**	**Nitrate/Nitrite as N**	**Total Kjeldahl Nitrogen**	**Total Phosphorus**	
11884	Coalbank Slough @Hwy 101	60	73	27	0.734	5100	367	2
33075	Isthmus Sl U/S Transmission Lines	48	59	41	0.905	7300	483	3.7

Table 35 – 2006 TMDL Study - Isthmus Slough Sediment Chemistry								
LASAR Number	Site Name	%			mg/kg wet			% Total Organic Carbon mg/kg dry
		Solids	Sand	Silt	Nitrate/Nitrite as N	Total Kjeldahl Nitrogen	Total Phosphorus	
13540	Isthmus Slough @Millington	38	47	53	**1.04**	**8800**	**512**	**6.4**
13389	Isthmus Slough @ Sumner Br	44	56	45	0.997	8600	507	4.8

Table 36 – 2002 CEMAP Isthmus Slough Sediment Chemistry (%)							
LASAR Number	Site Name	Solids	Sand	Silt	Total Nitrogen	Phosphate	Total Organic Carbon
13386	Isthmus Sl, near green Mkr 43	60	77	23	0.079	0.03	1.2
13583	Isthmus Slough So. of Shinglehouse Slough	41	30	70	1.157	0.06	4.0
28932	Isthmus Sl, S of Hwy 101 & 42 junction	33	29	71	0.354	0.09	5.1
28938	Coos Bay W shore near spoil disposal area	42	36	65	0.513	0.08	5.4

Sediment Carbon to Nitrogen Ratios

Carbon to nitrogen ratios (C:N) in sediments can reflect the source of organic matter. C:N ratios of about 7 (i.e., Redfield ratio) in estuarine areas are associated with marine organic matter whereas values higher than this indicate some terrestrial contribution (Redfield et al, 1963). Elevated C: N ratios occurred exclusively in upper Coos Bay, Haynes Inlet, the sediment disposal site near Clam Island, and at two locations in South Slough. The elevated C:N ratios shown in the table below indicate that terrestrial sources of carbon and nitrogen have been introduced into estuary sediments and decomposition of this organic material likely contributes to oxygen demand.

Isthmus Slough 2006 CEMAP sediment sampling was conducted at different locations than in sampling conducted in 2002. Carbon levels measured in 2006 were found to be similar to those found in 2002 but 2006 nitrogen levels were found to be higher. As a result 2006 Redfield ratios were significantly lower.

Table 37 – Sites with C:N Ratios Over 8		
EMAP Station ID	Station Description	C:N Ratio
2002		
OR02-0058	Coos Bay East, south of range maker	15
OR02-0069	Coos Bay East, south of Pierce Point	13
OR02-0042	Isthmus slough, near green marker 43	13
OR02-0028	Isthmus slough, south of Hwy 101 & 42 Jct.	12
OR02-0024	South Slough north of Collver Point	11

Table 37 – Sites with C:N Ratios Over 8		
EMAP Station ID	**Station Description**	**C:N Ratio**
OR02-0004	Coos Bay Southeast, north of a blind	11
OR02-0050	Coos Bay N, north of Trans Pacific Parkway	11
OR02-0063	Coos Bay North, east of Hwy 101	10
OR02-0022	Coos Bay Northeast, near range marker	10
OR02-0036	Coos Bay SE, south of Crawford Point	10
OR02-0031	Coos Bay North, far northwest shore	10
OR02-0016	South Slough near Joe Ney slough	10
OR02-0034	Coos Bay West, west shore near spoil area	9
OR02-0006	Coos Bay Northeast, south of Kentuck inlet	9
OR02-0002	Coos Bay North, east shore near boat ramp	9
OR02-0038	Coos Bay Northeast, off Glasgow	9
OR02-0056	South Slough Browns Cove	9
OR02-0046	Coos Bay Southeast, near green marker 1	9
OR02-0062	Coos Bay Southeast, west of Crawford Point	8
OR02-0010	Coos Bay North, south of Russell Point	8

Isthmus Slough Sediment Oxygen Demand

Benthic deposits have long been recognized as having the potential to influence the oxygen content of natural waters. The effects of bottom deposits on water column oxygen are quantified and reported as sediment oxygen demand (SOD). SOD includes oxygen demand from the respiration of living organisms in the sediment and from the chemical oxidation of reduced substances (divalent iron, manganese, and sulfide) in sediments.

SOD measurement involves isolating a known volume of water and area of sediment under a respiration chamber on the bottom. The dissolved oxygen (DO) concentration in the chamber is continuously monitored to measure the rate of change in the water column dissolved oxygen concentration. A control chamber measures the water column only respiration rate via changes in DO. Water column respiration is subtracted from the total oxygen demand, and the SOD is then calculated as gO_2/m^2day.

Table 38 – 2006 Isthmus Slough Sediment Oxygen Demand			
Station	**Site Name**	**Average SOD Rate (g/m2/day)**	**Values by Chamber (n=3)**
33075	Isthmus Slough U/S Transmission Lines	3.29	2.96, -0.32, 3.63
13389	Isthmus Slough @ Sumner Bridge	1.87	1.08, 3.62, 0.90

These results indicate that sediment oxygen demand in Isthmus Slough is contributory to low water column dissolved oxygen levels.

Isthmus Slough Surface Water Quality Sampling

EPA's National Coastal Condition Report EPA identified indices of estuary water quality conditions (EPA, 2012b). Water quality index indicators include dissolved inorganic nitrogen

[DIN], dissolved inorganic phosphorus [DIP], chlorophyll *a*, water clarity, and dissolved oxygen. A good, fair, and poor rating scheme was also developed.

Table 39 – EPA Estuary Indices for Coastal Waters					
Rating	**Dissolved Inorganic Nitrogen mg/L (DIN)**	**Dissolved Inorganic Phosphorus mg/L (DIP)**	**Dissolved Oxygen mg/L (DO)**	**Chlorophyll a ug/L**	**Water Clarity* % Light @ 1 Meter**
Good	<0.35	< 0.07	>5	<5	>40%
Fair	**0.35 - 0.5**	0.07 - 0.1	2-5	**5-20**	**20-40**
Poor	> 0.5	> 0.1	<2	>20	<20

* **Supporting Submerged Aquatic Vegetation**

Table 40 – EPA Ecological Condition by Site	
Rating	**Cut Points**
Good	A maximum of one indicator is rated fair, and no indicators are rated poor.
Fair	One of the indicators is rated poor, or two or more indicators are rated fair.
Poor	Two or more of the five indicators are rated poor.
Missing	Two component indicators are missing, and the available indicators do not suggest a fair or poor rating.

In 2006 and 2007 an intensive water quality study was conducted in Isthmus Slough and its tributaries in preparation for developing a TMDL for dissolved oxygen. Waters were sampled monthly in significant tributaries and twice monthly in Isthmus Slough proper. This effort has provided a dataset unique to Isthmus Slough. These data are compared to the EPA Estuary Indices for Coastal Waters in the table below. Water quality conditions in Isthmus Slough are ranked as fair.

Table 41 – Isthmus Slough Condition (EPA Estuary Indices)					
LASAR #	**Site Name**	**Average DIN mg/l**	**Average DIP mg/l**	**Average DO mg/l***	**Average Chl a ug/l**
13388	Isthmus Slough @ Eastside Br.	0.26	0.02	7.7	3.2
13389	Isthmus Slough @ Coos City Br.	**0.36**	0.01	7.4	3.3
11884	Coalbank Sl @ mouth (Hwy 101)	0.31	0.02	8.2	3.5
13583	Shinglehouse Slough @ Mouth	**0.35**	0.01	7.7	2.9
25997	Davis Slough @ Mouth	**0.38**	0.01	7.3	2.6
28998	Noble Slough @ Tidegate	**0.61**	0.01	9.0	3.1

* Note dissolved oxygen grab samples do not reflect the daily variability observed during continuous monitoring.

Additional Isthmus Slough assessment information can be found in the Water Quality Condition Assessment by Watershed section of this document.

Other Estuary Data Not Yet Included in This Report

Select parameters are discussed here but additional data is available from other studies such as the National Oceanic and Atmospheric Association National Status and Trends Program but these data have not yet been included in this report. In addition, other sediment characterization

efforts have been conducted as required for specific projects such as dredging, cleanup, and other related project proposals.

Additional data collected as part of the 1999 and 2006 CEMAP program includes water column profiles and water quality grab samples, toxicity bioassays, invertebrate characterization (evaluation of diversity), light penetration (submerged aquatic vegetation relationship), and the presence and absence of invasive species. ***As time allows data from other studies and from other areas should be added to this assessment.***

Human Health - Chemical Contaminants in Fish

CONCERN – Fish Consumption: Tributyltin (TBT) and Mercury

Recreational Shellfish Harvesting (Clams)

The harvesting of clams, especially in the Coos Bay and Coquille estuaries in is a long standing cultural and recreational resource. Recreational clam harvesting is not managed in the same manner as is commercial oyster growing and harvesting. Water quality standards apply to this resource but closures and/or advisories are not issued in response to rainfall events that may carry bacterial loads. The Oregon Department of Agriculture is responsible for issuing bay closures for sewage, toxic material spills, or in the instance of marine biotoxins. Clam populations are widely distributed throughout Coos Bay and recent distribution surveys are useful in defining the spatial extent of the resource.

Soft-shell Clams

Oregon has an abundant and widely distributed soft-shell clam population in nearly every estuary. These clams tend to be present higher in the estuaries and survive in substrates high in fines and in areas with lesser salinities. Soft-shell clams are distributed throughout the upper Coos Bay sloughs. Coos Bay soft-shell distribution demographics are similar to those currently supporting native oysters. The upper extent of soft-shell clam populations are not currently mapped and should be defined and incorporated into resource layers as possible to assure the alignment of DEQ programs with this resource.

Figure 33 – Coos Bay Recreational Shellfish Harvesting Areas
http://www.dfw.state.or.us/mrp/shellfish/maps/Coos.asp

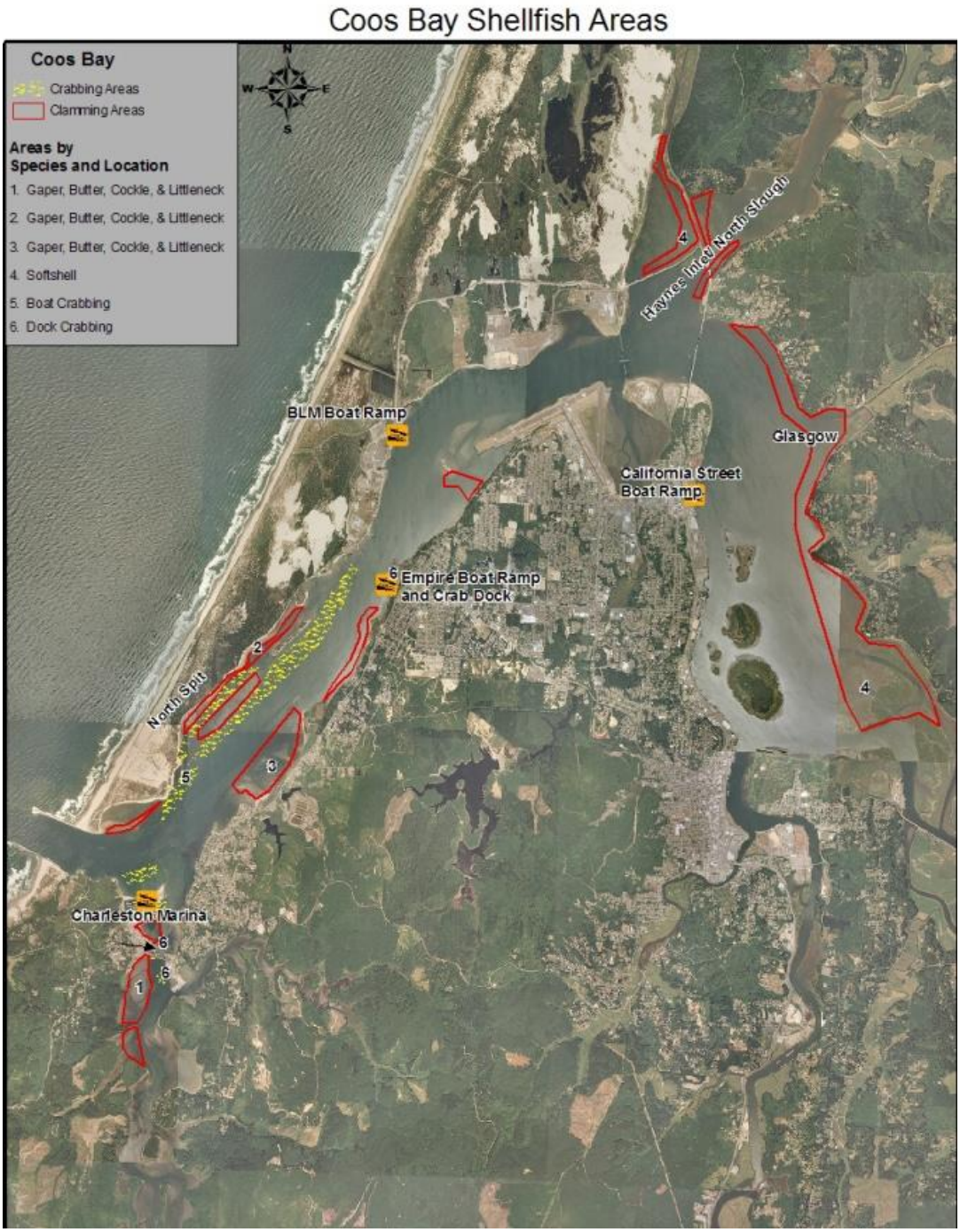
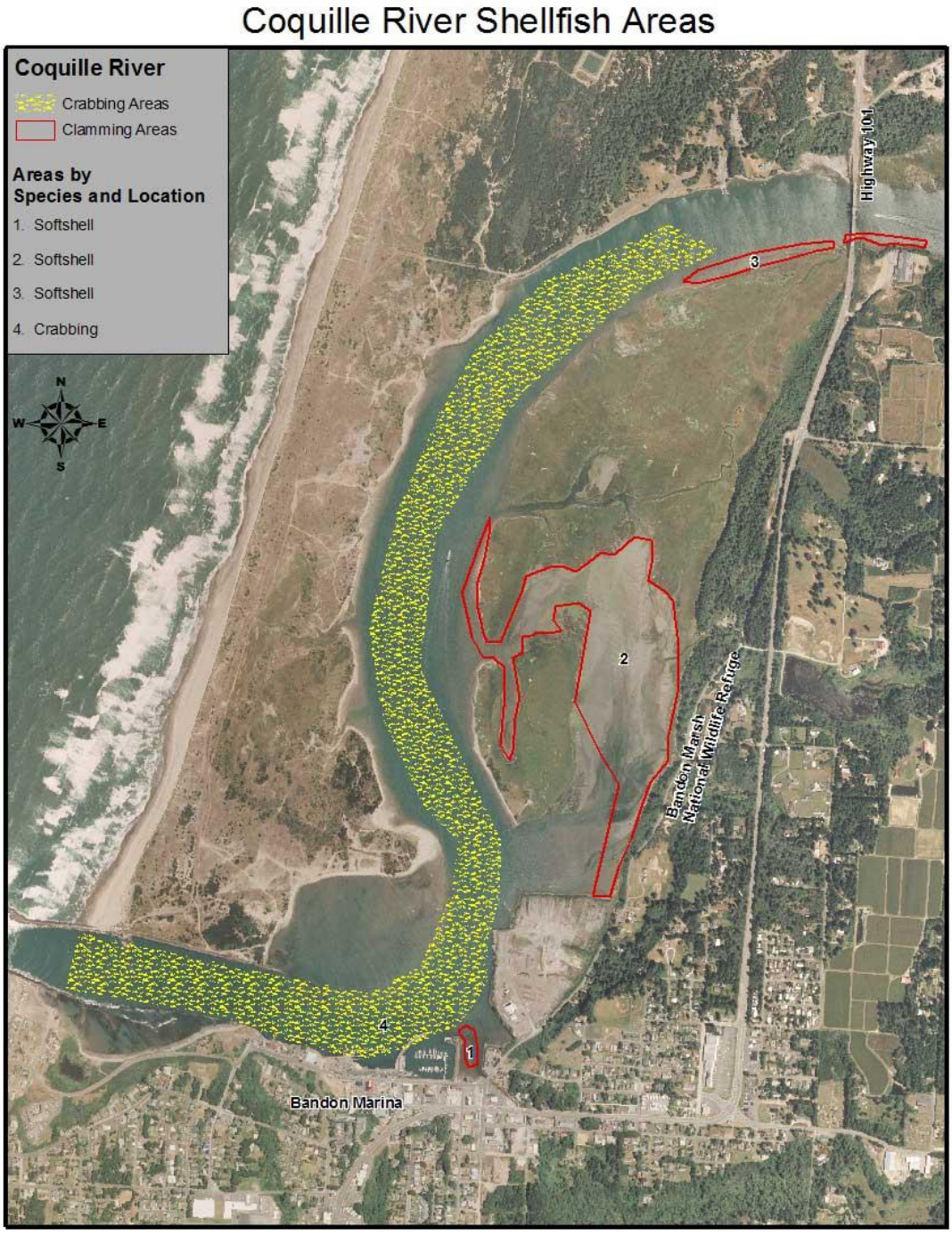
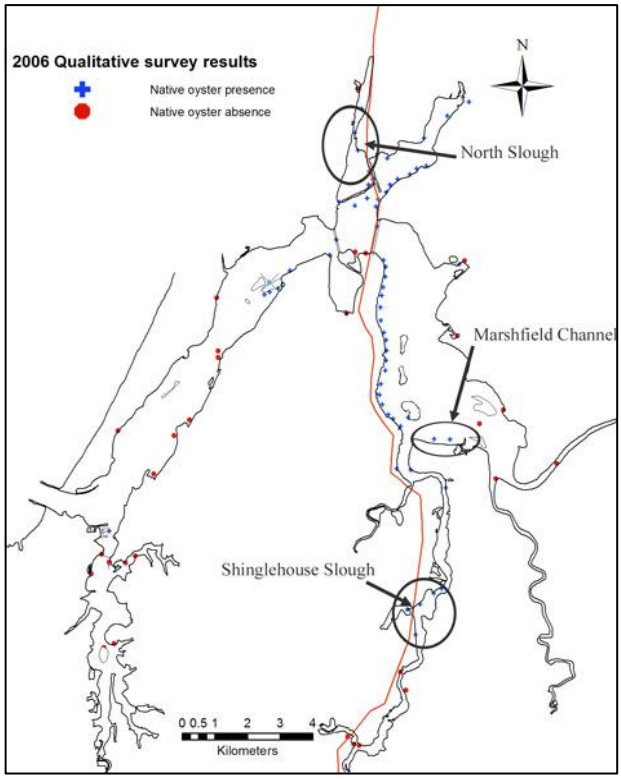


Figure 34 – Coquille River Estuary Recreational Shellfish Harvesting Areas
http://www.dfw.state.or.us/mrp/shellfish/maps/Coquille.asp



Native Oyster Recovery Efforts

Figure 35 – Native Oyster Survey Results



The South Slough National Estuarine Research Reserve (NERR) is working in partnership with diverse interests to conduct research and to develop support for the restoration of Olympic Oysters in Coos Bay. The native shellfish recovery partnership seeks to better understand the oyster's reproductive biology and early life history and ultimately develop a plan to restore self-sustaining populations of native oysters. When data from 1996-1997 surveys were compared to 2006 surveys substantial changes in the distribution of native oysters were observed. Native oysters appear to be making a slow recovery in middle and upper Coos Bay where salinities range from 10 to 30 psu. The availability of hard surfaces for larvae to settle and grow on appears be limiting.
http://www.nerrs.noaa.gov/Doc/PDF/Science/nsc_southslough.pdf

"Other" South Coast Basin Estuary Shellfish Distribution

The extent of South Coast Basin historic and current shellfish distribution in small estuaries south of the Coquille is not well defined. The spatial extent of shellfish habitat needs to be better defined. This information could then be used to clarify beneficial uses and guide the correct application of resource protection considerations and water quality bacterial standards. Pistol River is also identified as having bacterial concentrations above those allowed for shellfish growing waters on DEQ's 303d list. There are no bacterial data available for Bailey and Sixes River beaches and only limited enterococci data are available for Meyers beach.

Table 42 – South Coast Basin Shellfish Distribution

Location	Species Present
Bailey Beach (N of Gold Beach)	Razor Clams
Meyers Beach (S of Gold Beach)	
Pistol River Beach	
Sixes River Beach	

Coos Bay Toxics Study Tissue TBT

EPA's Near Coastal Waters Program began funding the Coos Bay Toxics Study in 1992. The study was designed to screen and characterize levels of chemical contaminants in Coos Bay sediments and fish tissue. The study was conducted in two phases with bay wide sediment and tissue sampling continuing through 1995. A local, federal, and state funding partnership continued shellfish tissue butyltin testing until mid 1998. **For tissue sample results for parameters other than butyltin please see the Coos Bay Toxics Study, Contaminants in Finfish and Shellfish section of this document.**

TBT, a pesticide, was detected in shellfish and fish tissue sampled between 1992 and 1994 at apparent levels of concern for human health through consumption. An interagency review group was formed and worked with the Oregon Health Authority (OHA) to assess health concerns. In early 1994 the OHA issued a health advisory warning of elevated TBT levels in clams collected from Jordon Cove, North Slough, and Catching Slough. Contaminant levels in commercial oysters were found to be significantly lower than those found in clams. A single striped bass sample was found to have elevated TBT levels.

The highest tissue TBT level detected was over 500 ppb in soft-shell clam specimens collected from Isthmus Slough upstream of the Mid-Coast Marine ship repair facility. TBT in softshell clams collected at the Catching Slough Bridge just upstream of the SAUSE Brothers/Southern Oregon Marine ship repair facility also showed high levels of TBT. Elevated TBT levels were also seen in soft-shell clam specimens collected from North Slough and Jordan Cove and sources of butyltin compounds are less apparent in these area.

Between 1995 and 1998 the analyses of TBT levels in various clam species, as well as native and commercial oysters continued. TBT was detected throughout the duration of the tissue sampling project and levels appeared to be fairly static. Oyster TBT levels were found to be consistently below those of soft-shell clams. Soft-shell clams may provide the most responsive indication of butyltin levels in shellfish. Soft-shell clam habitat most frequently occurs within areas providing high levels of fine sediment deposition. Sediments sampled in softshell clam habitat did not reflect remarkably high levels of butyltins and conversely some areas with elevated sediment TBT levels did not reflect elevated levels of butyltins in tissue samples. The non- linear relationship between shellfish tissue and sediment contamination at these sites suggests that TBT may be a water borne problem rather than a sediment borne problem in some areas like North Slough and Jordan Cove.

In late 1996 the Port of Coos Bay, Sause Brothers Inc., and Mid-Coast Marine Oregon Corp. jointly funded a study to examine the rigor of the scientific basis from which the Environmental Protection Agency (EPA) assessment criteria for TBT in food were derived. EPA's assessment criteria had been developed in 1988 based upon available studies. More recent studies were used as a justification for reducing uncertainty prompting EPA to revise the Integrated Risk Information System (IRIS) assessment criteria for TBT in food in 1997.

The Interagency Review Group and the OHA reviewed fish tissue TBT values again in light of the revised EPA assessment criteria. As a result OHA lifted all TBT shellfish advisories in Coos Bay. Based upon OHA consumption rates of 30 grams/day the current OHA screening level for TBT is 700 ppb (OHA, 2013). No Coos Bay tissue samples exceed this level.

In 2010, EPA disapproved the majority of DEQ's human health toxics criteria stating that the criteria values were based on a fish consumption rate that was too low (17.5 grams/day) to protect many

fish consumers in Oregon. DEQ then adopted human health toxics criteria based on a higher per capita fish consumption rate of 175 grams/day. DEQ is working with OHA regarding ways to better inform entities with higher consumption rates about contaminants of concern in Coos Bay shellfish. Based upon a consumption rate of 175 grams/day the TBT screening value is 120 ppb. TBT results at or above 120 ppb have been highlighted in the table below.

Table 43 - Coos Bay Toxics Study Tissue Butyltin Results Summarized

Site Description	Media*	Year	Mo	Tributyltin ppb[1]	Total butyltin compounds ppb[1]
Hwy 101, Coos Bay	Brown Rock Fish	94	5	ND	ND
Hwy 101, Coos Bay, QA		94	5	ND	ND
Hwy 101, Coos Bay	Cabezon Fish	94	5	ND	ND
W. End Airport	Cockles	98	4	10	10
Hwy 101, Coos Bay	Copper/Black/Grass Rock	94	5	ND	ND
Mid Coos Bay	Crab Tissue	93	2	4	4
Mid Coos Bay QA		93	2	3	5
South Slough		93	2	19	32
Upper Coos Bay		93	2	29	29
Mid Coos Bay	Crab Shell	93	2	ND	ND
Mid Coos Bay QA		93	2	ND	ND
South Slough		93	2	ND	ND
Upper Coos Bay		93	2	2	2
North Spit Clams	Empire Clams	96	7	10	10
W. End Airport		96	7	15	15
North Spit Clams		96	8	ND	ND
W. End Airport		96	8	ND	ND
W. End Airport		96	10	ND	5
North Spit Clams		96	11	5	5
W. End Airport		96	11	11	15
North Spit Clams		96	12	5	5
W. End Airport		96	12	10	10
W. End Airport		97	1	ND	9
North Spit Clams		97	3	ND	ND
W. End Airport		97	3	ND	5
North Spit Clams		97	4	3	3
W. End Airport		97	4	9	9
North Spit Clams		97	5	ND	ND
North Spit Clams		97	6	ND	4
W. End Airport		97	6	11	16
North Spit Clams		97	7	ND	4
North Spit Clams		97	7	ND	ND
W. End Airport		97	7	ND	8
Charleston Triangle		97	9	16	30
North Spit Clams		97	9	6	6

Table 43 - Coos Bay Toxics Study Tissue Butyltin Results Summarized					
Site Description	**Media***	**Year**	**Mo**	**Tributyltin ppb[1]**	**Total butyltin compounds ppb[1]**
North Spit Clams		98	4	ND	ND
W. End Airport		98	4	11	11
North Spit Clams		98	5	5	11
North Spit Clams		98	6	8	8
North Spit Clams	Empire Clams (flesh only)	98	4	4	4
W. End Airport		98	4	ND	ND
Charleston Triangle	Empire and Butter Clams	98	4	11	11
Hwy 101, Coos Bay	Greenling Fish	94	5	ND	ND
Coos River	Largescale Sucker Fish	93	6	ND	ND
Coos River		93	6	ND	ND
Catching Slough		94	5	ND	ND
Upper Coos Bay	Native Oysters	96	7	46	60
Isthmus Slough		96	8	ND	ND
Isthmus Slough		96	9	89	93
Isthmus Slough		96	10	57	65
Isthmus Slough		96	11	ND	19
Isthmus Slough (Central Dock)		96	11	ND	20
Isthmus Slough		96	12	29	41
Isthmus Slough		97	1	ND	9
Isthmus Slough		97	3	32	56
Isthmus Slough		97	7	ND	5
Isthmus Slough		98	1	ND	ND
Silver Point #8 (Market)	Pacific Oysters	92	5	50	60
Browns Cove		93	3	19	32
Browns Cove QA		93	3	ND	10
Joe Ney Slough		93	3	19	32
Silver Point #1 (Site #1)		94	2	ND	ND
Silver Point #1 (Site #2)		94	2	ND	ND
Silver Point #1 (Site #3)		94	2	ND	ND
Silver Point #1 (Site #4)		94	2	ND	ND
Silver Point #1 (Site #5)		94	2	ND	ND
Silver Point #7 (Site #7)		94	2	4	4
Silver Point #7 (Site #8)		94	2	ND	ND
Silver Point #7 (Site #9)		94	2	ND	ND
Silver Point #8 (Site #10)		94	2	7	7
Silver Point #8 (Site #6)		94	2	ND	ND
Browns Cove		94	4	ND	ND
Joe Ney Slough		94	4	4	4
Sengstacken Arm		94	4	ND	ND
Silver Point #3		94	4	ND	ND

Table 43 - Coos Bay Toxics Study Tissue Butyltin Results Summarized					
Site Description	**Media***	**Year**	**Mo**	**Tributyltin ppb[1]**	**Total butyltin compounds ppb[1]**
Silver Point #4		94	4	ND	ND
Silver Point #1		95	9	28	35
Silver Point #7 (Market)		95	9	31	37
Silver Point #8 (Market)		95	10	30	30
Silver Point #1		96	7	23	23
Silver Point #1**		96	7	22	22
Silver Point #3		96	7	33	39
Silver Point #4,5,6		96	7	27	31
Silver Point #4,5,6		96	7	24	24
Silver Point #7		96	7	20	20
Silver Point #7 QA		96	7	27	27
Silver Point #8,9		96	7	25	25
Silver Point #1		96	8	ND	ND
Silver Point #1**		96	8	ND	ND
Silver Point #3		96	8	ND	ND
Silver Point #7		96	8	9	9
Silver Point #8,9		96	8	ND	ND
Silver Point #1		96	9	40	40
Silver Point #1**		96	9	19	22
Silver Point #7		96	9	47	51
Silver Point #7 QA		96	9	48	57
Silver Point #8,9		96	9	34	34
Silver Point #3		96	9	32	37
Silver Point #1		96	10	17	19
Silver Point #1**		96	10	25	25
Silver Point #3		96	10	17	20
Silver Point #7		96	10	ND	5
Silver Point #7 QA		96	10	27	33
Silver Point #8,9		96	10	19	21
Silver Point #1		96	12	13	13
Silver Point #1**		96	12	ND	ND
Silver Point #7		96	12	19	19
Silver Point #7 QA		96	12	13	13
Silver Point #8,9		96	12	20	20
Silver Point #1		97	1	ND	ND
Silver Point #1**		97	1	ND	ND
Silver Point #7		97	1	ND	ND
Silver Point #8,9		97	1	ND	2
Silver Point #1		97	3	ND	2
Silver Point #1**		97	3	9	9
Silver Point #3		97	3	12	12
Silver Point #7		97	3	12	12

Table 43 - Coos Bay Toxics Study Tissue Butyltin Results Summarized					
Site Description	**Media***	**Year**	**Mo**	**Tributyltin ppb[1]**	**Total butyltin compounds ppb[1]**
Silver Point #8,9		97	3	14	21
Silver Point #8,9 QA		97	3	ND	ND
Silver Point #1		97	4	30	30
Silver Point #1**		97	4	27	27
Silver Point #3		97	4	12	14
Silver Point #4,5,6		97	4	11	11
Silver Point #7		97	4	28	31
Silver Point #7 QA		97	4	18	21
Silver Point #8,9		97	4	24	24
Silver Point #1		97	5	8	12
Silver Point #1**		97	5	ND	ND
Silver Point #7		97	5	13	17
Silver Point #8,9		97	5	ND	3
Silver Point #8,9 QA		97	5	ND	6
Silver Point #1		97	6	11	17
Silver Point #1**		97	6	11	11
Silver Point #3		97	6	16	20
Silver Point #7		97	6	15	15
Silver Point #7 QA		97	6	ND	ND
Silver Point #8,9		97	6	ND	ND
Silver Point #1		97	8	15	27
Silver Point #1**		97	8	20	28
Silver Point #3		97	8	8	16
Silver Point #7		97	8	12	16
Silver Point #7 QA		97	8	12	17
Silver Point #8,9		97	8	14	24
Silver Point #1		97	9	20	24
Silver Point #1**		97	9	18	32
Silver Point #4,5,6		97	9	16	28
Silver Point #7		97	9	21	31
Silver Point #8,9		97	9	24	29
Silver Point #7 QA		97	9	18	29
Silver Point #1		97	12	ND	ND
Silver Point #1**		97	12	ND	ND
Silver Point #3		97	12	ND	ND
Silver Point #7		97	12	ND	ND
Silver Point #7 QA		97	12	ND	ND
Silver Point #8,9		97	12	ND	ND
Silver Point #1		98	1	ND	ND
Silver Point #1**		98	1	ND	ND
Silver Point #3		98	1	ND	ND
Silver Point #4,5,6		98	1	ND	ND

Table 43 - Coos Bay Toxics Study Tissue Butyltin Results Summarized					
Site Description	**Media***	**Year**	**Mo**	**Tributyltin ppb[1]**	**Total butyltin compounds ppb[1]**
Silver Point #7		98	1	ND	ND
Silver Point #7 QA		98	1	ND	ND
Silver Point #8,9 QA		98	1	ND	ND
Silver Point #1		98	4	15	18
Silver Point #1**		98	4	10	21
Silver Point #3		98	4	14	14
Silver Point #4,5,6		98	4	14	14
Silver Point #7		98	4	10	10
Silver Point #7 QA		98	4	13	13
Silver Point #8,9		98	4	11	11
Silver Point #1		98	5	20	26
Silver Point #1**		98	5	19	34
Silver Point #3		98	5	23	29
Silver Point #4,5,6		98	5	13	19
Silver Point #7		98	5	19	25
Silver Point #7 QA		98	5	17	23
Silver Point #1		98	6	13	13
Silver Point #3		98	6	16	16
Silver Point #4,5,6		98	6	9	9
Silver Point #7		98	6	14	14
Silver Point #7 QA		98	6	19	19
Jordon Cove	Softshell Clams	92	5	457	491
North Slough Clams		92	5	264	293
Gardiner (Umpqua)		92	5	10	47
North Slough Clams		94	4	52	56
Catching Slough @ Bridge		94	4	168	172
Haynes Inlet		94	5	ND	2
Silver Point #8 (one clam)		95	10	374	374
North Slough Clams		96	7	71	71
North Slough Clams		96	8	ND	ND
North Slough Clams		96	9	125	129
Catching Slough @ Bridge		96	10	ND	8
North Slough Clams		96	10	ND	6
North Slough Clams		96	11	ND	3
North Slough Clams		96	12	59	59
North Slough Clams		97	1	ND	10
Catching Slough @ Bridge		97	3	462	468
Jordan Cove		97	3	113	113
North Slough Clams		97	3	127	132
Jordan Cove		97	4	87	87
North Slough Clams		97	4	89	92
North Slough Clams		97	5	94	94

Table 43 - Coos Bay Toxics Study Tissue Butyltin Results Summarized					
Site Description	**Media***	**Year**	**Mo**	**Tributyltin ppb[1]**	**Total butyltin compounds ppb[1]**
North Slough Clams		97	6	78	82
Catching Slough @ Bridge		97	6	166	166
Catching Slough @ Bridge		97	7	57	57
North Slough Clams		97	7	27	27
Catching Slough @ Bridge		97	9	223	231
North Slough Clams		97	9	66	73
North Slough Clams		98	1	ND	ND
Catching Slough @ Bridge		98	4	379	379
North Slough Clams		98	4	103	103
Catching Slough @ Bridge		98	5	203	209
Isthmus Slough		98	5	432	438
North Slough Clams		98	5	71	77
Catching Slough @ Bridge		98	6	119	119
Isthmus Slough		98	6	521	521
North Slough Clams		98	6	72	72
Catching Slough @ Bridge	Softshell Clams (flesh only)	98	4	ND	ND
North Slough Clams		98	4	ND	ND
Isthmus Slough	Staghorn Sculpin Fish	94	5	ND	ND
Isthmus and Catching Sloughs	Starry Flounder Fish	92	5	3	3
Isthmus Sl, Coos River		93	6	ND	ND
Isthmus and Catching Sloughs		94	5	ND	ND
Isthmus Slough	Striped Bass Fish	93	5	16	16
Catching Slough		92	5	110	130
Catching Slough QA		92	5	130	130
Isthmus Slough		92	5	40	50
Isthmus and Catching Sloughs	Striped Bass Fish (white flesh only)	94	5	9	15
Charleston Bridge South	Various Hardshell Clams	92	5	19	50
Charleston Triangle		92	5	14	120
Coos Bay STP #2		92	5	13	48
Port of Coos Bay SS		92	5	31	68
Charleston Flats		94	4	ND	ND
Charleston Triangle		94	4	ND	ND
W. End Airport		94	4	2	2
N. Spit Clam Island		94	4	ND	ND
Pigeon Point		94	4	3	3
Pigeon Point QA		94	4	3	3
Isthmus Slough	White Sturgeon Fish	94	5	ND	ND

[1]Reported as wet weight,* Whole animals were analyzed unless otherwise identified. Samples were composites of 8 -12 animals unless otherwise identified, ** Site established to track progressive age class, QA = Field Replicate, NA = Not Available, ND = Non Detect (detection limit = 2 ppb).

Figure 36 – Tributyltin in Whole Body Shellfish

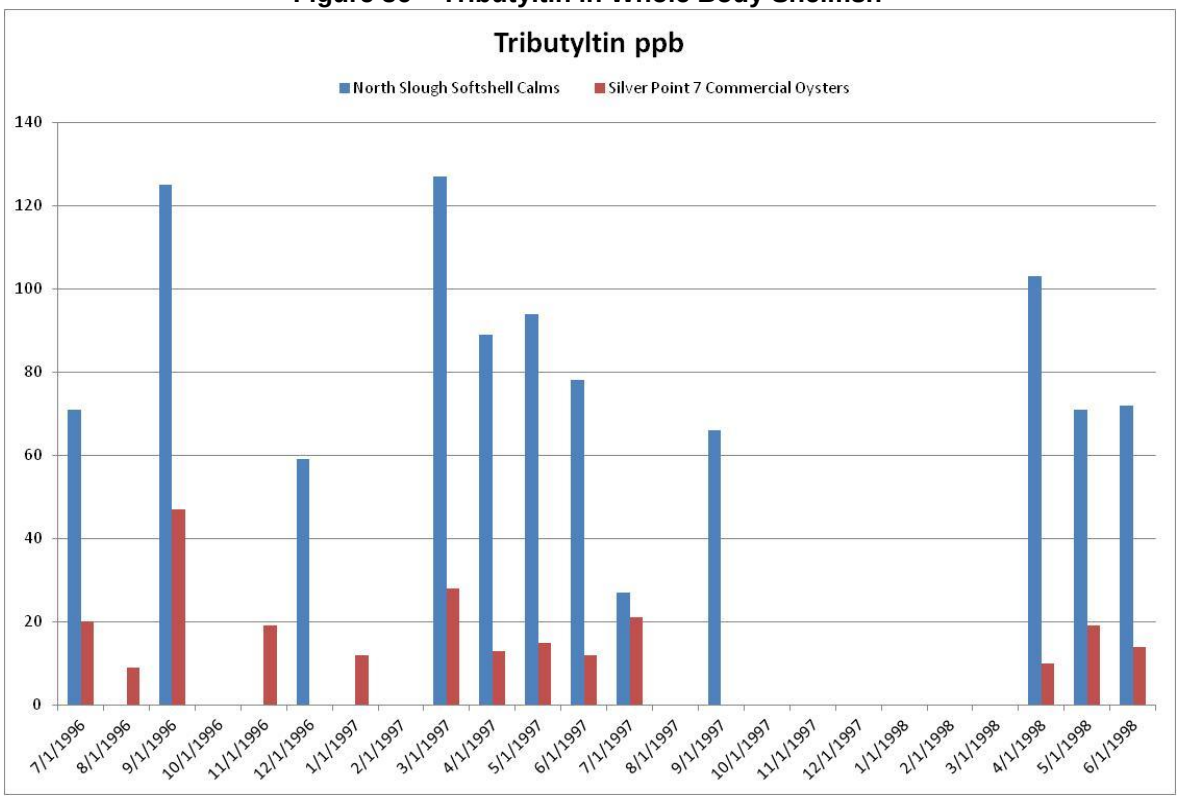


Figure 37 – Tributyltin Levels in Catching Slough Softshell Clams

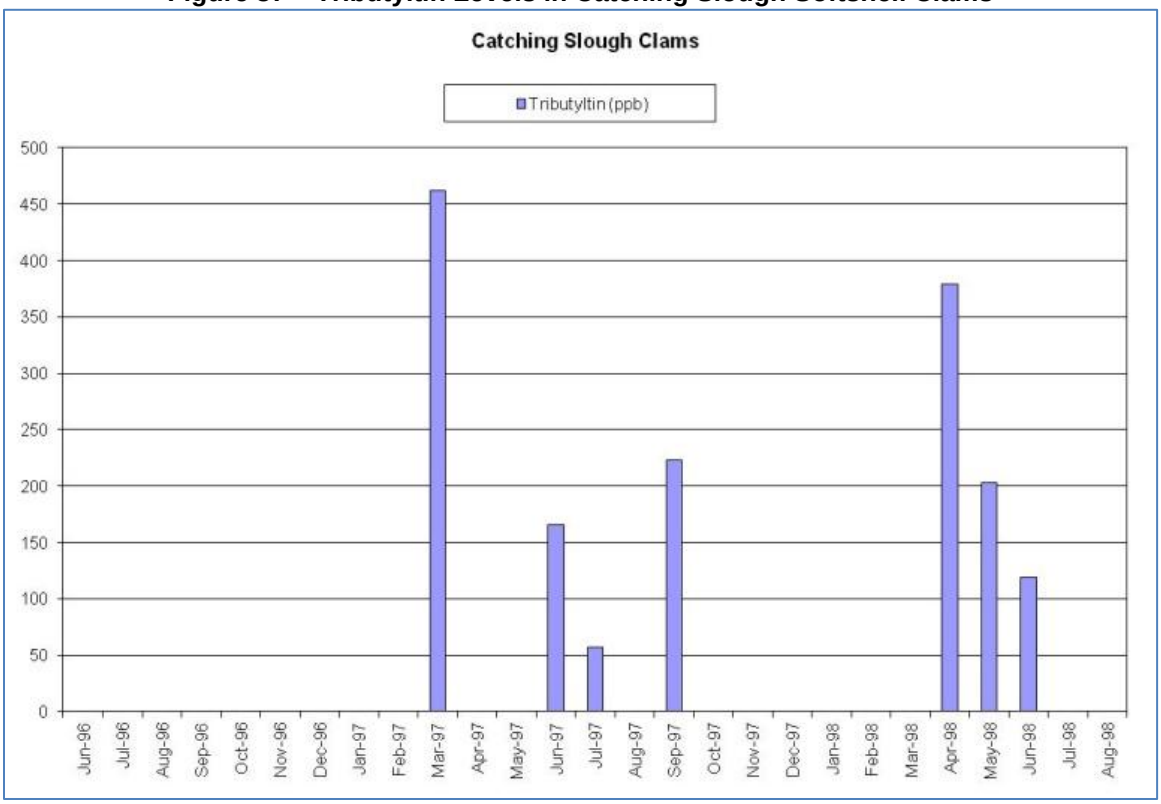
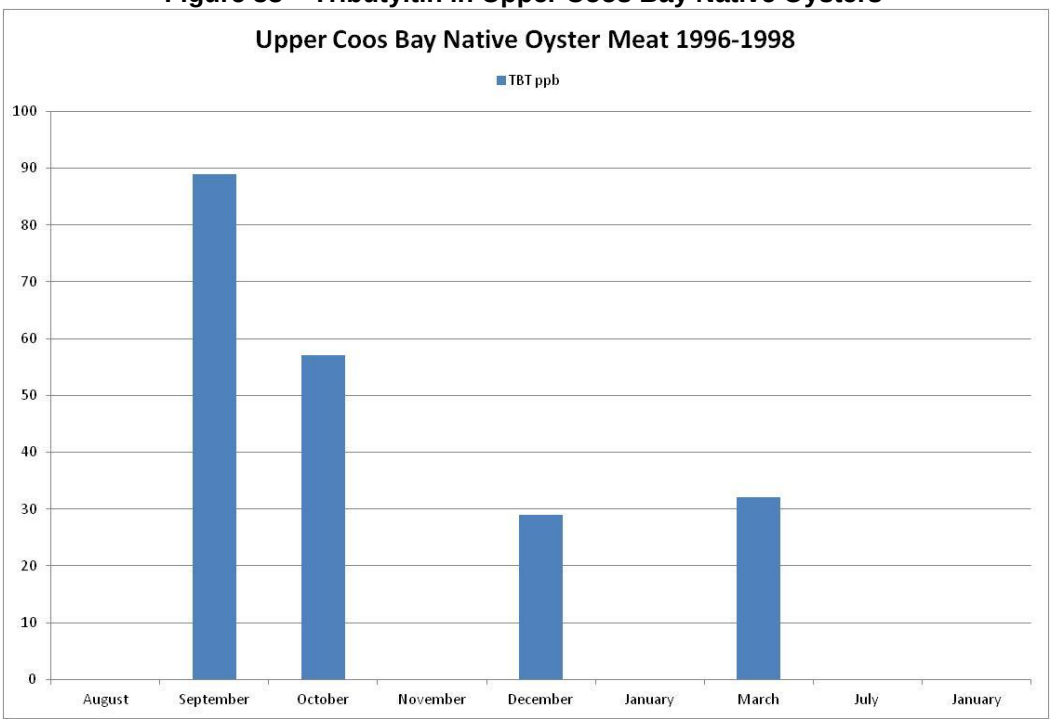


Figure 38 – Tributyltin in Upper Coos Bay Native Oysters



Data retrieved from the NOAA National Status and Trends data portal is shown in the figures below for the two Coos Bay long term monitoring stations, Russell Point and Coos Head. Mussel tissue sampled between 1988 and 2002 show a decreasing trend in butyltin levels. Note that these data are reported as dry weight.

Figure 39 - NOAA Status and Trend Coos Head Mussel Tissue TBT

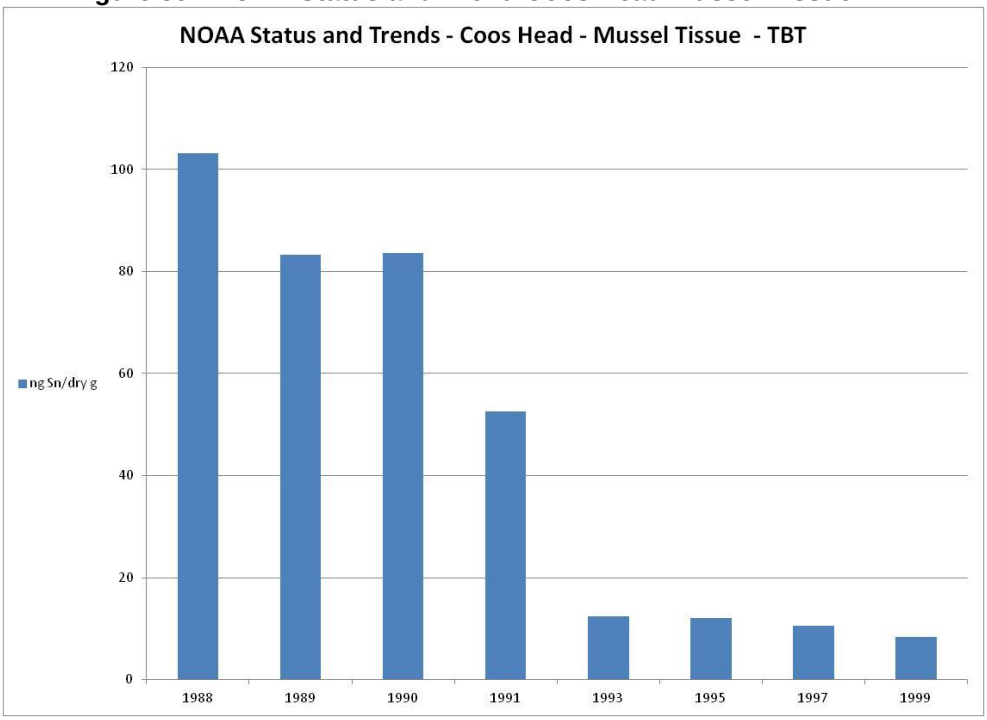
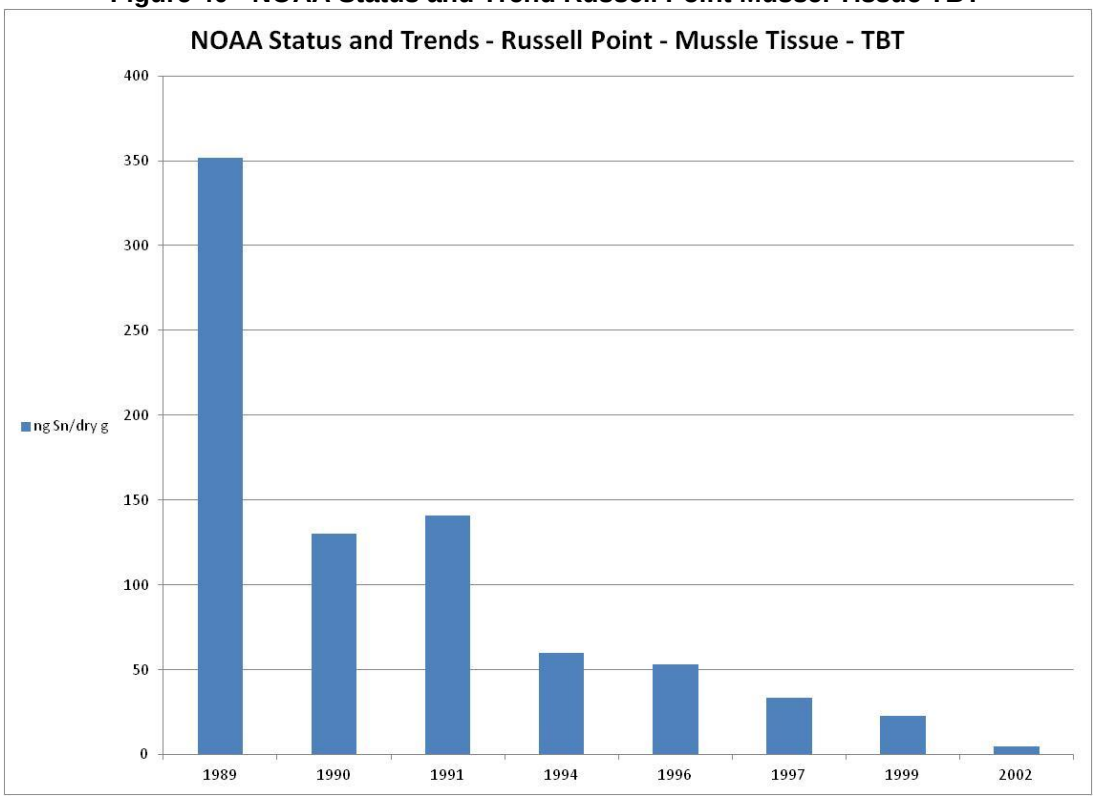


Figure 40 - NOAA Status and Trend Russell Point Mussel Tissue TBT



The NOAA National Status and Trends Mussel Watch Program Report (Kimbrough, 2008) assessed two decades of tissue contaminant data collected at two Coos Bay long term monitoring stations, Russell Point and Coos Head. NOAA evaluated the status of various mussel tissue chemical contaminants as a current measure of chemical contamination. The status of a given contaminate is then ranked as high, medium, or low when compared to other stations sampled nationwide and regionally. Statistically significant chemical contaminate trends were also evaluated providing information about whether concentrations have increased, decreased, or remained the same over time. Russell Point mussel tissue was ranked as "medium" for cadmium and mercury on a national level. Cadmium, mercury, and zinc were all ranked as "medium" in the Northwest Region. Russell Point mercury tissue levels showed an increasing trend.

Limited data are available for the diverse array of shellfish and finfish within the Coos Bay estuary. It remains a challenge to determine how sampling for chemical contaminants within edible tissue can be accomplished routinely. Historically shellfish sampling and classification protocol have only included fecal coliform and biological toxins.

Finfish Consumption

Limited testing has been conducted for fish tissue contaminants and there are currently no fish consumption advisories in the South Coast Basin. Whole fish sampled as part of the Coos Bay Toxics Study and the CEMAP program (see the Estuary Condition section) contained low levels of heavy metals and inorganics. The CEMAP program sampled and analyzed various species of whole fish. Because fish are not commonly consumed whole, these sample results cannot be directly compared to guidelines or standards designed to protect human health. Rather, sample results represent the overall body burden of contaminants present in the fish sampled. DEQ

plans to work with the Oregon Health Authority (OHA) at some time in the future to further interpret this data in regard to human health. Coos Bay Toxics Study fish tissue contaminant levels were reviewed by OHA and found not to be at levels of concern based upon OHA accepted consumption rates. DEQ plans to continue working with OHA regarding ways to better inform entities with higher consumption rates about contaminants of concern in Coos Bay.

CONCERN – Fish Consumption: Mercury

Tenmile and Eel Lakes Fish Mercury

Mercury was mined commercially in the South Coast Basin and used in gold and silver amalgamation. In addition, mercury has been used historically in fungicide formulations and can still be found in many commercial products including fluorescent lights, thermometers, automobile switches and dental amalgam. Mercury is also naturally present in trees and fossil fuels such as coal, natural gas, diesel fuel and heating oil. The mercury present in these fuel sources is released into the atmosphere upon combustion. Atmospheric mercury can be transported great distances and is known to be deposited on the landscape via either wet or dry deposition (Sweet *et al*., 1999, 2003). (DEQ, 2006b)

The Oregon Health Authority (OHA) fish consumption advisory screening level for methylmercury is 0.20 mg/kg wet weight tissue. OHA applies a fish consumption rate of 30 grams/day or about four meals a month. The Environmental Protection Agency (EPA) Tissue Residue Criterion is 0.3 mg methylmercury/kg fish. EPA applies a fish consumption rate of 17.5 grams/day. When the DEQ human health toxics criteria fish consumption rate of 175 grams/day is applied the screening level is reduced to 0.04 mg methylmercury/kg fish. For the purposes of fish advisories OHA assumes that total mercury in fish is almost entirely in the form of methylmercury. DEQ is working with OHA regarding ways to better inform entities with higher consumption rates about contaminants of concern.

Bass collected in 2008 were over the ODFW allowable size limit for harvest so fishing regulations alone disallows their consumption. Because no recent sampling of legal size fish has been conducted OHA has decided not to issue a fish advisory at this time and has requested that additional Tenmile Lakes fish sampling be conducted as resources allow.

Table 6. Mercury Concentration in Tenmile and Eel Lakes Fish

Site name	Sample Year	Number of Samples	Tissue Total Mercury mg/kg wet weight	Sample Matrix
Tenmile Lake at deepest point	1995	6	0.35 (Max 0.98/Min 0.14)	Fillet, no skin - Largemouth Bass
	1996	20	0.22 (Max 0.57/Min 0.08)	Fillet with skin - Bluegill (0.11), Bass (0.34)
	1997	9	0.40 (Max 0.83/Min 0.09)	Fillet, no skin - Species Unknown
Tenmile (South) Lake ODFW Sta. 1,4,7,8	2008	5	0.77 (Max 0.96/Min 0.65)	Fillet, no skin - Bass
Eel Lake @ deepest point	1997	10	0.39 (Max 0.88/Min 0.05)	Fillet, no skin - Species Unknown
North Tenmile Lake @ deepest point	1996	20	0.27 (Max 0.80/Min 0.11)	Fillet with skin - Bluegill (0.14),

Table 6. Mercury Concentration in Tenmile and Eel Lakes Fish				
Site name	**Sample Year**	**Number of Samples**	**Tissue Total Mercury mg/kg wet weight**	**Sample Matrix**
				Bass (0.44)
North Tenmile Lake @ deepest point	1997	10	0.30 (Max 0.70/Min 0.10)	Fillet, no skin - Species Unknown
North Tenmile Lake ODFW Sta. 1,3,4,5	2008	5	0.95 (Max 1.43/Min 0.29)	Fillet, no skin - Bass

Sixes River Mercury

Historic gold mining activities at the former Inman Mine site may be a continuing source of mercury to the Sixes River and the adjacent Bureau of Land Management (BLM) recreation site. Mercury was historically used to amalgamate gold and then the mercury is driven off by heat which allows the recovery of the gold solids. Miners continue to harvest elemental mercury from the Sixes River and extract gold in this manner today.

Addressing mercury from this abandoned is challenging because mining activities ended long ago and the party responsible for the contamination is no longer available to conduct cleanup. Mine sites are also often technically challenging and expensive to address and available state funding to assist is limited. DEQ continues to work with federal agencies and our Congressional delegation to identify potential federal funding sources to help address the highest priority abandoned and inactive mine sites. The Inman Mine should continue to be raised and as site that needs continued investigation and potential remediation.

Current recreational dredging activities are administered by the State of Oregon and have been authorized since 1970. Dredging is allowed only during the 'In-Stream Work Period', July 15th through September 30th in order to protect fishery resources. Panning and sluicing are allowed year-round. Commercial mining in the Sixes River is prohibited.

Recreational suction dredging is the most common method of gold mining in the Sixes River, and many small dredges (four inch or smaller intake nozzle) operate during the summer near Bureau of Land Management Sixes River Recreation Area. Sixes River recreational miners report finding instream elemental mercury, raising both ecological and human health concerns. BLM reported that one miner recovered over nine ounces during a single day. The subsequent processing (cooking off) of mercury extracted during dredging has resulted in the deposition of mercury on the ground in the recreation area. BLM characterized soils in the recreation area and subsequently conducted a removal of contaminated soils where mercury residuals were found to be at levels representing a threat to human health. BLM continues to be interested in partnering with DEQ to further evaluate the impacts of mercury at this site.

Considering the riverine conditions, inorganic mercury (elemental mercury) is expected to be the predominant form of mercury at the site, as opposed to organic mercury (methylmercury). Shallow, moving waters of the Sixes River tend to be well oxygenated and non-reducing as opposed to deeper, stratified, lake environments. According to the Forest Service, mercury is not naturally occurring in the Sixes River, and was only introduced to the area during historic mining activities. Additional information can be found in the DEQ Environmental Cleanup Site (ESCI) database. The Sixes River Placer Mine site ID is 2658.

In 1996, DEQ collected and analyzed fish tissue (sculpin and rainbow trout) and stream sediment samples for total (inorganic + organic) mercury. Several sizes of each fish species were collected and fish tissue results showed mercury concentrations in the upstream sculpin approaching 0.35 mg/kg. Elevated mercury concentration in the sculpins' tissue may be attributable to age since the larger sculpins and trout had the greatest mercury concentrations. The average mercury concentrations in the fish tissue samples were found to be low compared to similar fish tissue studies conducted in Oregon lakes. The DEQ laboratory recommended sampling of larger and older fish to determine if mercury body burden increases. The stream sediment sample results showed low total mercury concentrations. Concentrations of elemental mercury segregate into the substrate - bedrock interface by density and instream mercury deposits appear to be predominantly in sediments and at depth.

In August 1998, crayfish were collected and analyzed for total mercury. Mercury concentrations ranged from 0.05 mg/kg to 0.11 mg/kg, well below the OHA's trigger level of 0.20 mg/kg. In 1998, the drinking water well at the Recreation Site was tested for metals including mercury, pesticides and VOCs (volatile organic compounds). The results showed contaminant levels below method detection limits or below levels of concern (EPA Region 9 Tap Water PRGs).

Human Health – Shellfish Bacteria

CONCERN - Shellfish Consumption: Elevated Levels of Fecal Coliform

Commercial Shellfish Aquaculture

Coos Bay and South Slough support one of the states' largest commercial oyster industries. No other South Coast Basin areas are currently utilized for commercial oyster production at this time. Water quality in the Coos Bay estuary is "conditionally approved" for shellfish growing. Oysters are filter feeders and tend to concentrate contaminants present in the water column.

Rainfall events trigger runoff carrying elevated bacterial levels which adversely impact water quality and resulting harvest closures. Conditionally approved growing waters are determined to be water quality limited and 36 South Coast Basin "estuary" segments are identified on the 2010 303d list as impaired (DEQ, 2011). Some areas of Coos Bay are prohibited for use as commercial shellfish growing areas because of the close proximity to bacterial sources like waste water treatment plant outfalls as well as areas with urban storm drains. Areas where large ships moor and load are also classified as prohibited due the potential for discharges.

Elevated levels of fecal coliform bacteria result in recreation and commercial shellfish growing area advisories and closures. Fecal coliform is used as the bacterial indicator organism to manage shellfish growing waters in order to protect humans from disease when consuming shellfish.

Fecal coliform data collected from estuaries supporting shellfish growing are available but have not been presented here. Bacterial load reductions needed to attain shellfish growing criteria can be derived from this information. In addition, bacterial intensive sampling studies implemented during storm events provide additional insight into the amount of rainfall needed to trigger bacterial loading, sources of bacterial loads to estuaries, and the period of time needed for bacterial levels to decline. ***These data are not presented here but should be added to this assessment as time allows.***

Conditionally approved shellfish growing areas are managed based upon rainfall events of sufficient size to raise fecal coliform levels above a geometric mean of 14 colonies/100 ml. Less

than 10% of samples collected during times when the growing areas are open are allowed to be at or above 43 colonies/100 ml.

Although classified in the past, the Coquille River is not currently utilized or managed as commercial shellfish growing waters.

Coos Bay is closed to commercial shellfish harvest under the following conditions;

- When there is more than 1.5" of rain within a 24-hour period; or greater than 2.5" in 72 hours, the Upper Coos Bay Conditionally Approved Area
- When there is more than 1.0" of rain in a 24-hour period; or greater than 1.0" in 72 hours, the Pierce Point (previously East Bay) and Haynes Inlet conditionally approved areas are closed.
- The Lower Coos Bay Conditionally Approved Area remains open during rainfall closures, unless there is a sewage or toxic spill impacting the Lower Bay.
- Upper South Slough and Middle South Slough, including Browns Cove, will be closed 10 high tides when 3-day total is greater than 2.5", or when more than 1.5" rain falls in 24 hrs.
- Winchester and Sengstacken Arms and Joe Ney Slough will be closed for 10 high tides when 3-day total is greater than 1.0", or when more than 1.0" of rain falls in 24 hrs.

These rainfall triggered closures are currently occurring in response to relatively small storm events. The magnitude of storm events is often described using the term precipitation return intervals. Precipitation return intervals are based upon the historical rainfall measurements and evaluated to determine how often a rainfall event of a given magnitude is expected to occur. For example; a 100 year rainfall return interval describes and event which has a one percent chance of being exceeded in any year (it does not mean one event every 100 years). The table below summarizes rainfall return intervals for daily precipitation at the North Bend Airport weather station (per comm. George Taylor, Oregon Climate Service, 2000).

Table 44 – Rainfall Return Intervals
Daily Precipitation North Bend, Oregon (inches)

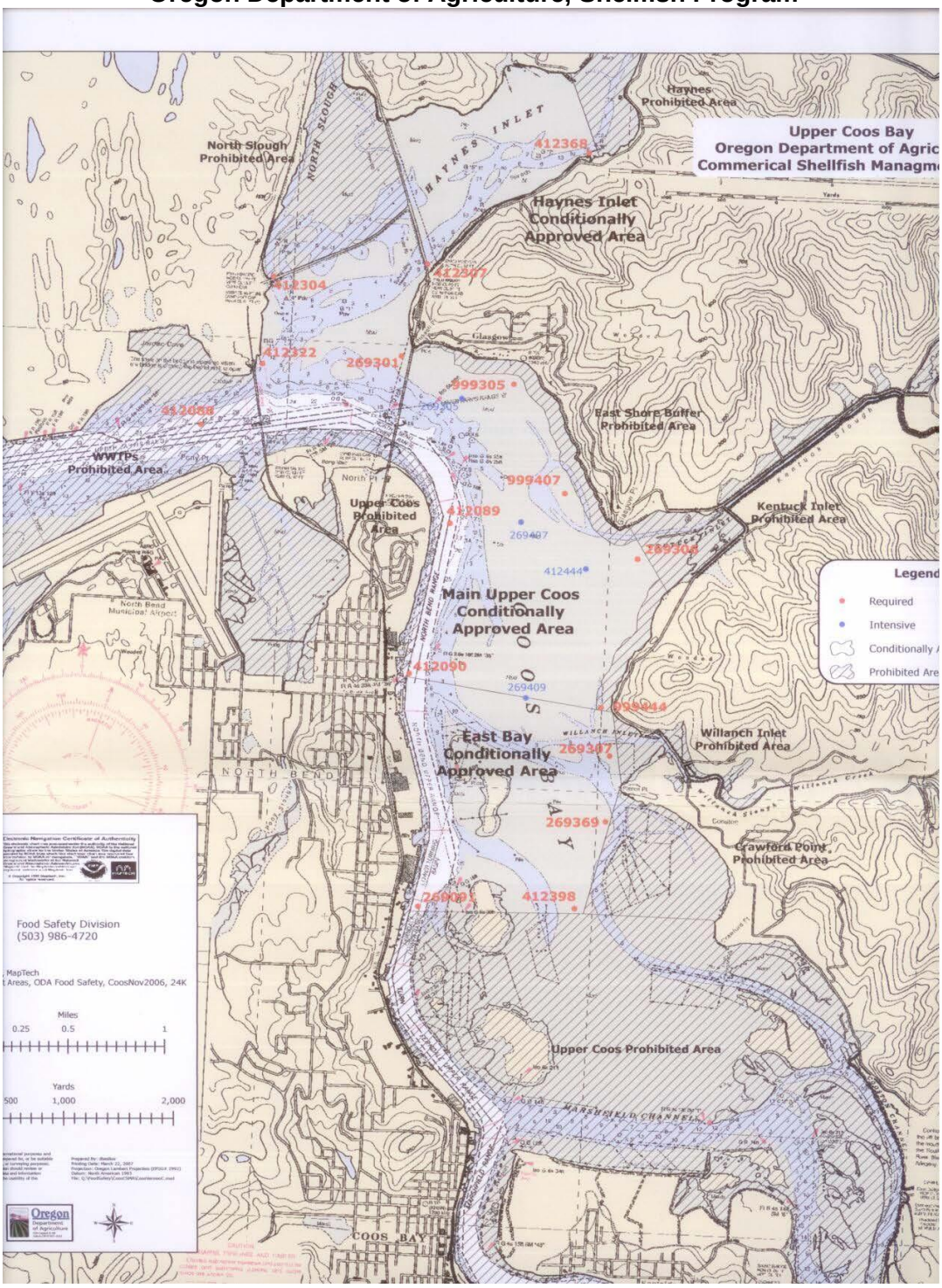
	24 Hours	48 hours	72 hours	96 hours	120 hours
2 year	**2.68**	**4.1**	**5.15**	**5.95**	**6.73**
5 year	3.81	5.51	6.60	7.57	8.41
10 year	4.87	6.49	7.51	8.57	9.45
25 year	6.43	7.74	8.59	9.74	10.66

When compared to historic rainfall return incidence shellfish growing water closures occur during two year return interval rainfall events. The Coos Bay area routinely experiences storms of this magnitude several times a year. Bacterial reductions that would allow shellfish growing to continue in larger sized storms would allow better support for this beneficial use.
The Department of Agriculture is the State agency responsible for managing the harvest and sales of commercial oysters. Bay closure procedures are initiated when any of the following conditions occur:

- A sewage spill of such magnitude to affect water quality and shellfish operations;
- A toxic material spill of a magnitude to affect shellfish or growing waters;

- Flooding determined to impair the adequate treatment of sewage from subsurface sewage treatment systems on the bay;
- Marine biotoxins in the edible portion of shellfish are determined to be near or above the alert levels set by the US Food and Drug Administration (FDA).

Figure 41 – Coos Bay Commercial Shellfish Growing Waters Classification Oregon Department of Agriculture, Shellfish Program



Point Source Design Criteria

Waste water treatment plant design criteria state that domestic waste collection and treatment facilities are prohibited from discharging raw sewage to waters of the State during the period of November 1 through May 21, except during a storm event greater than the one-in-five-year, 24-hour duration storm as specified in OAR 340-041-0009(6) and (7). A one-in-five year, 24 hour duration, storm is based upon Figure 26 of the 1973 NOAA Atlas 2 entitled "Precipitation-Frequency Atlas of the Western United States, Volume X – Oregon". This figure is entitled "Isopluvials of 5-yr 24-hr precipitation in tenths of an inch". A one-in-five-year, 24-hour duration storm size ranges from 4.0 inches in the northern portion of the South Coast Basin to 6.0 inches in the southern portion of the basin.

The NPDES CAFO general permit prohibits the discharge of process wastes to surface waters except when rainfall events cause an overflow of process waste water from a facility designed, constructed, operated, and maintained to contain all process-generated waste water plus the runoff and direct precipitation from a 25-year, 24-hour rainfall event. (For new source swine, poultry, and veal large concentrated AFOs, facilities must be designed, constructed, operated, and maintained to contain all process-generated wastewaters plus the runoff from a 100-year, 24-hour rainfall event for the location of the facility.) This is essentially a "no discharge" technology-based effluent limit required by the federal EPA. A one-in-twenty five-year, 24-hour duration storm size ranges from 5.5 inches in the northern portion of the South Coast Basin to 8.0 inches in the southern portion of the basin.

Point source design criteria should be examined and aligned with shellfish growing criteria to assure that allowable PS design criteria alone do not result in water quality limited 303d listings. Where this is the case, DEQ should determine if either design criteria and/or shellfish growing criteria need clarification or adjustments.

Human Health - Harmful Algal Blooms

CONCERN: Biological Toxins - Recreational Contact and Drinking Water

Some species of algae, such as cyanobacteria or blue-green algae, can produce toxins that can cause serious illness or death in pets, livestock, wildlife, and humans. There are multiple beneficial uses affected by harmful algal blooms. These include: aesthetics, livestock watering, fishing, water contact recreation, and drinking water supply (DEQ, 2011b).

Nutrient pollution, warm water, high pH, stagnant water and lots of sunlight can lead to excessive blooms. Nutrient pollution can come from wastewater treatment plants, residential on-site wastewater treatment systems, agricultural, urban and forestry runoff, and natural sources. Introduced fish species also can recycle nutrients and preferentially graze zooplankton within a lake, allowing for more intense blooms. Warm water, high pH, stagnant water and sunlight are conditions that are harder to control in lakes and large rivers than nutrient pollution (DEQ, 2011b).

In 2011 DEQ finished the development of an Oregon DEQ Harmful Algal Bloom (HAB) Strategy. The purpose of this effort was to describe and recommend improvements to an overall strategy that the Department of Environmental (DEQ) can implement in order to prevent and control, where possible, Harmful Algal Blooms (HAB) in Oregon. The primary audience for this strategy is DEQ management and staff. This document may also be useful to others, particularly the wide range of partners that are involved addressing HABs in Oregon (DEQ, 2011b). The HABs strategy document provided a HABs summary for Tenmile Lakes which is presented in

Appendix H of this document. For more information about Oregon DEQ's overall HABs strategy please see the Oregon DEQ Harmful Algal Bloom (HAB) Strategy at: http://www.deq.state.or.us/wq/algae/algae.htm.

Tenmile Watershed Total Maximum Daily Load (TMDL)

DEQ has worked in partnership with diverse interests to develop a Tenmile Watershed TMDL assessment focusing on water quality goals and pollution control targets to address aquatic weed and algae problems. The TMDL focuses on sediment and phosphorus reductions and describes the amount (load) of these pollutants that the lakes can receive and be expected, through time, to meet water quality standards.

All lakes have some level of natural nutrient loading and sedimentation from things like natural landslides, wildlife, and decaying organic material. Tests have shown that the rate the Tenmile lakes have been filling with sediments has dramatically increased compared to predevelopment rates. Landowners who own property near the mouths of tributaries are increasingly alarmed by the accelerated rate of the formation of sediment bars.

Phosphorus travels to the lakes on sediment, and the amount of sediment (and phosphorus) delivered to the lakes from human-caused activities has increased. This sediment loading has exceeded the lake's ability to "digest" the accompanying nutrients. Because the lakes act like big settling basins, very little of this sediment and phosphorus load can be moved out of the lakes once it enters. This makes coastal lakes very sensitive to upland sediment inputs. In stream systems, large storms can more readily move and digest sediment loads.

The filling in of the lake facilitates the growth of weeds because they can root on the lake bottom and still get sunlight in shallow waters. Because the blue-green algae that are problematic in the lakes are able to take nitrogen from the air, lake-bottom sediments can provide phosphorus that they need to grow. In the summer months, phosphorus from increased lakefront activities is more readily available to algae than that stored in sediments. Reducing phosphorus present in lake water is identified as an important measure to reduce nuisance algae problems.

The TMDL takes into account contributions from all sources, including current and past agricultural, lakefront residential, urban, and forest management activities. Ground-disturbing activities can increase the amount and velocity of runoff during storms. Runoff from the City of Lakeside is addressed as a nonpoint source pollutant because of the relatively small population of this incorporated area. Recreational activities such as boating can create wakes that erode sediment from the lakefront. Nutrients from yard and garden, as well as older or improperly functioning septic systems are significant contributors during the summer months. Fisheries management can also add or remove nutrients, and different fish eat different organisms. This "preferential grazing" by fish can favor growth of blue-green algae. There are many factors which combine to influence the water quality of Tenmile lakes.

The Tenmile Watershed TMDL seeks to define that amount of sediment and phosphorus that can be added from human activities and still protect lake water quality. This is known as the "loading capacity." The pollutant loading capacity is distributed between all sources as a "load allocation". Sediment loads in the Tenmile Watershed TMDL are depicted in tons per area from lake tributaries. The Murphy Creek tributary was used as the reference condition. The reference condition was then used to set sediment target loads for the remaining lake tributaries. Nearly all nonpoint source pollutant loading was allocated to natural sources. The annual sediment loads set for lake tributaries reflect tons of sediment that would be expected to enter the lakes in

rather routine rainfall events expected to occur 95-98% of the time. Large variability in sediment loading occurs based upon the timing and size of storm events that fall in the watershed. The TMDL also set sediment accrual rate load reductions to slow lake sedimentation.

The accuracy and attainability of loads identified in this TMDL will be proven through time and monitoring. Although further discussion may help refine loading information, most land managers and lakefront residents know that pollutant loading can be reduced from its current level. To meet the load allocations the following activities have been identified as critical;

- Implement basin-wide sediment abatement activities
- Maintain and/or establish riparian vegetation to buffer nutrient inputs
- Maintain and/or establish lakefront wetlands to buffer nutrient inputs
- Develop and implement invasive weed management programs

Tenmile Lakes Watershed Water Quality Management Plan (WQMP)

The CWA as well as Oregon's TMDL rule required a water quality management plan (WQMP) be developed to guide implementation of the Tenmile Watershed TMDL. The WQMP identifies activities that may be contributing to accelerated pollutant delivery. It then identifies entities that have authorities over such activities as "Designated Management Agencies" or DMAs. These DMA's are asked to develop Water Quality Implementation Plans (WQIPs) that reflect how the activities they govern may impact water quality and what management mechanisms are in place to reduce pollutant loading. These WQIPs identify the technologies, best management practices, and/or measures and approaches to be implemented by each source to reduce pollution.

An agricultural water quality management plan addressing agricultural activities has already been adopted for the watershed. Land management activities on the Elliott State Forest (ESF) are managed according to the 2011 ESF Forest Management Plan. Private timber lands are governed through the implementation of the Oregon Forest Practices Act and other voluntary measures. The Oregon Department of Fish and Wildlife Tenmile Lakes Fish Management Plan guides fishery management. The Department of State Lands manages the lake bottom and bed and banks and Oregon State Marine Board authorities relate to navigability. The City of Lakeside and Coos and Douglas Counties are identified as local jurisdictions with authorities related to land development and with ownerships which they directly manage.

Adaptive Management

DEQ recognizes that there are uncertainties in the development of any TMDL. It may also take a significant amount of time to achieve water quality standards. DEQ proposes to use an adaptive management approach with the Tenmile Watershed TMDL. This means reviewing the progress made towards achieving the TMDL every five years. Each management agency will need to track plan implementation and progress. If implementation or management techniques prove inadequate, the management agencies will need to revise their plans. DEQ, in consultation with the management agencies, will determine if all feasible steps have been taken to meet the TMDL. DEQ will revisit the TMDL as new water quality information is available and resources are allocated.

Harmful Algal Bloom (HAB) Advisories

The Oregon Health Authority Harmful Algae Bloom Surveillance (HABS) program has been working to gain a better understanding about the occurrence of toxic algae blooms in Oregon, and advises the public when a bloom has been detected, so people can take protective action to avoid illness. Funding for the HABS program ended as of September 30, 2013, and many

program functions are no longer available. However, the Oregon Health Authority (OHA) continues to collect and review information on HABs and to inform the public through the issuing and lifting of advisories when water sampling data warrants. In order to issue and lift advisories, the OHA must rely on water sampling performed, and data provided by partner agencies and lake managers. OHA staff will continue to answer any health related questions, and receive illness reports for humans and pets.

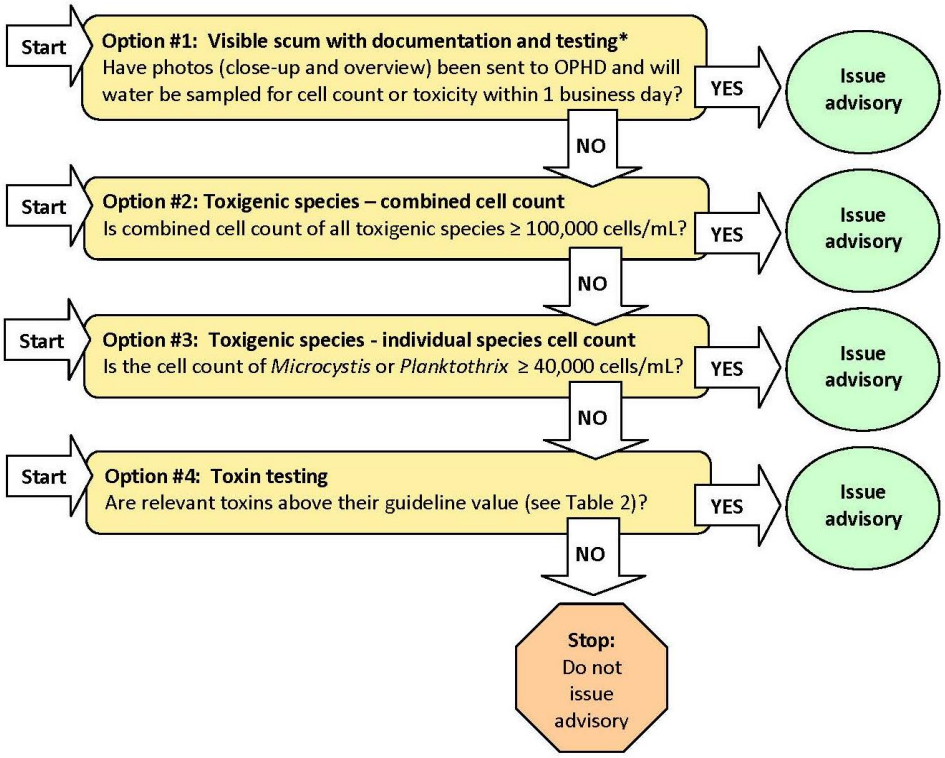

Sru Lake Blue Green Algae Bloom

Due to the patchy nature of blue-green algal blooms it is possible for higher HAB densities and toxin concentrations in areas along shorelines. Given the fact that all areas of a lake cannot be tested at all times, those utilizing the lakes for drinking water should always follow Oregon Health Authority recommendations for purification. Another option is to use bottled water for drinking and cooking purposes. Recreational users should always avoid contact with water whenever a visible surface scum of algae are evident or when the lake has an obvious green to blue-green appearance. Because pets or other domestic animals are likely drink water contaminated with a HAB, these animals should not be allowed access to the lakeshore whenever a surface of algae or an obvious green to blue-green appearance is evident.

The OHA continues to encourage water resource and recreation site managers to submit blue-green algae data on monitored lakes. Without this data, the OHA is not able to advise the public regarding the status of HABs and to make recommendations about the safety of water based recreational activities. For additional information please visit http://www.oregon.gov/DHS/ph/hab/.

The figure below shows the Oregon Public Health Department Process for Issuing Public Health Advisories for hazardous algal blooms (OHA, 2012). More information can be found at: http://public.health.oregon.gov/HealthyEnvironments/Recreation/HarmfulAlgaeBlooms/Documents/HABPublicHealthAdvisoryGuidelines.10.10.12.pdf

Figure 42 – Process for Issuing Public Health Advisories for HABs (OHA, 2012)



*Note: If an advisory was issued based on Option 1 and initial sample results come back below guideline values after an advisory has already been issued (based on visual assessment), no additional sampling is required to lift the advisory. It will be lifted as soon as OPHD receives the initial laboratory results showing cell count or toxin concentrations are below guideline values.

Scum is defined as a visible mass of algae or cyanobacteria in stagnant or slow moving water. Scum accumulations of the greatest concern are those occurring at or near recreational access points.

OPHD guideline values for cyanobacterial cell counts and toxins are based on the World Health Organization risk categories and research in the field. More information regarding the rationale used to help determine when advisories should be posted is provided in Appendix A.

Table 45 – Record of South Coast Basin Harmful Algal Blooms

Lake Name	Year	Start Dates	Duration	Dominant Cyanobacteria Species	Maximum Cell Count	Maximum Toxin Measured (ug/l)
Tenmile*	1997	10/3	60	*Microcystis aeruginosa*		Microcystin – 1.65
	2000					Microcystin – 2.3
	2001	8/31				
	2002	7/6				
	2003	9/22				
	2004	March?				
	2009	9/18	73	*Microcystis aeruginosa* *Aphanizomenon flos-aquae* *Anabaena planctonica*	4,664,468	Microcystin – 20.1
	2010	9/23	112	*Microcystis aeruginosa* *Anabaena planctonica* *Aphanizomenon flos-aquae*	5,939,379	Microcystin – 149 - 705 Anatoxin 0.2

Table 45 – Record of South Coast Basin Harmful Algal Blooms						
Lake Name	**Year**	**Start Dates**	**Duration**	**Dominant Cyanobacteria Species**	**Maximum Cell Count**	**Maximum Toxin Measured (ug/l)**
	2011	8/25	88	*Aphanizomenon*		
	2013	10/4	60	*Microcystis aeruginosa*		
Sru	2009	9/9	82			
	2010	8/30	36			
	2011	8/24	167	*Anabaena*		
	The USFS discontinued algae sampling and lake advisory information is continuously posted. A thick blue green surface scum was observed during sampling conducted in 2012.					
Eel Lake	2002	Sept.	One report of high Microcystis cell count. No advisory issued because data was reported to OHA much later. .			

* The presence of Aphanizomenon in Tenmile Lakes in 1956 was reported in Sweet, James W. May 1985. An Analysis of Phytoplankton of Oregon Lakes. Aquatic Analysts, Portland, OR. Sweet (1985)

National Lakes Assessment (NLA)

In the summer of 2007, crews from the Oregon Department of Environmental Quality (DEQ) surveyed 30 lakes and reservoirs across the state as part of EPA's NLA. This sampling effort was designed to provide broad scale nationwide condition assessment information to EPA and to determine the relative importance of stressors in impacting lake conditions. The report summarizing this effort can be found at http://www.deq.state.or.us/lab/techrpts/docs/10-LAB-012Lakes2007.pdf (DEQ, 2010b).

The trophic state is a measure of a lake's algal biomass, or primary productivity potential. Several water quality parameters can be used to estimate trophic state. The NLA determined the trophic state of lakes separately for each of four parameters; nutrients (total nitrogen and phosphorus, chlorophyll-a, and depth of the photic zone measured by Secchi disk. The thresholds used to define trophic status, based on values from the literature, were used nationwide (EPA, 2010).

An ogliotrophic lake has low primary productivity and low nutrient levels. Ogliotrophic lakes often have excellent water quality and support diverse aquatic life. A mesotrophic lake is characterized by intermediate productivity often with beds of submerged aquatic vegetation. A eutrophic lake has high biological productivity due to excessive nutrients and may be dominated by aquatic plants or algae. Hypereutrophic lakes are very nutrient rich and often have severe algae blooms.

The following table summarizes the trophic status of the three South Coast Basin Lakes included in this survey.

Table 46 – Lake Trophic Status				
Lake Name	**Secchi**	**Chlorophyll a**	**Total Phosphorus**	**Total Nitrogen**
Horsfall Lake	Eutrophic	Eutrophic	Eutrophic	Mesotrophic
Lake Edna	Ogliotrophic	Ogliotrophic	Ogliotrophic	Ogliotrophic
Powers Pond (sampled 2X)	Eutrophic	Hypereutrophic	Hypereutrophic	Hypereutrophic
	Eutrophic	Hypereutrophic	Eutrophic	Eutrophic

The NLA used the reference condition approach to identify *least-disturbed* lakes to establish benchmarks for indicators (Stoddard et. al 2006). Least-disturbed conditions represent "the best of what's left" for any given region. Multiple sets of reference sites were used to assess different indicator types. Each separate set of reference sites was used to establish benchmarks for determining condition classes for the various indicators, and the methods by which benchmarks were determined also varied.

The distributions of values observed at reference sites were used to determine the conditions of all indicators at a lake, except for recreational indicators and shoreline human disturbance. For indicators where increasing values were associated with improved conditions, the 5th and 25th percentiles of reference values were used as benchmarks separating condition classes. For indicators where increasing values were associated with decreasing conditions, the upper 75th and 95th percentiles were used as benchmarks (DEQ, 2010b). South Coast Basin results are shown below.

Table 47 – National Lakes Survey - South Coast Basin Lakes Characterized

Lake Name	Biological Indicators (Plankton)	Physical Habitat				Water Quality Indicators			
		Shoreline Human Disturbance	Riparian Vegetation Cover	Littoral Cover	Littoral and Riparian Cover	Total Phosphorus	Total Nitrogen	Turbidity	Chlorophyll a
Horsfall	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Poor
Edna	Good	Fair	Good	Good	Good	Good	Good	Good	Good
Powers Pond (2X)	Poor	Poor	Poor	Good	Fair	Poor	Poor	Poor	Poor
	Poor	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Poor

Poor biological conditions, as measured by plankton assemblages, were observed for 23% of the lakes surveyed in Oregon. Riparian and shallow water habitats were found to be the most common stressors.

The table below summarizes other lakes where additional monitoring to determine the status of water quality, invasive weeds, and algal blooms is desired.

Table 48 – South Coast Basin Lakes Water Quality Status

Lake Name	Maximum Depth (ft)	Size (Acre)	DEQ 2010 Integrated Report
Eel Lake	65	355	pH 303(d) List cat 4a TMDL Approved
Tenmile	22	1,627	Aquatic Weeds and Algae 303(d) List cat 4a TMDL Approved
North Tenmile	23	1,098	
Spirit (Horsfall)	3	204	Habitat Modification 303(d) list cat 4c Not Needing a TMDL
Beale	13	130	

Table 48 – South Coast Basin Lakes Water Quality Status			
Lake Name	**Maximum Depth (ft)**	**Size (Acre)**	**DEQ 2010 Integrated Report**
Bluebill	Not Available		
Sandpoint Lake			
Snag			
Sru			Aquatic Weeds and Algae – 303(d) List cat. 5 – TMDL needed
Floras	35	236	Aquatic Weeds and Algae, chlorophyll a, Iron 303(d) List cat. 5 – TMDL needed
Garrison	26	90	Aquatic Weeds and Algae, pH, Phosphorus Category 4a - Point Source only TMDL approved, NPS TMDL needed

Many other small coastal lakes not listed here are present in the South Coast Basin. Water quality in many of these lakes has never been characterized or very little data is currently available. In 2006 DEQ partnered in funding a South Coast Watershed Council lake monitoring project focusing on water quality and aquatic plants. DEQ will seek to continue working with partners to support the characterization of all coastal lakes in the basin through time.

Aquatic Nuisance Weeds and Invasive Species

DEQ uses information documenting reports of excessive growths of invasive, non-native aquatic plants that dominate the assemblage in a water body and have a harmful effect on fish or aquatic life or are injurious to health, recreation, or industry to identify areas where water quality impairment exist. Invasive, non-native aquatic plants include species on the Oregon Department of Agriculture Noxious Weed Policy and Classification System designated as “A”, “B”, or “T” weeds or those covered by a quarantine in OAR 603-052-1200. (DEQ, 2012)

“A” designated weeds are weeds of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent. Recommended actions to address “A” designated weeds warrant that these infestations be subject to eradication or intensive control when and where found. (ODA, 2012)

“B” designated weeds are weeds of economic importance which is regionally abundant, but which may have limited distribution in some counties. Recommended actions to address “B” designated weeds warrant limited to intensive control at the state, county or regional level as determined on a site specific, case-by-case basis. Where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) shall be the primary control method. (ODA, 2012)

“T” designated weeds are priority noxious weeds designated by the Oregon State Weed Board as a target for which the ODA will develop and implement a statewide management plan. “T” designated noxious weeds are species selected from either the “A” or “B” list. (ODA, 2012)

Excessive invasive aquatic weeds can impair the beneficial uses: domestic and industrial water supply, irrigation, livestock watering, fish and aquatic life, fishing, boating, water contact recreation, and aesthetic quality.

Other South Coasty Basin invasive species of concern include New Zealand mudsnail, zebra mussels, and mitten crab. New Zealand mussels compete with native invertebrates for food and habitat, and can have a detrimental impact on fish populations, vegetation, and other native biota. Zebra mussels reproduce rapidly and can damage boat engines, clog power plant and public water pipes, and threaten native mussels, fish and wildlife by competing for their food. Mitten crab can eat salmon, trout and sturgeon eggs, and in large populations can cause damage to levees and increase bank erosion.

Humans play a major role in the movement of a wide variety of plant and animal species to habitats outside of their historic range which can threaten native biodiversity and may disrupt entire ecosystems. Eradication of invasive species can be difficult if not impossible and the economic costs can be significant. The spread of invasive species represents a unique and particularly threatening type of pollution.

A TMDL addressing invasive aquatic weeds has been developed for the Tenmile Lakes. Where suitable depths occur, invasive aquatic weeds are able to quickly colonize. This makes reducing sedimentation an important component in the management of aquatic weeds. In addition, the Tenmile Lakes Basin Partnership has developed the Tenmile Lakes Integrated Aquatic Plant Management Plan to guide efforts to control invasive weeds (TLBP).

Several state and federal agencies and organizations (DEQ, ODFW, Portland State University, Oregon State University, U.S. Forest Service, and Oregon Wildlife Heritage Foundation) are working together inform residents and visitors about ways they can help prevent the spread of invasive species. Boaters and hikers, who go from one recreational area to another within the state, as well as out-of-state boaters and hikers, have some of the most important roles to play.

Wetlands

CONCERN: Aquatic Life - Loss of Wetlands

National Wetland Condition Assessment

EPA and its State, Tribal, and Federal partners participated in implementing the first-ever national survey on the condition of the Nation's wetlands in 2011. The survey is designed to provide regional and national estimates of wetland ecological integrity and rank the stressors most commonly associated with poor conditions. The process of designing and conducting the survey is also intended to help build state and tribal capacity to monitor and analyze wetland conditions while promoting collaboration across jurisdictional boundaries.

The National Wetland Condition Assessment (NWCA) uses a probability-based sampling design to provide statistically-valid estimates of condition for a population of wetlands. States, tribes and federal partners will participate in the NWCA design, planning, and field assessment. A consistent field assessment procedure will be used for the NWCA to ensure that the results can be compared across the country.

In collaboration with Oregon Department of State Lands (ODSL), DEQ staff sampled 12 wetlands in Oregon in 2011. A report detailing the results of these surveys should be available sometime in 2014. Wetland-Survey-Fact-Sheet

For additional information please see the 401 water quality certification section of this document.

Aquatic Life –Flow and Habitat

Flow volume is an important thermodynamic and hydrologic parameter that is subject to human manipulations. Many water quality parameters are affected by flow volume. In fact, the flow regime of a riverine system formulates the basic connectivity of instream and riparian processes (Boyd, 2003). Large volume streams are less responsive to temperature change, and conversely, low flow streams will exhibit greater temperature sensitivity (and greater rates of stream temperature change). Stream flow volume affects the wetted channel dimensions (width and depth), flow velocity (and travel time), and pollutant assimilative capacities. Human related reductions in flow volume can have a significant influence on stream water quality (Boyd, 2003). TMDL allocations are flow based and depicted as mass per unit pollutant loads. Accessing good hydrological information is critical to the development and implementation of TMDLs.

There are three active USGS continuous flow monitoring stations in the basin, the South Fork Coquille, Chetco, and Smith Rivers. There are also historic, inactive, USGS stations with variable length period of records. The tables below summarize locations where continuous flow measurement data is available.

The USGS Oregon StreamStats tool applies regression equations supporting the estimation of instantaneous peak flows with annual exceedance probabilities/recurrence intervals. In addition, the StreamStats tool measures and reports a suite of hydrological pertinent watershed characteristics.

The Coos Watershed Association maintains and operates thirteen stream gauging stations and three weather stations in the Coos sub-basin. This data can be accessed at the watershed association's website http://www.cooswatershed.org/Gaging_Home.html.

Other miscellaneous Oregon Water Resource Department (OWRD) field measurements are also available.

Table 49 – South Coast Basin Continuous Stream Flow Data

4th Field HUC Sub-Basin	USGS Station	Total Avg. Yield Acre Feet	May – Sept. Yield Acre Feet
Coquille	14326500 MF Coquille River, Near Myrtle Pt OR	438,591	38,486
	14327000 NF Coquille River, Near Myrtle Pt OR	676,012	55,456
	14325000 SFk Coquille River, At Powers, OR	563,473	46,654
Coos	14323200 Tenmile Creek, Near Lakeside OR	244,720	NA
Sixes	14327150 Sixes River, At Sixes, OR	500,518	26,189
Chetco	**14400000 Chetco River, Near Brookings, OR**	1,627,791	136,846
Smith	**11532500 Smith River, Near Crescent City, CA**	2,714,713	317,679

Fish Distribution

Anadromous fish are widely distributed throughout the South Coast Basin and continuing presence absence surveys often identify new stream segments occupied by fish populations. The distribution of anadromous is not static but rather can vary based upon flows during periods of spawning. The table below summarizes total stream miles and the percent of total stream miles accessed by anadromous species.

Table 50 – South Coast Basin Fish Presence Data			
4th Field HUC/ Sub-basin	Total Miles[1]	Stream Miles With Anadromous Fish Presence[2]	Percent of Total Miles of Streams Accessed by Anadromous Fish
Coquille	1,177	187	16%
Coos	892	186	21%
Sixes	536	86	16%
Chetco	674	96	14%
Smith[3]	98	14	14%

[1]Major stream miles - 100K Hydro GIS Layer, [2]StreamNet, [3]Oregon Only Portion

Resident trout and a wide variety of other fish species are widely distributed throughout the South Coast Basin and data collected during stream surveys continues to expand areas of known presence. Areas not accessible by anadromous fish due to passage barriers are often inhabited by resident trout populations.

Flow and Habitat Modifications

CONCERN: Aquatic Organisms and Water Quality - Adequate Instream Flow and Habitat Features

Flow and habitat modification affect both water quality and fish habitat in many ways. Some South Coast Basin flow and habitat modification impairments are identified in the 2010 Water Quality Assessment (DEQ, 2012). In 2002, it was determined that flow and habitat modifications are not pollutants in themselves and therefore TMDLs are not required. These parameters continue to be an important part of most TMDL assessments and may be identified as surrogate measures where improvements are needed to improve other water quality parameters.

Temperature – Low Flow

Human related reductions in flow volume and habitat complexity influence stream temperature dynamics and increase diurnal variability in stream dissolved oxygen, and pH. Higher summer flows and sufficient channel complexity provide deeper water which prevents solar radiation from penetrating the water column fully. Stream flow and habitat complexity affect the wetted channel dimensions (width and depth), flow velocity (and travel time), and the amount of heat the water column can receive and meet a desired condition (i.e. temperature) (Boyd, 2003). In addition, these modifications can reduce or eliminate groundwater connectivity and cool hyporheic flow.

Because flow volume and channel dimension directly relate to the parameter temperature, flow augmentation and instream habitat targets may be incorporated into temperature TMDLs as surrogate measures.

In addition, thermal waste load allocations for point source discharges are flow based. This means that when more flow is available increased dilution allows for the discharge of warmer effluent than during low flow periods when less dilution potential is available.

Hydromodified Channels

Many forms of modified channels existing in the South Coast Basin including urban streams, stabilization projects, and the clearing, cleaning, straightening, widening, deepening, and the relocating of existing stream channels. These modifications are often made for flood control and drainage improvement purposes and have resulted in more uniform channel cross sections and reduced average pool depths (EPA, 2007).

Channelized and simplified streams are common in South Coast Basin agricultural lowlands. In many areas levees have been are placed along stream banks to delay flooding into adjacent wetlands and riparian areas during high-water events. These modifications interrupt natural drainage from upland slopes, delay over bank flooding and the lateral movement of high flows into adjacent areas, and concentrate erosive flows causing channel instability and streambank erosion. Increased instream volume and velocity accelerate the delivery of sediment, nutrients, bacteria, and other NPS pollutants to downstream areas of the watershed (EPA, 1993). Slowing stream flows allows sediment bed load to sort and deposit and allows time for bacterial die off to occur.

Coastal Coho and Stream Complexity

The lack of sufficient over-wintering habitat for coastal juvenile Coho populations has been identified as the primary factor limiting the recovery of this threatened fish population. High stream velocities during flow events displace or wash juvenile fish downstream. If these fish cannot find a place to hold over on the way downstream, they can be prematurely delivered into saltwater where they die (ODFW, 2005).

Over-wintering habitat for juvenile Coho provides slower stream velocities during rainfall events. Stream velocities are slowed by instream complexity like instream wood, pools, off-channel alcoves, beaver ponds, connected floodplains, and wetlands. South Coast Basin low gradient streams, often associated with agricultural wetlands, represent areas with High Intrinsic Potential to provide high quality winter habitat (ODFW, 2005). Habitat improvements that create shelter for juvenile Coho salmon during the over-winter rearing period are a high priority in these areas.

Table 51 – Limiting Factors for Independent Populations in the Oregon Coast Coho ESU (ODFW, 2007)

Population	Primary Limiting Factor	Secondary Limiting Factor
Tenmile	Exotic Fish Species	Stream Complexity Water Quality
Coos	Stream Complexity	Water Quality
Coquille	Stream Complexity	Water Quality
Floras	Stream Complexity	Water Quality
Sixes	Stream Complexity	Water Quality

http://www.oregon.gov/OPSW/cohoproject/pdfs/november2007_pdfs/coho_plan.pdf

Because of this type of interconnectivity between water quality and flow quantity and stream habitat complexity DEQ expects to see improvements in flow and habitat conditions as a result of TMDL implementation.

Please see Action and Alignment Opportunities, Point Source Program, Section 401, Removal/Fill WQ Certification for additional information.

South Coast Basin Water Availability (from OWRD (2002))

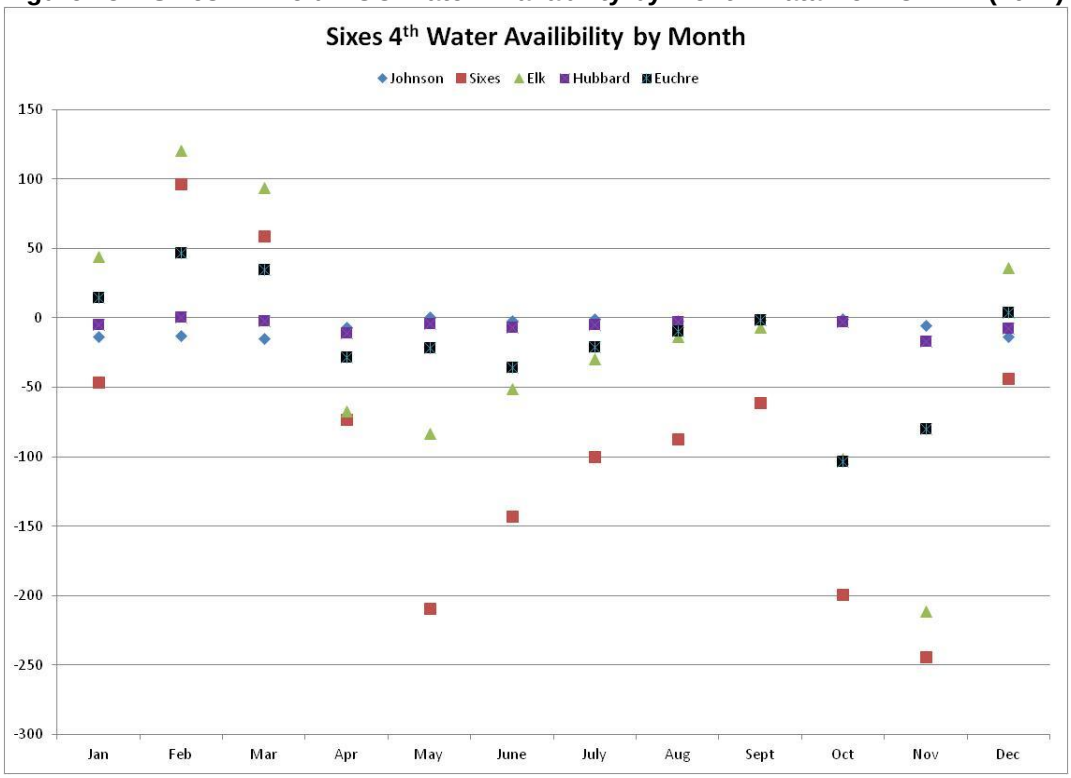
Oregon Water Resource Department (OWRD) has created and maintains a database of the amount of surface water available for appropriation for most waters in the state. Examining water availability allows the characterization of the influences that water *quantity* may have on water *quality*. Water availability is obtained from natural stream flow by subtracting existing storage, out-of-stream consumptive uses, and in-stream demands. Water availability has been calculated for over 2500 Water Availability Basins (WAB) in Oregon. In general, the calculation of water availability at one WAB cannot be considered in isolation from other WABs in the same stream system.

Stream flow can be highly variable, and it is useful to characterize it in some way, usually by a statistic, e.g., a monthly or annual mean. The appropriate statistic in this case is exceedance stream flow. This statistic tells us how often to expect a given rate of stream flow to occur based upon historic flow records or estimated through modeling.

Consumptive use from allocations for out-of-stream uses can total no more than the 80-percent exceedance natural stream flow, and allocations for in-stream flows can be no more than the 50-percent exceedance natural stream flow. When consumptive use flow allocations meet these thresholds water becomes unavailable for additional consumptive uses both upstream and downstream. Consumptive use is divided into three major categories: irrigation, municipal, and all others e.g., domestic, livestock.

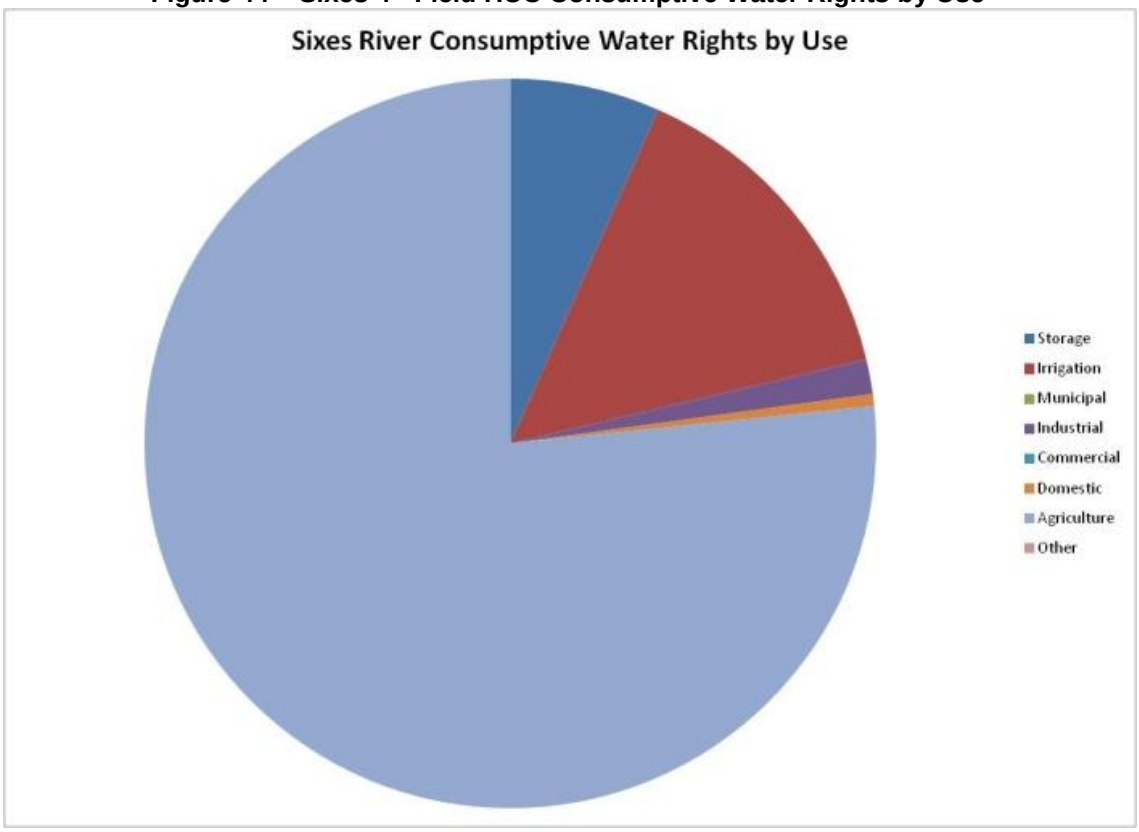
Appendix C provides graphics depicting water availability in South Coast Basin streams discharging to the Pacific Ocean. The Sixes 4th Field HUC Water Availability and Consumptive Water Rights by Use graphic example is shown below (Data from OWRD, 2012). The majority of consumptive use is for agricultural activities such as irrigation and storage. During periods where values fall below zero, no water is available for allocation and junior (or later) water rights may be shut off. Negative values illustrate that stream flows are over allocated and conservation and other activities that augment instream flows would be beneficial for fishery and water quality.

Figure 43 – Sixes 4th Field HUC Water Availability by Month. Data from OWRD (2012)



Water availability in each of these streams is independent from the other

Figure 44 – Sixes 4th Field HUC Consumptive Water Rights by Use



Instream Water Rights

Instream water rights are water rights that leave water in streams and lakes for beneficial public uses such as recreation, pollution abatement, navigation, maintenance, and enhancement of fish and wildlife populations and their habitats (ODFW, 1997). The WRD holds these instream water rights in trust. There are two types of in-stream demands: instream water rights and scenic waterway flows. In-stream demands diminish availability upstream only (ODFW, 1997). Because they are non-consumptive, they do not diminish stream flow downstream as do consumptive uses (OWRD, 2002).

The ODFW developed instream flows by month needed to support anadromous salmonid species and used this information to set minimum perennial stream flows throughout Oregon. These instream water rights are enforced like all other water rights. A water right priority date establishes the order of water use and a junior water right cannot take away or impair any legally established water use having an earlier priority date (ODFW, 1997).

Many of the instream water rights established to protect fish and wildlife populations are junior to other existing water rights and there is little assurance of instream flow protection, particularly in dry years. Various conservation measures are being implemented to help augment instream flows including measurement, efficiency, lease, and acquisition programs (ODFW, 1997).

Water Withdrawal for Irrigation

Irrigation accounts for most of the total surface water withdrawals in Oregon. The withdrawn of water from a stream for irrigation purposes leaves less water in-stream. Shallower rivers and streams have increased surface area to volume ratios which contribute to increased stream temperatures. When riparian vegetation is limited water temperatures in shallow stream systems increase even more. (Joyce, 2002)

Irrigation Best Management Practices

Application of the correct amount of water based upon the soli type helps minimize surface runoff and deep percolation. Runoff and deep percolation can carry sediments, chemicals, and fertilizers into waterbodies and negatively impact fish populations and overall water quality. The Coos Agricultural Water Quality Management Plan encourages landowners to understand their soil's infiltration rate and to apply water according to soil moisture in the root zone (Joyce, 2002).

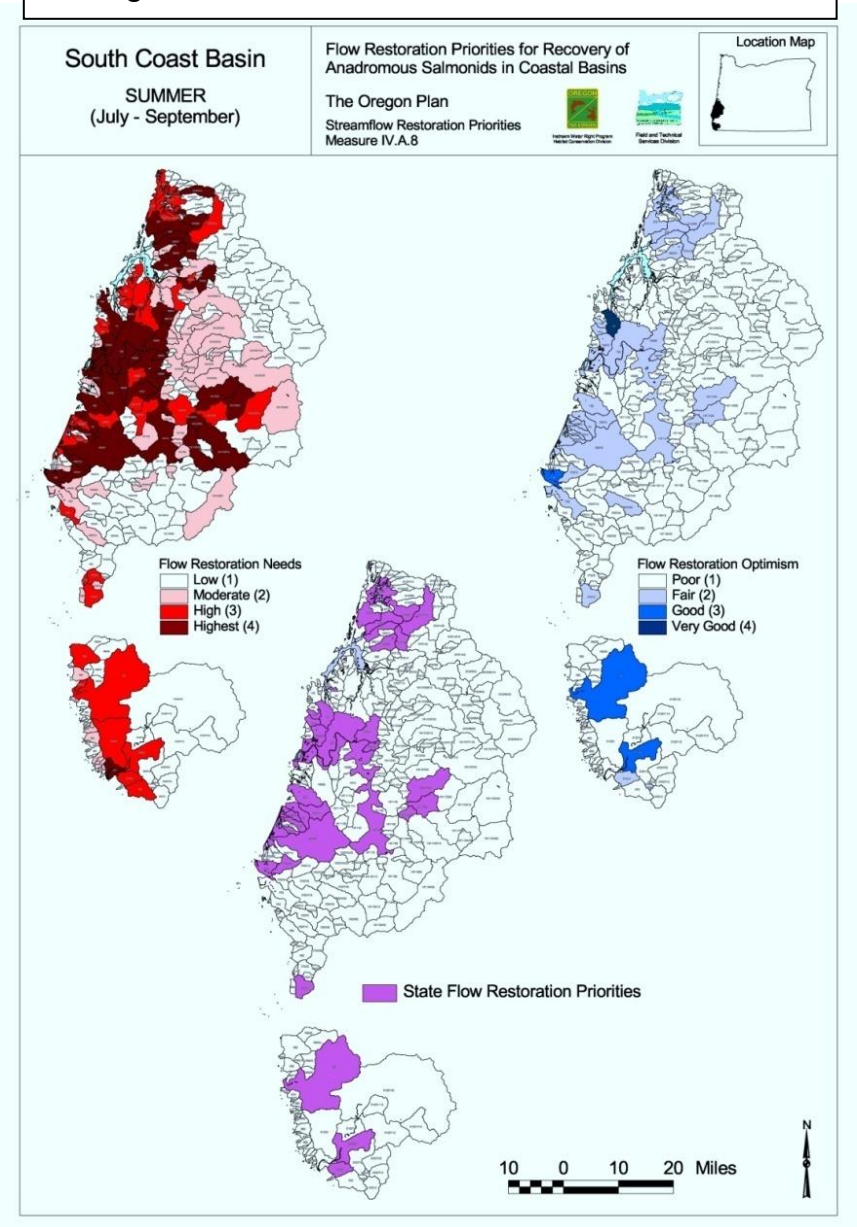
The following best management practices are from Joyce (2002)

- Analyzing soil and knowing crop needs to prevent over-application
- Consulting local resources such as Soil and Water Conservation Districts, the Natural Resource Conservation Service, OSU Cooperative Extension service, and consultants to develop an irrigation water management plan
- Maintaining ditches, tide gates and pipelines to minimize water losses
- Maximizing water system efficiency by checking field layouts to ensure correct combinations of spacing, operating pressure, sprinkler head, and nozzle size/type that match the soil infiltration rate
- Leasing water rights to in-stream use during periods of non-agricultural use
- Providing fish screening at irrigation intakes (unscreened irrigation intakes suck in fish as well as unwanted debris. State law requires irrigators to screen diversions that divert more than 30 cubic feet per second)).
- Checking field layouts for flow uniformity.
- Maintaining good soil fertility to make effective use of irrigation water

Flow Restoration Priorities

The OWRD and the ODFW jointly identified priority areas for stream flow restoration in basins throughout the state. These priority areas represent watersheds in which there is a combination of need and opportunity for flow restoration to support Oregon Plan for Salmon and Watersheds fish recovery efforts. ODFW developed and implemented a process to identify the watersheds in which fish were more likely to respond to increased flows and the OWRD identified those watersheds in which there are the best opportunities to restore flows. This prioritization process yielded a value reflecting the need for flow restoration during each season in each water availability basin (WAB). A WAB is the watershed unit used for OWRD water availability calculations. There are more than 2,500 water availability basins in the state. These values were divided into the following four classes: Low, Moderate, High and Highest (ODFW & OWRD, 2002). Flow restoration priorities for the South Coast Basin are depicted in the figure below and can be viewed in further detail at ODFW & OWRD (1998).

Figure 45 – Summer Flow Restoration Priorities



Groundwater

Groundwater is a critical natural resource providing domestic, industrial and agricultural water supply, base flow for rivers, lakes, streams and wetlands, and other beneficial uses. Private domestic wells do not require a water right for water extraction. Water rights may be needed in areas where groundwater supply wells are hydraulically connected to surface water bodies and groundwater extraction can impact surface water resources. For additional information about South Coast Basin groundwater please see the Groundwater Program section of this document.

Bandon Cranberry Water Control District – Groundwater Resource Study
During the early 2000s, the Bandon Cranberry Water Control District, in partnership with the OWRD and the U.S. Bureau of Reclamation (BOR), commissioned a study to document the availability of surface water and groundwater resources for irrigation and production of cranberries. [1]This study focused on about 100 square miles of the South Coast, from Bandon to Cape Blanco and then inland up to 4.5 miles.

The report states the area receives between 59 and 71 inches of rainfall per year in the flatter areas and up to 120 inches per year on the slopes. Precipitation easily infiltrates much of the study area and then is stored in thick layers (50-200 feet) of unconsolidated materials. Estimates of groundwater storage ranged from 28 to 59% of precipitation. In areas of thin soils and a shallow depth to bedrock, the water is not stored in the subsurface and thus, overland runoff occurs.

According to the study, the primary aquifer of concern has a saturated thickness generally less than 50 feet and is predominately unconfined, meaning there are no low permeable layers (such as clay) situated above the aquifer. The report estimated wells installed in this aquifer would produce between 25 and 100 gallons per minute. A 1999 water quality analyses indicated there were no exceedances of any standard for a public water system.

In general, the report concluded that ground water in the unconsolidated aquifer discharges to streams or directly to the ocean. Recommendations included the use of an aquifer storage and recovery system during high stream flows (winter and spring) to augment groundwater storage and discourage saltwater intrusion.

Integrated Water Resources Strategy

The Oregon Water Resources Commission adopted the state's first Integrated Water Resources Strategy (IWRS) in 2012. The Strategy provides a blueprint to help Oregon better understand and meet its instream and out-of-stream needs, taking into account water quantity, water quality, and ecosystem needs. DEQ worked with OWRD, ODFW and ODA to develop the integrated water resources strategy (IWRS) which will form the foundation of an integrated strategy to address the impacts of water withdrawals. The IWRS states “Oregon needs to further integrate and coordinate both the long-term planning and day-to-day management of Oregon’s water resources among its natural resource and economic development agencies, at all levels of government. Key factors to consider include state-level and place-based water planning, water management and development, and the protection of ecosystems and public health” (OWRD, 2012).

Action and Alignment Opportunities (Water Quantity)

ACTION: Division 33 Reviews DEQ will continue to review consumptive use water right applications per OAR Chapter 690, Division 33. These rules apply to applications for permits: to

[1] *Golder Associates, Inc., Feb 2004; Phase Two Groundwater Resource Study*

appropriate surface water, hydraulically connected groundwater, appropriations for the purpose of groundwater recharge; and to store water or construct a reservoir.

If the OWRD determines water is available for allocation an "Interagency Review Team" comprised of staff from the ODA, DEQ, ODFW, OWRD, and other state natural resource agencies are asked to review the application and to recommend conditions necessary to protect the public interest with regard to sensitive, threatened or endangered fish species and to achieve no net loss of essential habitat as defined in OAR 635-415-0005(4). During this review conditions to minimize the water quality impacts of an allowed use are developed as needed.

ACTION: DEQ and OWRD are currently collaborating to develop strategies to address the influence of water quantity on water quality, through an Integrated Water Resources Strategy (IWRS). Staff should be in place in early 2014 to being to implement the strategy.

ACTION: At the completion of a TMDL, DEQ has the opportunity to prepare and submit to the OWRD an instream water right application for the flow amount used to calculate the TMDL. DEQ should consider assessing the status of other instream rights to assure that instream water rights exist at levels equal to or above the flow amounts used to calculate the TMDL. If a sufficient level of instream water rights do not exist DEQ should consider making application for a TMDL based instream water right even if the right is junior to others.

Alignment Opportunity: The Oregon Conservation Strategy provides a plan for long-term conservation of Oregon's native fish and wildlife and their habitats. It takes a non-regulatory approach to conservation and recognizes that conservation issues vary by region and promotes planning at the local level. DEQ's current process to promote flow protection and habitat restoration relies on voluntary measures and community initiative and this approach aligns well with the approach identified in the Oregon Conservation Strategy.

Alignment Opportunity: Align the Integrated Water Resource Strategy work with Water Reuse program efforts to maximize benefits, deliver overarching message, and prioritize outreach and education.

Water Quality Standards and Assessment

Establishing water quality standards is at the core of DEQ's water quality activities. The Water Quality program establishes standards to protect the beneficial uses of water, such as water supply, aquatic life, fishing (consumption) and recreational and then acts to protect and restore water to the standards that support those uses. Water quality standards and assessments program activities include:

- Conduct standards reviews and rule revisions to establish and update scientifically based water quality standards
- Identify water bodies not meeting water quality standards
- Develop policy, guidance, and procedures documents for implementing standards

Action and Alignment Opportunities (Standards)

ACTION: Turbidity. DEQ has begun the process of revising the water quality standards for turbidity based on the best available science regarding the effects of turbidity on beneficial uses, in particular aquatic life. DEQ also will address a number of issues that have made it challenging to implement the current turbidity standard across all of DEQ's water quality programs, such as better definition of what is allowed for a limited duration exceedance and the duration and frequency of exceedances that would violate the standard.

DEQ last reviewed its water quality standards for turbidity in 2005 and 2006. The standard ultimately was not revised at that time. DEQ's current review will build on the turbidity effects analysis that was conducted at that time and documented in the Draft Technical Basis for Revising Turbidity Criteria. DEQ will incorporate new research and data, any data that is received and screened through the Call for Data process and address comments received in 2005 from the Independent Multidisciplinary Science Team. More information can be found in the Turbidity Rulemaking Fact Sheet. Given current resource uncertainties, DEQ does not know when the turbidity rule revisions will be completed.

ACTION: Sedimentation. There is no formal DEQ strategy for assessing, addressing or responding to sediment concerns. Sedimentation issues exist in a number of South Coast watersheds but DEQ is unable to successfully identify and implement objectives for water quality due to a lack of sediment assessment tools and clear in-stream targets. Presently a narrative sediment standard exists with no documented implementation method, which has led to a lack of certainty regarding how to apply the standard in the context of beneficial uses. In addition, it is unclear what type of monitoring data can and should be used to inform management decisions regarding sedimentation.

The bioassessment section of this document identifies sediment as a primary biological stressor and the evaluation of biological conditions in relation to sediment impairment has shown itself to be a useful tool. In addition, methods to evaluate bedded sediment conditions are also being considered in support of the development of a more robust sediment strategy. An assessment of the sediment stressor on biological communities result in the identification of 2010 303d listed impairments for biocriteria.

The development of either numeric sediment criteria or clear guidance on how the narrative standard should be applied is needed. Progress made in these areas will allow the review of data to determine if sedimentation is limiting beneficial uses and could subsequently trigger the Total Maximum Daily Load (TMDL) process. It would also facilitate discussion regarding the development and implementation of consistent assessment protocols for stream bank erosion, channel stability and general sedimentation conditions.

ACTION: Standards Development. Provide regional input to the standards program identifying standards needs. Continue to provide regional input during the development of an implementation plan or Internal Management Directive for any new or revised standards. This is an opportunity for regional needs to be included and aligned.

- Develop and implement more effective sedimentation and turbidity standards
- Regional support for the initiation of an agency strategy for identifying and responding to sediment impairment concerns, identify funding for support of sediment assessment

tools and strategies, and develop, adopt and implement a better way to assess sedimentation and determine impairment.

- Regional staff will work with standards section to evaluate data needs related to sedimentation and explore data collection opportunities using proposed methodologies for stream condition assessment as potential models for agency use (e.g. Relative Bed Stability and/or other available methods.
- Regional staff will work with other programs and stakeholders to determine potential causes and treatments of sediment impairments. Interests may include; DEQ (Standards and Assessment, Permitting, Monitoring, TMDLs, Nonpoint source, and 319 programs), ODA, Drainage Districts, OWEB, NRCS, EPA, USFS, ODF, BLM, ODFW and others.

ACTION: Identification of water bodies not meeting water quality standards
DEQ is required to assess the level at which Oregon's water quality supports beneficial uses. DEQ prepares an integrated report for submission to EPA that meets the requirements of the federal Clean Water Act (CWA) for Section 305(b) and Section 303(d). CWA Section 305(b) requires a report on the overall condition of Oregon's waters. CWA Section 303(d) requires identifying waters that do not meet water quality standards where a Total Maximum Daily Load (TMDL) needs to be developed.

ACTION: Integrated Report Alignment - There is an opportunity to have the assessment described by the Integrated Report database more closely align with basin assessments. These assessments and action plans will be reviewed every five years. A May 5, 2009 EPA memorandum articulates support for “the rotating basin approach as an effective tool for States to make water quality assessment determinations and manage their water quality programs. In this approach, available assessment resources are concentrated or targeted in defined watersheds for a specified period of time, thus allowing for data to be collected and assessed in a spatially and temporally "focused" manner. Over time, every portion of the state is targeted for monitoring and assessment (often over a four or five year period). States using a rotating basin approach may consider explaining in their data solicitation that a special emphasis is being placed on obtaining and considering data and information from the basin of interest, but that data and information from outside of the basin may also be considered for water quality assessments, NPDES permitting decisions, TMDL development, compliance monitoring, etc.”

- Work with 303(d) coordinator to secure all available quality data for review.
- Better define and account for “Insufficient data” versus “Potential concern” 303d list categories. The 1988 NPS Assessment was evaluated during the development of the 1994 303d list (DEQ, 1988). In some instances anecdotal concerns were utilized to support 303d listings. In instances where no supporting water quality data exists, it is recommended that these segments be identified as areas of potential concern. Segments identified as those having “insufficient data” could be applied to sites where data is available but the Integrated Report minimum data requirements are not met. Segments in this category may represent areas that attain criteria or where available data may indicate the potential for a water quality problem. Where these small datasets indicate water quality problems exists emphasis should be placed on building a dataset of sufficient size to allow the characterization of water quality conditions, at least for priority pollutants.
- Apply assessment benchmarks for parameters with narrative criteria. The WQ assessment can use benchmarks developed to implement the narrative criteria. The effort and priority of agency work to develop and implement these benchmarks could be

aligned to the needs and priorities of the South Coast Basin. Developing approaches to address sedimentation and nutrient loading are basin priority actions.

- Work to better define and refine the distribution of the beneficial uses at the 6th Field HUC level for resident trout, anadromous fish spawning (timing and extent), and shellfish distributions.
- Because of the lack of aeration and the presence of fine substrate spawning is not supported in tidal areas and should be removed as a beneficial use in tidally influence areas.

ACTION: During an update of 303d list of impaired waters define and/or refine areas where shellfish growing is identified as a beneficial use. Currently the upper limits of tidal influence is used to guide the identification of shellfish growing waters and in many instances salinity levels are not sufficient to support this beneficial use. In addition, salinity values recorded in the LASAR database should be carefully scrutinized for their validity. In many instances salinity values are recorded as less then and subsequent conductivities are also recorded. When this situation exists the measured conductivity values should be utilized to determine marine influence rather than salinity less than estimates.

ACTION: Policy, guidance, and procedures documents for implementing standards Consideration should be given to developing guidance on how and when to apply the spawning criteria to a waterbody where spawning is triggered by rainfall and may not correspond to an assigned date.

Consider developing narrative criteria or numeric criteria for nutrients. In lieu of criteria guidance in the form of an Internal Management Directive (IMD) may suffice. Elevated nutrient levels can contribute to photosynthetic processes which can result in pH and dissolved oxygen limitations, increased plant and algal growth, elevated chlorophyll *a* concentrations (nuisance phytoplankton growth), toxic algal blooms, and aquatic weed growth. The nutrients of concern for surface water quality are typically nitrogen and phosphorus.

ACTION: Clarification of beneficial uses. Work with local resource agencies to better define the spatial and temporal extent of aquatic life. Fish use maps should be updated to reflect actual resident trout distributions (rather than defaulting to presence in all salmonid rearing areas) and spawning areas. For example, spawning is identified as a beneficial use in tidally driven segments on fish distribution mapping. Spawning does not occur in these areas due to this tidal influence. Regional staff will work with the Standards section to integrate refined information into rule in order to clarify the application of temperature and dissolved oxygen life stage based criteria. .

ACTION: Tribal Water Quality Standards Development. South Coast Basin tribal entities (Coquille Tribe and the Coos, Lower Umpqua, Siuslaw Indian Tribes) have voiced interest in securing Treatment in the Same Manner as a State (TAS) certification which would allow the Tribes to develop water quality standards separate from the State of Oregon. These standards would apply to resource conditions on or impacting Tribal lands. As resource assessment and resource-related concerns are most effectively addressed at the basin scale, DEQ looks forward to continued communication and coordination with the tribes as they pursue standards development. DEQ will continue to work through the agency Tribal Liaison to assist and support tribal standards development and watershed assessments.
Alignment Opportunity: Standards and Assessment group aligned with Monitoring, NPS, Permits, and Toxics groups to identify high priority standards support needs and to ensure that

monitoring efforts fill gaps, inform standards development, and meet data needs identified in the South Coast Basin.

Wastewater Control – Point Source Program

DEQ's wastewater management program regulates and minimizes adverse impacts of pollution of Oregon's waters from point sources of pollution. A point source is described as a discrete discharge of pollutants as through a pipe or similar conveyance. Point sources of pollution include effluent discharges from wastewater treatment plants and industrial discharges, most of which are permitted and required to comply with certain discharge limits. Point sources in Oregon are regulated through Federal National Pollutant Discharge Elimination System (NPDES) permits or state Water Pollution Control Facilities (WPCF) permits issued by DEQ. DEQ currently utilizes 27 different types of general WPCF and NPDES permits.

General Permits

General permit are used to cover a category of similar discharges and are generally valid for a five year period. DEQ may issue a general permit when there are several minor sources or activities involved in similar operations that may be adequately regulated with a standard set of conditions. As of December 2012, there were 84 facilities and 31 construction sites covered under general permits within the South Coast Basin. The number of 1200 C type general permits is quite variable because this permit is required during construction activities only. As sites move out of the construction phase, these permits are terminated. Permitted facilities, excluding construction sites in each sub-basin, are as follows: 57 in the Coos Sub-basin, 41 in the Coquille Sub-basin, 10 in the Sixes Sub-basin, and 24 in the Chetco Sub-basin. A list of these permits can be found in Appendix D. Detailed information about these general permits and permit conditions can be seen at http://www.deq.state.or.us/wq/wqpermit/genpermits.htm.

Table 52 – South Coast Basin General NPDES Permits

Permit Type	Permit Description	Count
GEN01	Industrial Wastewater; NPDES Cooling Water	1
GEN02	Industrial Wastewater; NPDES Filter Backwash	6
GEN03	Industrial Wastewater; NPDES Fish Hatcheries	2
GEN04	Industrial Wastewater; NPDES Log Ponds	3
GEN07PM	Suction Dredges - not required to provide specific locations but rather general information in regard to where they will be working.	
GEN08	Confined Animal Feeding Operations (ODA)	20
GEN09	Industrial Wastewater; NPDES Seafood Processing	3
GEN10	Gravel Mining	3
GEN12A	Stormwater; NPDES Sand and Gravel Mining	26
GEN12C	Stormwater; NPDES construction more than 1 acre	31
GEN12Z	Stormwater; NPDES specific SIC codes	28

Table 52 – South Coast Basin General NPDES Permits		
Permit Type	**Permit Description**	**Count**
GEN14A	Wineries and Fresh Pack Food Processors	4
GEN17A	Industrial Wastewater; NPDES wash water	4
GEN17B	Industrial Wastewater; WPCF wash water	1
GEN 2300-A	Pesticide General Permit - No South Coast Basin applicators are currently permitted but some will need to acquire this permit for pesticide applications.	
	Total	115

General permits issued by DEQ but not present in the South Coast Basin at the time that this assessment was developed include: 500J - Boiler blow down, 1300J - Oily stormwater runoff, oil/water separator, 1400B – Canneries, food and animal processing, extracts, 1500A and B – Tanks cleanup and treatment of groundwater, 1900B - Geothermal Exploration, 1900J - Non contact geothermal, 2401 and 2402 Tier 1 and 2 Gray water reuse and disposal system, 2300 Pesticide applications, and two other permits specific to Lower Columbia, Youngs Bay, and Clatsop County floating residences.

Industrial and Domestic Wastewater Permitting

Water Pollution Control Facility (WPCF)

Individual WPCF permits are site specific and developed to address treatment and disposal or beneficial reuse from a particular sewage or industrial wastewater treatment facility that does not discharge to surface waters. Individual WPCF permits are issued for a period not to exceed ten years. These individually permitted sources have the potential to impact groundwater but are not likely to impact surface waters. Monitoring by the permittee is required to insure that permit limits are met and water quality is adequately protected. There are 46 individual WPCF permits within the South Coast Basin; 16 in the Coos Sub-basin, eight in the Coquille Sub-basin, 12 in the Sixes Sub-basin, and 10 in the Chetco Sub-basin.

Individual NPDES

An individual NPDES permit is site-specific, developed to address discharges from a specific sewage or industrial wastewater treatment facility or stormwater outfall. Individual NPDES permits are issued for a period not to exceed five years. Individually permitted sources have the potential to impact surface waters and require frequent monitoring by the permittee to ensure that permit limits are met and water quality is adequately protected. There are 17 individual NPDES permits within the South Coast Basin; nine in the Coos Sub-basin, four in the Coquille Sub-basin, two in the Sixes Sub-basin, and three in the Chetco Sub-basin. There are no individual NPDES MS4 stormwater permits in the basin.

Table 53 – South Coast Basin Domestic Wastewater Individual NPDES Permits				
Facility Name	Class	Upgrade Planned/ In Progress	Renewal Year	Status
[1]Lakeside STP	Minor	No	2013	No WLA Planned
North Bend STP	Minor	Yes	2013	WLA planned for 2015
Coos Bay STP #1	Minor	Yes	2013	
Coos Bay STP #2 Empire	Minor	Yes	2013	
Bandon STP	Minor	No	2013	Coquille River RM 1.1
Coquille STP	Minor	Yes	2013	WLA will be set in 2014
Myrtle Point STP	Minor	Yes	2015	
Powers STP	Minor	Yes	2015	
Port Orford STP	Minor	No	2015	Ocean Outfall
[2]Pacific High School STP	Minor	No	2013	WLA will be set in 2015
Rainbow Rock	Minor	No	2013	Ocean Outfall
Gold Beach STP	Minor	Yes	2016	Ocean Outfall
Brookings WWTP	Major	No	2016	Ocean Outfall

[1]Very little data is available for Tenmile Creek at this time.
[2]No summer discharge. Receiving water body is Madden Creek a tributary to the Sixes River – no WQ data is available for Madden Creek.

Table 54 – South Coast Basin Industrial Wastewater Individual NPDES Permit			
Facility Name	**Class**	**Renewal Year**	**Receiving Waterbody**
Conrad Wood Preserving (Hauser)	Minor	2013	North Slough
Fort Chicago Holdings	Minor	2013	Coos Bay
Millington Log Yard	Minor	2020	Isthmus Slough
ORC Properties LLC	Minor	2013	Isthmus Slough
Westport Well Field	Minor	2013	Davis Slough

DEQ intends for permits to be issued on the five year watershed cycle (2016) and will work to align these processes through time. Permits must also be written to comply with the waste load allocations and requirements of TMDLs as they are issued. Many permits have expired and have been administratively extended until DEQ takes action on the renewal applications. These permits will be reissued as resources allow.

If water quality problems associated with point sources are identified, permit writers will include permit conditions to collect the needed information to determine the contribution from the specific point sources. If a point source is not able to meet its permit requirements, a compliance schedule may be included in Schedule C of the permit and/or in a Mutual Agreement and Order (MAO). Six permits in the South Coast Basin currently have MAO compliance schedules. Wasteload Allocation (WLA) means the portion of receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. WLAs constitute a type of water quality-based effluent limitation.

Senate Bill (SB) 737 Effluent Contaminant Monitoring

Senate Bill 737 was enacted by the Oregon Legislature in 2007. The bill directed DEQ to identify a list of persistent, bioaccumulative, and toxic ("PBT") chemicals which might be present in the effluent of 52 of Oregon's largest wastewater treatment facilities. The list of PBT chemicals was developed through a public process and included consultation with Oregon Association of Clean Water Agencies, the League of Oregon Cities and other stakeholders. Ultimately, the SB 737 list included 119 chemicals thought to pose the greatest risk to human and environmental health. SB 737 pollutant classes included PAHs, halogenated flame retardants, pesticides and herbicides, pharmaceuticals and personal care product ingredients, perfluorinated surfactants (anti-stain agents), metals (including arsenic, tributyltin, cadmium, lead, mercury and selenium) and select industrial chemicals (including polychlorinated biphenyls (PCBs), polychlorinated napthalenes, and dioxins and furans. In addition to the compounds identified by the SB737 working group, additional "ancillary" pollutants measured by the Toxics Monitoring Program were also analyzed and reported for informational purposes in the laboratory findings.

Threshold concentrations of individual SB 737 pollutants were identified with the input of members of a technical working group. If these thresholds are exceeded in the final effluent facilities would be required to develop plans to reduce their concentrations below the established values. These concentrations were called "Plan Initiation Levels" (PILs). The PILs were selected based on the risk that the individual pollutants posed to human and environmental health. At its February 2011 meeting, the Environmental Quality Commission passed a temporary rule to suspend municipalities' requirement to develop reduction plans for cholesterol and coprostanol, after considering the following: 1) Pollution Prevention is the primary focus of SB 737. These pollutants are naturally-occurring byproducts of human digestion and are not amenable to pollution prevention. 2) Toxicity estimates used to set plan initiation levels are not corroborated by scientific literature, 3) DEQ also considered treatment, and determined that it is not cost-effective for cholesterol or coprostanol.

The statewide data show that the pollution reduction measures currently in place are working to keep the majority of persistent pollutants out of municipal wastewater. Wastewater from municipal treatment plants is not a significant source of the most persistent pollutants. In the 52 facilities sampled statewide most of the listed pollutants were not observed at measurable levels in wastewater effluent. Of the 117 pollutants tested, only five pollutants occurred above the threshold levels set by DEQ. The results of these tests are discussed in a fact sheet Implementing SB 737, June 2011 Update. Only five municipalities, none of which are located in the South Coast Basin, must develop pollutant reduction plans under SB 737.

South Coast Basin SB 737 Results

In 2010 effluent samples were collected twice, for a total of eight samples, from four waste water treatment facilities in the South Coast Basin (Brookings, Coos Bay #1 and #2, North Bend). Results indicate that all facilities tested in South Coast Basin had cholesterol and coprostanol above Plan Initiation Level (PIL). Concentrations of the PBT chemicals were not found above SB 737 threshold concentrations that would require wastewater facilities to develop prevention/reduction plans. Metals, aromatic hydrocarbons, herbicides, insecticides, fire retardants, polychlorinated biphenyls (PCBs), and pharmaceutical compounds were detected in samples at low levels.

PCB was detected at levels above the Human Health Water Quality Criterion in effluent from two Coos Bay treatment plants. There is currently no approved method for WWTP effluent PCB

analyses that can reach the SB 737 detection limits. DEQ will not require additional sampling for PCB at WWTP until an approved method is identified.

Many of the State of Oregon marine water quality metals criteria are stated as dissolved concentrations in the water column. A conversion factor was applied to effluent total copper sample results to calculate effluent dissolved copper. Copper was detected at levels above the marine acute criteria in Brookings WWTP effluent samples and above the marine chronic criteria in Coos Bay #2 WWTP effluent samples. Total manganese levels were found to be just below the human health criteria for the protection of human consumption of fish in saltwater at the Coos Bay #1 WWTP facility.

Pharmaceuticals and personal care products (caffeine, carbamazepinein, venlafaxine, codeine, diphenhydramine, sulfamethoxazole, triclosan, stigmastanol, DEET, steroids, hormones were detected in many of the samples taken.

Water Quality Based Effluent Limits for Toxic Pollutants (WQBEL)

An Internal Management Directive (IMD) has been developed to provide guidance for DEQ staff in determining whether an individual point source discharge contains toxic pollutants of concern (POCs) that might cause an exceedance of the water quality standard in the receiving water body, and how to calculate effluent limits. This determination is called the Reasonable Potential Analysis Process for Toxic Pollutants (RPA) (DEQ, 2012c) supported by the Memorandum Implementation Instructions for Dissolved Metals Water Quality Criteria in Reasonable Potential Analysis and Water Quality- based Effluent Limits Calculations (DEQ, 2013). The current water quality criteria for aquatic toxicity are listed in OAR 340-41-0033 Tables 30, 31, and the current Human Health water quality criteria are listed in the Table 40 Human Health Water Quality Criteria for Toxic Pollutants. The IMD provides step-by-step guidance for identifying POC, conducting the Reasonable Potential Analysis (RPA), calculating Water Quality Based Effluent Limits (WQBELs), and discussions of various technical and policy issues.

Permit Development and RPA Process Overview

As part of permit development for all major domestic and most industrial sources, a list of effluent monitoring requirements will be developed based upon the facility and receiving water impairments. During the first 36 months of a new permit term, the permittee will be required to conduct pollutant scanning. The effluent is then characterized and POCs are identified using the both the aquatic and human health RPA spreadsheets to conduct an “end of pipe” reasonable potential (RP) determination. Larger South Coast Basin wastewater treatment plants, Coos Bay #1 and #2, North Bend, and Brookings will be required to conduct sampling for toxic constituents. During this sampling, planned for the two years after permit issuance, elevated PCB and copper levels in City of Coos Bay treatment plant effluent will be further examined. Additional metals sampling will also be conducted at the Brookings facility and elevated copper levels will be further evaluated.

DEQ will then utilize all available data and supporting information to model potential in-stream water quality impacts and complete the “in-stream” RP determination. The permittee may chose to characterize source water quality. An intake credit may allow a deduction if source water provides some of the contaminant load. A facility is only held accountable for their direct impacts to the source water and water quality. For each POC found to have RP (in-stream) a Water Quality Based Effluent Limit (WQBEL) will be calculated. This limit will become part of the permit unless a more stringent Technology Based Effluent Limit (TBEL) is applicable.

If the facility is not capable of initially meeting the effluent limit, the permittee may use the remainder of the permit term (~24 months) to collect additional information, attempt source reduction, develop treatment options, or justify a variance request or standards adjustment. In some cases, a Compliance Schedule may be granted, allowing the permittee additional time to implement source reduction or treatment options to meet the final effluent limit. Prior to re-issuing a permit the RPA and WQBEL calculations are finalized and management decisions are documented in the Permit Evaluation Report.

The monitoring timelines are designed to identify potential environmental issues early in the permit development process so that treatment, reduction or compliance alternatives can be explored, developed and approved by the end of the permit term.

Mixing Zone Studies – Follow-up Recommendations

Lakeside Wastewater Treatment Plant, 2009
Nutrient levels in the effluent were significantly higher than the background location for all nutrients measured: total ammonia, nitrate-nitrite, total Kjeldahl nitrogen, and total phosphorus.

Aquatic vegetation was observed in the stream and this condition should be further characterized to determine if excessive growths of invasive, non-native aquatic plants dominate the assemblage and have a harmful effect on fish or aquatic life or are injurious to health, recreation, or industry.

Based on visual observations, the effluent remained near the bottom of the stream and hugged the right bank as it moved downstream. The high flows in the stream may have contributed to this by preventing rapid mixing (velocity from the outfall was much less than stream velocity).

Barium, copper, nickel, and zinc were detected in the effluent. Zinc was present at levels just below the water quality criteria and copper was present at levels just below the chronic water quality criterion. Zinc and copper were not detected above the reporting limits in the upstream or downstream samples from Tenmile Creek. Land application occurs July through September or whenever flows drop below 7.8 cfs. It appears that adequate dilution is present during the period of discharge to reduce metals concentrations sufficiently to not exceed the acute and chronic criteria.

Myrtle Point Wastewater Treatment Plant, 2007, 2009
Based on the information from the two sampling events, it appears that copper, zinc, and silver may be present consistently in the discharge from Myrtle Point at levels that may potentially affect aquatic life in the system. Elevated metal concentrations in ambient waters may be toxic to salmon and other aquatic life in several ways; toxicity in salmon may be expressed as inhibition of olfactory function, or suppression of immune system and other physiological processes (LCREP, 2007). Copper, silver, and zinc effluent levels exceed the acute water quality criteria with effluent copper levels over two times higher than the acute criteria.

Mixing did not appear to be sufficient for the discharge based on the visual observations and chemical constituents. During the facility upgrade the outfall will be engineered to promote improved mixing. The area of the outfall is subject to sedimentation from upland sources. Because of high sediment accrual rates low flow wetted channel dimensions are quite dynamic. Alternate outfall locations were explored but a stable location for the placement of the outfall does not appear to be readily available.

Concerns regarding E Coli, Nutrients, and BOD stated in the Myrtle Point mixing zone study are being addressed through facilities upgrades. Planned upgrades resulting in increased sludge contact time may reduce effluent copper and zinc levels.

Powers Sewage Treatment Plant, 2006
Total recoverable copper approaches the chronic criteria. A monitoring requirement for copper should be considered in the permit renewal. Alternatively addition metals sampling could be conducted after the facility upgrade.

Concerns regarding effluent e coli and ammonia levels are being addressed through facilities upgrades. Mixing dynamics will be improved by the relocation of the existing outfall. Planned upgrades resulting in increased sludge contact time may reduce effluent copper levels.

Pollutant Trading Program

Water quality trading is an innovative program that allows facilities that discharge wastewater to a stream or river to meet regulatory obligations by:

- Purchasing equivalent or larger pollution reductions from another source; or
- Taking action to protect or restore riparian areas, wetlands, floodplains, and aquatic habitat to reduce the impact of pollutants.

Trading is based on the fact that dischargers in a watershed can face very different costs to control the same pollutant. Trading programs allow facilities facing higher pollution control costs to meet their regulatory obligations by purchasing environmentally equivalent (or superior) pollution reductions from another source at lower cost, thus achieving the same water quality improvement at lower overall cost. Trading may also allow Oregon to achieve water quality improvements more quickly than would otherwise be possible.

DEQ only allows trading when it addresses the source or sources of the pollution problem and does not negatively affect the environment. Trading cannot be used to avoid existing federal and state treatment requirements. This approach makes sense in areas where instream temperatures are warm enough to be unhealthy for fish and the main cause of warming is the removal of bank vegetation (no shade to block the sun from warming the water) rather than the wastewater discharge. Allowing this type of thermal unit trade also has additional benefits: wildlife habitat is created; the treatment plant saves money because it does not have to purchase and operate wastewater chillers; and greenhouse gas emissions from operation of the chillers are prevented. (DEQ, 2005c)

For DEQ guidance and more information on trading, please visit DEQ's website at: http://www.deq.state.or.us/wq/trading/trading.htm.

Action and Alignment Opportunities (Point Source Permitting)

ACTION: The DEQ Bacterial Internal Management Directive (IMD) should be revised to accurately reflect shellfish resource distributions. The upper limits of softshell and native Olympic oysters are understated. Municipal wastewater treatment plant facilities discharging into shellfish growing waters should meet the growing waters criteria at the end of pipe.

ACTION: Point source design criteria should be examined and aligned with shellfish growing criteria to assure that allowable design criteria alone do not result in water quality limited 303d

listings. Where this is the case, DEQ should determine if either design criteria and/or shellfish growing criteria need clarification or adjustments.

ACTION - DEQ will identify monitoring to characterize water quality conditions in Tenmile Creek as a high priority action item. This effort should focus on nutrient loading, aquatic vegetation, and dissolved oxygen and pH diel conditions. A mixing zone study should be repeated to assure that the required dilution is attained. Additional City of Lakeside WWTP effluent monitoring should be conducted to better characterize copper and zinc concentrations in effluent.
Flow monitoring records should be reviewed to assure that the stream is flowing and not in a bar bound backwater state during periods of discharge to Tenmile Creek. There is a potential that the lake stage monitoring could be used as a surrogate for flow monitoring. The relationship between lake stage and flow records should be examined.

ACTION: Additional City of Myrtle Point WWTP effluent monitoring should to be conducted to better characterize copper, zinc, and silver concentrations. Permit conditions should include a visual outfall inspection to assure that the outfall remains within the wetted channel with sufficient flows to achieve adequate mixing and dilution.

ACTION: Additional City of Powers WWTP effluent monitoring should to be conducted to better characterize copper concentrations. The new outfall location should be selected based upon a mixing zone study to assure adequate mixing and dilution and to assure adequate spatial separation from active spawning areas. .

ACTION: Compliance Monitoring Studies to Determine Compliance with Permit Conditions
Compliance monitoring is required for all individual permits in the watershed and for some general permits. Parameters monitored and the frequencies of monitoring vary with each permit. General Permitted sources in the basin with the potential to impact water quality and which may have a nexus with TMDL WLAs include:

Table 55 – General Permits-Potential TMDL Nexus-Parameter of Concern

General Permits – Potential TMDL Nexus		Parameter of Concern
GEN03	Industrial Wastewater; NPDES Fish Hatcheries	Temperature
GEN04	Industrial Wastewater; NPDES Log Ponds	BOD
GEN07PM	Suction Dredges	Temperature, Mercury
GEN08	Confined Animal Feeding Operations (ODA)	Bacteria
GEN09	Industrial Wastewater; NPDES Seafood Processing	Bacteria

If discharges managed under these general permits are determined to represent more than de minims WQ impacts individual permits and wasteload allocations may be required.

Alignment Opportunity: Align DEQ NPS, Point Source (recreational mining), and Land Quality (Environmental Cleanup) programs to address mercury in the Sixes River. Work toward an improved understanding of the effects of instream dredging of mercury deposits to determine the compliance or non compliance of this activity with the state mercury water quality standard.

ACTION: As per the 2011-2013 DEQ Agency Request Budget, the industrial and domestic wastewater permitting sub-program must carry out the following four activities: issue discharge permits that adequately evaluate and limit pollution to prevent an impact on receiving waters

and the beneficial uses of those waters (drinking, swimming, fishing, aquatic habitat, etc.), inspect facilities and review monitoring results, take prompt and appropriate enforcement actions when violations occur, provide essential technical assistance for facility owners and operators to help assure ongoing compliance at minimum expense to permit holders. When effluent toxic data sets are of sufficient size conduct RPAs and apply Water Quality Based Effluent Limits (WQBELs) in permits as needed.

ACTION*:* Staff Collaboration. Continued collaboration is needed between the point source permit writers and the TMDL group as implementing a TMDL often includes revising industrial and municipal wastewater permits to incorporate revised permit limits based on TMDL derived waste load allocations. TMDL staff and stormwater staff need to collaborate to evaluate the effectiveness of stormwater control measures incorporated into TMDL Implementation Plans for those areas not covered by NPDES Phase II stormwater requirements.

Action: Data Collection. If water quality problems associated with point sources are identified, permit writers will include permit conditions to collect the needed information to determine the contribution from the specific point sources.

When designing monitoring plans for permit compliance permit writers should review and identify TMDL point source requirements, all available water quality data, and identify water quality data gaps. A WQ Assessment classification for a stream as “Insufficient data” or “Potential concern” for any pollutant or beneficial use should trigger the alignment of the monitoring plans (project or basin specific) to address those data needs.

- Collect data to better characterize receiving waterbody water quality conditions in Tenmile and Madden Creeks prior to permit renewals
- Review effluent toxics data and evaluate the need for additional data to support an RPA. Identify data gaps and revise permit monitoring requirements or develop a DEQ monitoring plan.
- As possible assist minor sources to characterize effluent toxic constituents and mixing zone concerns.

ACTION: As permits are renewed review all available data and monitoring requirements to ensure that monitoring efforts align with impairments identified in the basin.

ACTION: Review DMRs submitted in response to general permit conditions to determine if additional monitoring or permit conditions are required prior to the renewal of these permits.

Alignment Opportunities: Utilize point source compliance monitoring to inform TMDL development, implementation, and beneficial use support.

ACTION: Compliance Monitoring Studies to Determine Compliance with Permit/Certification Conditions

Compliance monitoring is often required as part of DEQ certifications and permits. Parameters monitored and the frequencies of monitoring vary. This data should be periodically reviewed to assure compliance with water quality conditions. Examples of these sources in the basin with the potential to impact water quality include: permitted point sources, 401 dredge and fill activities (certification), onsite septic system permits and biosolids application. This action should be applied to other programs that require monitoring and reporting.

Alignment Opportunities: Point and nonpoint source staff need to work together to evaluate the feasibility of water quality trading where warranted to maximize environmental benefit. Work is needed to identify and support nutrient trading in the future as dissolved oxygen, pH, and chlorophyll a nutrient TMDLs are developed.

Alignment Opportunities: Point source, nonpoint source, and SRF staff coordinate to assist in focusing SRF technical assistance to facilities with required upgrades in the near future.

Alignment Opportunities: Point source, nonpoint source, and SRF staff coordinate to promote and help to develop SRF Sponsorship Option projects when permitted entities apply for SRF loans.

Alignment Opportunities: Point source, nonpoint source, and laboratory staff align efforts with water quality monitoring required from permittees to provide a better understanding of receiving water conditions and impairments.

Alignment Opportunities: Point and nonpoint source staff should coordinate during the determination of permitted facility monitoring needs/requirements.

ACTION: Share SB 737 results with point sources, local communities, and nonpoint source TMDL, monitoring, groundwater, and drinking water programs staff.

Alignment Opportunities: Alignment begins with sharing SB 737 results among point source program, nonpoint source TMDL program, and groundwater and drinking water programs.

ACTION: Develop Toxic Constituent Reduction Plans. Continue to work with entities as they conduct source assessments and additional monitoring. Municipalities may use the 2010 SB 737 effluent results now to identify potential problems and consider changing local limits for their industrial dischargers.

ACTION: Approved methods consistency. Although PCB was detected in effluent from two Coos Bay wastewater treatment plants at levels above those found in 340-41 Table 40, Human Health Water Quality Criterion, there is no currently approved method for the facilities use that can reach these detection limits. Continue to work within the agency to address this gap.

A June 2011 DEQ memorandum provided guidance on the use of SB 737 effluent samples for permitting purposes. The memo suggested that SB 737 datasets, for parameters with water quality standards analyzed using 40 CFR Part 136 methods, may be used for RPA calculations.

Alignment Opportunities: Sampling for toxic constituents conducted under SB 737 at major facilities should be reviewed to determine if this information can be utilized to guide subsequent sampling efforts. Other data (without water quality standards or 40 CFR Part 136 methods) should be used for informational purposes only (for example, to evaluate whether additional monitoring is advisable for certain pollutants). Utilize this information when developing the Toxics Monitoring Program Plan.

Stormwater Program

Stormwater discharges are considered point sources, which under certain circumstances require an NPDES permit. NPDES permit coverage (MS4) is required for large or medium municipalities with a population greater than 50,000 people and a population density of 1,000

people per square mile as designated by the 2010 U.S. Census that own or operate municipal separate storm sewer systems. There are insufficient population densities in the South Coast Basin to require NPDES MS4 permitting. Certain types of industrial facilities (1200 Z general permit) and construction sites disturbing one or more acres (1200 C general permits) are required to secure stormwater discharge permits.

Total Maximum Daily Load (TMDL) and Stormwater Management
The Tenmile Watershed TMDL addressed stormwater discharges from the City of Lakeside and future South Coast Basin TMDLs will address stormwater from other small non MS4 permitted municipalities. Discharges from small municipalities will receive a portion of the nonpoint source load allocation and will be required to develop Water Quality Implementation Plans (WQIP). WQIP requirements are articulated in OAR 340-42. These plans will need to describe how the stormwater collection system will be managed in order to meet the assigned load allocations.

If the jurisdictions stormwater control efforts are not sufficient to meet load allocations an NPDES permit may be required. EPA encourages permitting authorities to consider designating stormwater sources for coverage under a NPDES permit when NPDES permits are a more effective regulatory mechanism than nonpoint source control methods. EPA also recommends including more flexible language in a TMDL for stormwater sources that may be required to obtain a NPDES permit in the future. For example, a TMDL writer should include language in the TMDL that a stormwater source is under a load allocation contingent upon the source remaining unpermitted, but the load allocation would become a wasteload allocation if the source were required to obtain a NPDES permit. The purpose of this flexible TMDL language is to ensure that water quality based effluent limits (WQBELs) in a NPDES permit of the newly permitted source are consistent with the requirements of the TMDL's allocation to that source.

Jurisdictions will be encouraged to incorporate a performance standard for post-construction stormwater management to ensure the restoration of a stable hydrology. This should include;

- Structural and nonstructural controls that will result in stormwater discharges from new development/redevelopment be managed so that post-development hydrology does not exceed the predevelopment hydrology at a site.
- Performance standards that address minimum volume to be retained on site, minimum storm size to be retained on site, maintenance of the predevelopment runoff rates or predevelopment hydrograph for various storm sizes, groundwater recharge, and/or limits to impermeable surfaces.
- Incentives for reducing impervious surfaces on redevelopment sites.
- Requirement for long-term maintenance of post-construction stormwater control measures
- Requirement for the consideration of watershed protection measures when revising plans such as transportation master plans (e.g., minimization of impervious surface associated with roads/parking lots/roofs, preservation/protection/restoration of ecologically sensitive areas, reduction of thermal impacts to streams, and vegetation standards).
- Requirement for the maintenance of an inventory of all post-construction structural stormwater control measures installed in new developments/redevelopments.
- Requirement for establishing a threshold (e.g., % of target audience reached) for conveying education messages to the public.

Stormwater-source impairment of a waterbody is usually the result of the cumulative impact of multiple pollutants and physical effects and identifying a specific pollutant causing impairment

may be difficult. The use of surrogate measures focusing on the quantity of flow and variation in flow regimes may be most effective since flow is an important factor in stormwater pollutant transport. Using flow or a surrogate such as impervious cover as a measure of stormwater loading can be a straightforward way to regulate stormwater contributions to waterbody impairment. This is consistent with TMDL regulations specifying that TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measure.

In 2007 DEQ issued a "*TMDL Implementation Plan Guidance – for State and Local Government Designated Management Agencies*" which was then supplemented in 2014 by the "*TMDL Implementation Guidance: Guidance for Including Post-Construction Elements in TMDL Implementation Plan*". Although DEQ encourages all urban and rural residential DMAs to use the 2014 guidance, it is particularly recommended for urban and rural residential DMAs within the Coastal Nonpoint Management Area. At some time in the future DEQ and DLCD will seek to partner to provide training to local governments and other stakeholders about the guidance(s) and help them develop effective stormwater management plans.

Action and Alignment Opportunities (Stormwater)

ACTION: As per the 2011-2013 DEQ Agency Request Budget, stormwater general permits for industrial and construction activities are to be issued within 30 days after the close of the public comment period.

ACTION: As TMDLs are developed, DEQ will work with local jurisdictions to develop WQIPs (stormwater management plans). These plans will need to include performance measures for evaluating the effectiveness of BMPs identified in stormwater management plans (SWMP) and pollutant load reduction benchmarks for load allocations.

ACTION*:* Staff from the TMDL and stormwater programs should collaborate to evaluate the effectiveness of stormwater control measures incorporated into TMDL implementation plans.

Alignment Opportunity: Stormwater program provide assistance to nonpoint source program staff as they work with urban areas to integrate stormwater measures into implementation plans for those areas that are not covered by NPDES Phase II stormwater requirements.

Alignment Opportunity: Work with SRF program to promote stormwater master planning and TMDL water quality implementation planning through the planning loan program and or the Sponsorship Option.

Alignment Opportunity: Work with local jurisdictions to allow the discharge of treated water sourcing from leaking underground storage tank (UST) remediation efforts under DEQ oversight into stormwater conveyance systems. UST sites in close proximity to and with a high risk of delivery to surface water will be prioritized.

Pretreatment Program

The National Pretreatment Program is a cooperative effort of federal, state, and local regulatory environmental agencies established to protect water quality. The U.S. Environmental Protection Agency (EPA) has delegated DEQ the authority to approve pretreatment programs at the local level and oversee state-wide pretreatment activities. The communities approved to implement the pretreatment program have the legal authority to issue industrial user permits, conduct inspections of industrial and commercial sources, sample industrial discharges and enforce

regulations. These programs also routinely perform self monitoring to ensure the protection of worker safety, sewage treatment plant operations, biosolids, and water quality.

Objectives of the pretreatment program:

1. Protect publicly owned treatment works (POTW) from pollutants that may cause interference with sewage treatment plant operations.
2. Prevent introducing pollutants into a POTW that could cause pass through of untreated pollutants to receiving waters.
3. Manage pollutant discharges into a POTW to improve opportunities for reuse of POTW wastewater and residuals (sewage sludge).
4. Prevent introducing pollutants into a POTW that could cause worker health or safety concerns, or that could pose a potential endangerment to the public or to the environment.

Regulatory oversight of industrial sources by approved programs includes formal permitting, compliance monitoring (routine compliance inspections and sampling), and enforcement. Many pretreatment programs work effectively with industrial users to reduce contaminants in the waste stream through voluntary pollution prevention efforts.

Oregon has about 25 approved programs that oversee more than 300 industrial users. Currently there are no pretreatment programs in the South Coast Basin.

Action and Alignment Opportunities (Pretreatment Program)

ACTION: Continue to review and approve pretreatment programs at the local level and oversee state-wide pretreatment activities.

Alignment Opportunity: The pretreatment program participates in the development of the toxics strategy, which includes evaluating opportunities for the pretreatment program to address and contribute to reduction in priority toxic pollutants. As DEQ develops specific strategies and increased protections related to emerging contaminants, the pretreatment program may be a valuable tool to reach up the pipe with BMPs and or local limits as part of a source reduction strategy to address newly identified toxic pollutants of concern.

Biosolids Program

Land Application – Beneficial Use of Nutrients

Biosolids are the nutrient-rich organic solids that are derived from the treatment of domestic wastewater at municipal wastewater facilities. The organic matter, nitrogen, and phosphorus as well as numerous micronutrients present in biosolids enhance intensively-managed agricultural soils as well as degraded soils. Biosolids act as a slow-release fertilizer, which improve plant growth, while reducing the use of conventional fertilizers in agricultural operations. The high organic matter present in biosolids enhances soil water holding capacity and improves microbial activity. Overall, biosolids improve soil quality by enhancing soil functions, such as cycling nutrients, regulating water, and filtering potential pollutants. The results of biosolids land applications include healthier crops with better drought resistance, fewer pollutants leaching to groundwater and surface water, and less erosion and sediment runoff to surface waters.

The Biosolids program regulates wastewater solids and domestic septage that have undergone sufficient treatment to allow its beneficial use as a soil amendment or fertilizer through land

application. Biosolids are regulated through NPDES or WPCF water quality permits issued by DEQ. Land application activities are described in biosolids management plans and land application plans are approved by DEQ. Prior to land application, the concentrations of ten pollutants must fall below federal and state limits, pathogens must be reduced, and the biosolids stabilized (i.e., vector attraction reduction or VAR) to reduce odors. Biosolids are treated to Class A or Class B standards, depending on the degree of pathogen reduction. Class A biosolids are the most highly treated and may be sold to the general public. Because some pathogens may remain in Class B biosolids, land application at individual sites is regulated by DEQ. Individual sites are visited by DEQ and authorized for land application activities with site-specific conditions necessary to protect public health and the environment, such as establishing setbacks and buffers to streams, wells, and groundwater; establishing appropriate agronomic rates based on soils and crops; and identifying seasonal, topographic, or geographic limitation of the site. Biosolids contain significant concentrations of nitrogen and may not be applied at rates that exceed the agronomic requirements for crops cultivated onsite.

Through the water quality permitting program, DEQ works with domestic wastewater treatment facilities to assure biosolids are adequately treated and stabilized and that land application operations and management practices meet federal and state regulations. DEQ requires wastewater treatment facilities to monitor and report on biosolids production and land application activities. Soil monitoring for residual nitrate-nitrogen is required whenever biosolids are applied at agronomic rates two out of three years. On an annual basis, permitted facilities report to DEQ on their biosolids land application program, including: the quantity of biosolids generated and land applied; the quality of the biosolids, including pollutant concentrations and nutrients; monitoring data on pathogen reduction; and monitoring data for vector attraction reduction.

In 2010, approximately 63,000 dry tons of biosolids were generated in Oregon; 95 percent of the biosolids (or 60,000 dry tons) were beneficially reused on over 20,000 acres of land. Approximately 6% of the biosolids produced were Class A and 88% were Class B. Based on 2009 data, the average concentration of monitored pollutants in biosolids was well below threshold limits established in Oregon Administrative Rules (OAR 340-050) and federal statute (40 CFR 503). Biosolids tend to have high concentrations of N and P and can provide significant nutrient benefit to plants. Organic sources of N, such as that predominantly found in biosolids, are less likely to leach or migrate to groundwater that inorganic nutrient sources.

Table 56 – State-wide Average Metal Pollutant Concentrations in Biosolids
Self Reported 2009 Data

Pollutant	Avg. concentration, mg/kg	Exceptional quality concentration limit, mg/kg*	Ceiling concentration limit, mg/kg**
As	6.15	41	75
Cd	2.61	39	85
Cr	30.3	1200	3000
Cu	328	1500	4300
Pb	36.9	300	840
Hg	1.67	17	57
Mo	8.53	--	75
Ni	24.4	420	420
Se	6.52	36	100
Zn	831	2800	7500

* Biosolids with pollutant concentrations below the exceptional quality limit do not require cumulative pollutant tracking.
** Biosolids cannot be land applied if the concentrations of pollutants exceed the ceiling concentration.

Table 57 – Oregon Average Nutrient and Solids Concentrations in Biosolids
Self Reported 2009 Data

Parameter*	Concentration, %
TKN	5.58
NO3-N	0.377
NH4-N	1.23
Total P	2.18
K	0.474
pH	7.51
Total solids	18.5
Volatile solids	47.7

Six wastewater treatment facilities in the South Coast Basin produced approximately 566 dry tons of biosolids or approximately 1 percent of the total biosolids state-wide. Approximately 60 dry tons of solids produced at the Brookings wastewater treatment facility are transported to Grants Pass for composting. Although exact numbers are not available, most of the biosolids produced by other facilities in the basin were land applied primarily onto farm and forest lands in the South Coast Basin.

Table 58 – 2010 Biosolids Production in the South Coast Basin

Generator	Total Solids generated, dry tons	Class	Biosolids land applied, dry tons	Area of land application, acres
Bandon WWTP	23.8 est.	B	17.9 (75%)	15.05
Coos Bay WWTP #1 & #2	402	B	402	80.6
Gold Beach WWTP	22	B	22	10.2
Lakeside WWTP	7.3	B	7.3	30
Myrtle Point WWTP	3.4	B	3.4	155
North Bend WWTP	108	B	108	52.8
Totals	**566.5**		**560.6**	**343.65**

Other wastewater treatment facilities in the basins that do not currently operate separate land application programs include the City of Brookings WWTP who transported 60 dry tons to Grants Pass for composting in 2010 and the City of Coquille WWTP who transports biosolids for disposal at an approved solid waste disposal site. Domestic septage haulers operating land application programs in the South Coast Basin include Roto Rooter and Econo Rooter.

Confined Animal Feeding Operations (CAFO)

Confined Animal Feeding Operations (CAFOs) operate under the Oregon CAFO general (NPDES) permit, managed by ODA, to ensure no discharge of fecal bacteria or nutrients under normal weather conditions defined as a 25-year, 24-hour rainfall event. There were 20 active CAFO permits in the South Coast Basin in 2011.

Each permitted CAFO receives a routine inspection from the area Livestock Water Quality Inspector once a year, on average. During this inspection, the operator and inspector discuss the operation and review required plans and records. The inspector views the entire operation to assure compliance with permit terms and water quality rules and laws. Inspection reports detail permit compliance in the following areas: permitted number of animals, animal confinement requirements, manure and silage containment requirements, manure application requirements, and record keeping. Problems in any of these areas, including incomplete record keeping, can result in the issuance of a water quality advisory (WQA) or a notice of noncompliance (NON). Note that a WQA is not a violation but is used to point out things that could be potential violations so they can be corrected before a violation occurs. When a discharge occurs or where there is a potential for a discharge to occur, ODA may take samples of the effluent to determine bacterial concentrations. Surface water quality samples are taken when visual or anecdotal evidence of discharge is present.

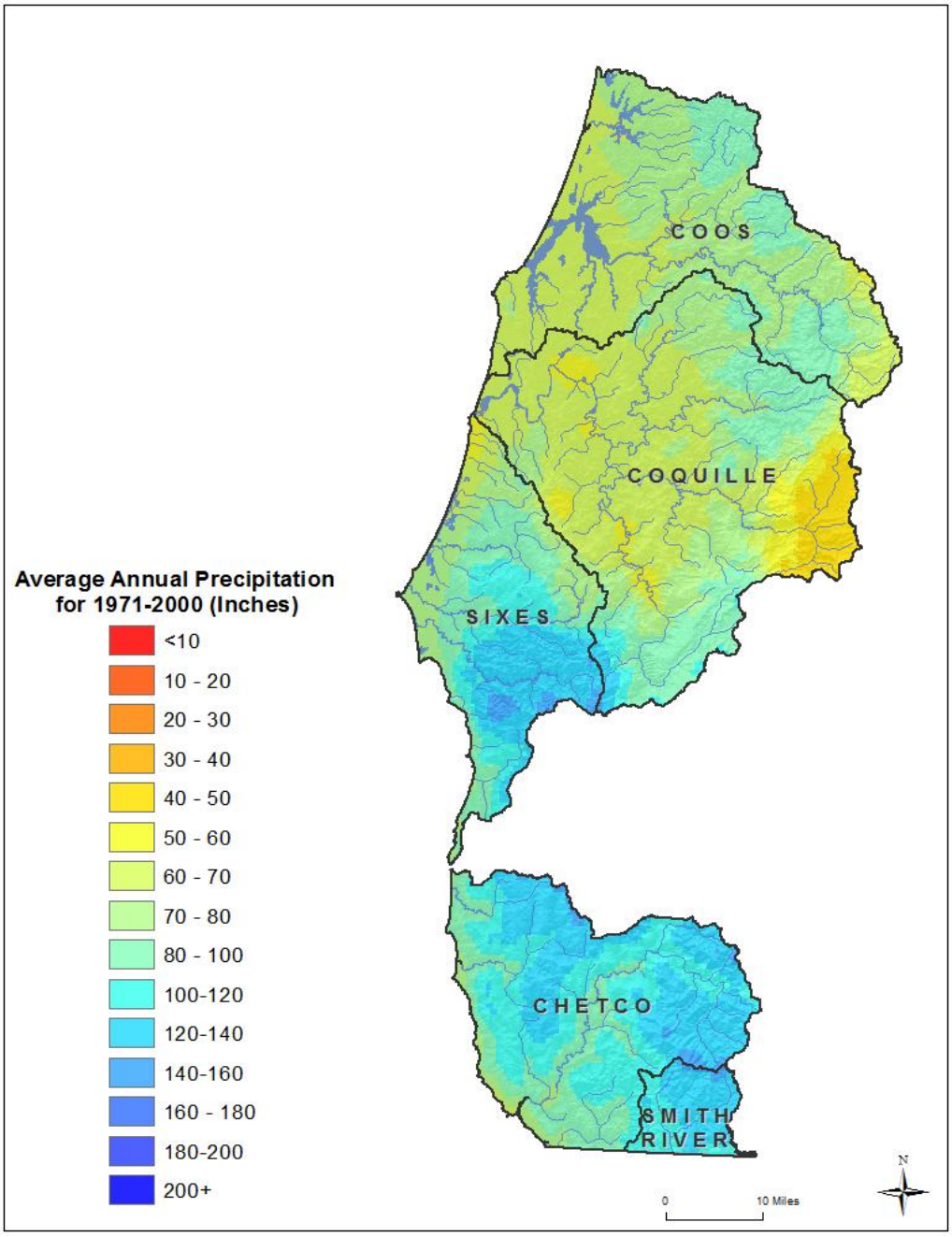
In 2011, nine South Coast Basin facilities were in compliance with all of the permit requirements. Two facilities were issued water quality advisories, and four facilities did not provide required records in a timely manner. Notices of non compliances were issued to four facilities for manure management (3) and being over in animal numbers (1). Some of the NONs issued in the South Coast Basin detail a potential release of bacteria and the potential for these CAFOs to contribute to bacterial levels in area waterbodies. In the event a violation is found, the inspector works with the operator to develop a solution to the problem and a schedule to complete the corrective actions. ODA can issue civil penalties for violations listed in NONs. Eighty three NONs have been issued in the South Coast Basin since 1990. Many of these NONs document multiple violations and require a plan of correction be developed and/or a required action be implemented to correct the observed problem.

Manure Spreading Advisory (MSA) Tool
ODA currently provides a Manure Spreading Advisory tool to help asses if predicted weather conditions are suitable for manure land application. The risks of runoff or leaching are ranked from low to high based upon predicted precipitation. Operators are required to consider other site specific risk factors like soil saturation, ponding, freezing conditions, the quality of cover, etc. http://www.oregon.gov/ODA/NRD/Pages/cafo_front.aspx#Manure_Spreading_Advisory

Manure Spreading Index
The Manure Spreading Index (MSI) was developed by the Oregon Department of Agriculture (ODA) for CAFO operators to use as guidance regarding when to spread manure on fields for use as fertilizer. The ODA meteorologist developed the index formula based on recorded rainfall and predicted rainfall to calculate a numerical "index". This was calibrated against actual weather records for Tillamook and threshold values of "Generally Okay", "Use Caution" and "Not Advisable" were determined.

In 2004 ODA obtained a grant from the US Environmental Protection Agency to conduct a demonstration program to prove the feasibility of the MSI. The grant has expired but the computer program that calculates the indices was modified to use input from the National Weather Service (NWS) observing stations and from the NWS's National Digital Forecast Database (NDFD). MSI rating can be found at http://msi.jimlittle.net/index.shtml.

Figure 46 – South Coast Basin Average Annual Precipitation



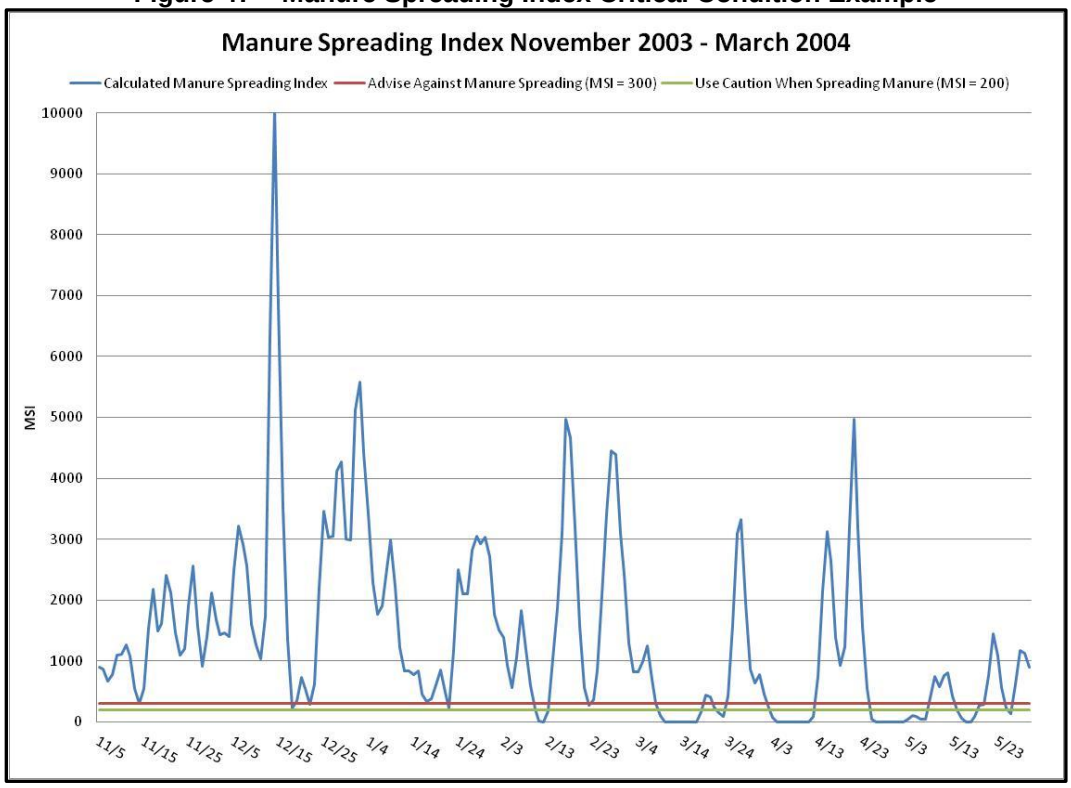
Like the MSA, the purpose of the MSI is to provide guidance to dairy and other confined animal feeding operations as to when spreading manure on fields would have the lowest risk of causing contaminated runoff into rivers, streams, creaks, ponds and lakes.

The MSI is calculated by using web services to obtain actual and forecast rainfall amounts from the National Weather Service. This information is combined into a simple index which weighs more recent rainfall more heavily than rainfall several days ago. MSI values range from zero (good) to essentially unlimited. Generally, in Oregon, a value of 300 or less may correspond to

lower risk for spreading manure. Values above 300 indicate an increased risk potential for runoff problems.

MSI Look Back Exercise
Because coastal rainfall can be intense and extend for long periods of time having adequate manure storage can be challenging. This can be further exacerbated by the location of some CAFO facilities in narrow finger valleys with streams and drainages in close proximity to limited acceptable land application areas. DEQ used a look back weather analysis utilizing rainfall records for the period November 2003 through May 2004. This period was examined because extensive rainfall trigger bacterial sampling was conducted. Note that early in the season rainfall intensity and duration were limiting to land application for 103 days. The majority of CAFO facilities do not have the capability to store manure for that long and were likely forced to land apply manure when conditions were not favorable. When these conditions align, water quality is likely to be adversely impacted.

Figure 47 – Manure Spreading Index Critical Condition Example



Action and Alignment Opportunities (Biosolids and CAFO)

ACTION: Continue to require monitoring and reporting on biosolids activities, review monitoring results, take prompt and appropriate action when potential issues arise, provide technical assistance for facility owners and operators when needed. Develop more efficient annual reporting system for biosolids generating facilities and communicate information through GIS.

ACTION: Map location and extent of existing and future biosolids application sites and share with subprograms.

ACTION: Digitize biosolid applications and records.

ACTION: NPS, DW, Groundwater, Onsite, Industrial Stormwater, and Biosolids subprograms to provide input to Toxics Monitoring Program to aid in site selection and the identification of analytes of interest.

ACTION: Integrated review (drinking water program, NPS TMDL, ODA, ground water) of biosolid program information to ensure no WQ impacts based on current data.

ACTION: Education and outreach about emerging contaminants. Proper disposal options should be investigated and publicized (waste pick up events, drug turn in, etc.) to prevent the accumulation of emerging contaminants at biosolid application sites.

Alignment Opportunities: Because of seasonal weather patterns along the coast and regional topography, implementing biosolids land application programs can be challenging for smaller facilities, particularly during wet winter months. In addition, the expense associated with transporting liquid biosolids (biosolids with less than 10% total solids content) for processing or land application outside the region often imposes significant costs on wastewater treatment facilities. Opportunities to align water quality strategies also include the financing of dewatering capabilities and solids storage structures at wastewater treatment facilities as well as identifying additional suitable land application sites near the treatment facilities.

Alignment Opportunity: Work with wastewater facilities, communities, and land owners to recognize environmental benefits of biosolids program. Identify potential reuse locations in the geographic area of the wastewater treatment facilities.

ACTION: Provide information to WWTP operators regarding suitable land application windows based upon rainfall and agronomic rates. Perhaps refer to the Manure Advisory Tool.

ACTION: Work with ODA to develop advanced best management practices for CAFO waste management that are protective of both surface and ground water.

ACTION: DEQ to collaborate with ODA to provide water quality monitoring data to inform the CAFO program. Investigate opportunities for collaboration between ODA and TMDL outreach activities. Work with ODA to augment the Manure Spreading Advisory Tool website with site specific risk tools like the Application Risk Management Field Assessment Worksheet provided by the Whatcom Conservation District in Washington State. The worksheet can be accessed at http://www.whatcomcd.org/manure-spreading-advisory.

ACTION: Work with ODA to conduct “look back exercises” to better evaluate the sufficiency of manure storage capacity on farm and to assist operators in expanding capacity as necessary.

ACTION: Coordinate with the groundwater program to work with ODA to develop advanced best management practices for CAFO waste management and develop a research forum on determining agronomically correct nitrogen loading rates that are protective of groundwater.

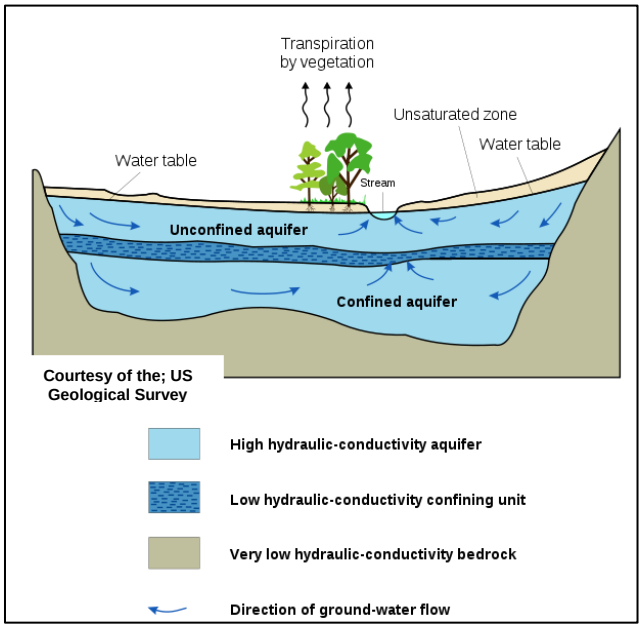
Alignment Opportunity: The common need for increased storage capacity is shared by CAFOs (manure) and wastewater treatment facilities (biosolids). The Manure Spreading Advisory Tool should be shared with wastewater treatment facilities land applying biosolids to help inform decisions regarding agronomically correct meteorological conditions.

Underground Injection Control

The UIC program's goal is to protect aquifers from contamination due to underground injection activity. All aquifers in Oregon are considered suitable as drinking water. The Underground Injection Control program began in 1974 under the Safe Drinking Water Act. Oregon DEQ regulates this program under the Underground Injection Control rules (OAR Chapter 340, Division 44). Many Oregonians rely on groundwater from domestic and municipal wells for their drinking water. UICs are not allowed to directly discharge into an aquifer because groundwater is especially sensitive to contamination and, in many instances, is the sole source of public and private drinking water. Pollutants can also enter lakes, streams, wetlands, and springs.

An underground injection control system is a system designed with the intent to discharge or distribute fluid below the ground surface. The most common UIC systems in Oregon are stormwater drywells. Jurisdictions often use drywells to discharge runoff from public roads and other publicly owned facilities. Private businesses outside of sewer or stormwater service areas may seek approval to discharge their process wastes into sumps, drywells, trench drains, floor drains, septic tanks and drain fields (UICs). Approval depends on the type of waste and pretreatment before subsurface discharge. Other reasonable options, such as storage in a holding tank pending disposal at an approved receiving facility are preferred. UICs need to be carefully managed so as not to release waste contaminants directly into the ground and over time pollute groundwater.

Figure 48 – Confined and Unconfined Aquifers



As a condition of Authorization by Rule every owner/operator of an injection system is required to have a storm water injection management plan. The plan discusses the control measures or Best Management Practices which will eliminate polluted storm water or treat it prior to discharge. Some stormwater UICs, for example roof drainage, are exempt from this requirement.

Coos and Curry counties have approximately 269 UIC wells that are known (164 and 39 UICs respectively). In Curry County 92% of the UIC's are in compliance. In Coos County 93% are in compliance with 66 UIC's pending approval. DEQ staff should continue to address the need for UIC systems to be authorized by rule or permitted in the South Coast Basin.

Action and Alignment Opportunities (UIC)

ACTION – Coordination of the permit programs (NPDES, WPCF and UIC) to bring the basin UICs into compliance with state and federal regulations. There are a number of educational opportunities that could be pursued with municipalities about UICs, stormwater and infrastructure needs (especially in high risk areas), financial assistance programs (SRF), and program rules and enforcement.

Alignment Opportunity: Coordinate with stormwater and SRF programs to pursue outreach, education, and financing opportunities. NPS program can assist with outreach in the South Coast Basin.

Section 401 Removal/Fill Certification

Section 401 of the federal Clean Water Act requires that any federal license or permit to conduct an activity that may result in a discharge to waters of the United States must first receive a Water Quality Certification (WQC) from the state in which the activity will occur. DEQ 401 program staff evaluates project proposals for potential impacts to water quality and beneficial uses. Certifications may be: 1) issued for the project as proposed, 2) issued with conditions intended to eliminate or minimize impacts, 3) denied, or 4) waived if DEQ takes no action within one year of receiving the request for a 401 certification. The majority of applications receive 401 certifications with conditions. Most certification requests come to DEQ through either the Federal Energy Regulatory Commission (FERC) process for hydroelectric projects**,** or through US Army Corps of Engineers (USACE) permits for removal and fill activities. For more info: http://www.deq.state.or.us/wq/sec401cert/sec401cert.htm .

A proposal to conduct work in waterways or wetlands requires a Joint Permit Application submitted to both the USACE and the Department of State Lands (DSL). These agencies process the applications separately. USACE determines if an application may result in a discharge into jurisdictional waters and requires a permit. If a permit is required, USACE will determine which type of permit (Nationwide Permit, Regional General Permit, or Individual Permit) is needed. DEQ's 401 process is triggered by this federal nexus.

Approximately 119 projects were considered for individual permit 401 WQC in the South Coast Basin during the period 1995 through October 2011. Of these, 16 were for channelized stream maintenance, 16 were for stream bank erosion control, eight authorized instream gravel harvest, and 15 projects involved maintenance dredging by ports and/or dock operators. There were nine certifications issued for road bridge construction and fish habitat enhancement each. Seven certifications were issued for commercial site development. For development projects which impact wetlands the 401 certification requires the implementation of an approved storm water management plan (SWMP). This ensures that treatment of increased stormwater runoff from all associated impervious surfaces for the life of the projects.

The Army Corps of Engineers (ACOE) evaluates permit applications for proposed activities in waters of the United States (including wetlands) throughout Oregon, under the authorities of the Marine Protection, Research and Sanctuaries Act, Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. Since 1992 the ACOE has issued approximately 487 Nationwide Permits (NWP). The purpose of the Nationwide Permit Program is to streamline the evaluation and approval process throughout the nation for certain types of activities that have only minimal impacts to the aquatic environment. DEQ does not review each project but rather issues generic 401 WQC for activities covered under NWP. These permits are usually review by DEQ and WQCs reissued every five years. Additional information can be found at http://www.spn.usace.army.mil/regulatory/nwp.html.

Oregon's Removal-Fill Law (ORS 196.795-990) requires any person who plans to "remove or fill" material within "waters of the state" to obtain a permit from the Department of State Lands (DSL). Removal means taking rock, gravel, sand, silt and other inorganic substances from the bed or banks of a waterway, or their movement by artificial means within the bed or banks, including channel relocation. Fill means the deposit by artificial means of any material (organic

or inorganic) at any one location in the bed or banks. Waters of the state include wetlands on private and public land. DSL has several General Authorizations and General Permits for certain activities that involve minimal impacts. General Authorizations (GAs) are an expedited process for nine specific types of removal-fill activities that have minimal adverse effects. General Permits (GPs) authorize a group of activities that are substantially similar in nature, recurring or ongoing, and have predictable effects and outcomes. DSL currently has two GPs available for use by the public. These permits have expedited permit processing timelines. If there is no federal nexus DEQ does not issue individual 401 WQC for these projects. If an ACOE individual or nationwide permit is issued the DEQ WQC comes with this federal permit. From 2001 to 2011 DSL issued approximately 441 removal fill permits including 27 emergency permits, 295 GAs and 119 individual permits. For more information about Department of State Lands removal fill permitting visit http://www.oregon.gov/DSL/PERMITS/index.shtml (DSL, 2013).

Section 401 Certification - Hydroelectric Certification
The OWRD may issue water rights for minor hydroelectric projects, those with relatively small turbines (generating less than 100 theoretical horsepower). To approve an application, OWRD must first find that the project will meet applicable resource protection standards given in OAR 690 Division 051, including water quality. OWRD consults with state resource agencies, including DEQ, to make this determination. DEQ evaluates proposed minor hydroelectric projects and may place certain conditions in the water right as necessary to ensure compliance with applicable water quality standards. OWRD on-line information indicates that there are no small hydropower projects in the South Coast Basin at this time.

Area of Concern – Gravel Harvest
Water quality and habitat degradation concerns have been raised with the on-going gravel removal and maintenance dredging projects. Channel stability and bed-material transport studies have been completed by US Geological Service (USGS) in the Chetco River (Wallick, 2009), South Fork Coquille River (Jones, 2012) and Hunter Creek (Jones, 2011). These studies commissioned by a multi-agency regulatory group (USACE, EPA, USFWS, NMFS, DEQ, DLCD, ODFW)), to determine the potential sediment delivery regimes for these streams and the extent of alteration of the physical and biological systems, in response to alteration of the sediment regimes. Results of these studies may warrant additional limiting conditions or cessation of these actions to protect water quality and beneficial uses of these streams.

Area of Concern – Channelized Streams
Water quality concerns related to channelized stream maintenance projects include the accelerated direct delivery of pollutants like bacteria and sediment. These hydrological modifications result in reductions in overall stream length, loss of wetland connectivity, and increased stream velocities. In addition, vegetation is often not allowed to establish along channelized streambanks. DEQ should consider applying additional conditions related to this project type when certifying individual projects as well as for projects covered under general or nationwide permits.

Action and Alignment Opportunities (401 Certification)

ACTION: Incorporate the results of the USGS sediment study on the Chetco and South Fork Coquille River and Hunter Creek into WQCs.

ACTION: In areas where accelerated pollutant delivery contributes to a water quality limitation applicants proposing channelized stream management activities in the South Coast Basin should provide specific information to facilitate the review and evaluation of the project. The information will be used to better assess potential impacts from proposed projects and should include:

- The available gradient and if the gradient is sufficient in the proposed project area to indicate that dredging the stream will result in improved drainage
- A management plan for existing and future vegetation along the channelized streams. This plan should promote the establishment and maintenance of stream channel and side channel(s) vegetation. Vegetative alternatives could include clusters of vegetation and/or vegetation establishment on at least one side of the stream
- A discussion of the potential to use sediment trapping methods in locations where a change in stream gradient results in early sediment deposition. These areas may allow for the cleaning of sediment traps on a more frequent basis and reduce the need for stream cleaning in the future
- A spoils (sediment) management plan that discusses where, when and how all spoils will be dispersed. Alternatives to the placement of this material onto dikes and/or near stream embankments are desired
- A reporting mechanism to DEQ for the amount of cubic yards that are removed each year
- If tidegates are present in the project area or as a control structure at the tidal interface of the stream the following information shall be provided at a minimum; tidegate relationship(s) to stream gradient information, a description of tidegate structures, and an assessment of the condition of these structures inclusive of any maintenance needs and how tidegate(s) position and condition relate to the goals of the proposed project

ACTION: Applicants who propose stream bank erosion control should provide information that will allow their project to be reviewed in the context of the stream reach. The stream reach should be identified based upon dynamically stable upstream and downstream points. A reach based approach will seek to establish channel stability within the reach through time assuring that one project does not adversely impact over stream banks in the reach.

ACTION: Continue to work with DSL to address water quality issues during the state only 404 permitting process. Because there is no federal nexus DEQ may not have adequate opportunity to provide input regarding water quality concerns. Seek to work with DSL when state only 404 permits are issued for bank stabilization, channelized stream maintenance dredging, and gravel harvest.

Alignment Opportunity: Continue to work with NPS and WQC staff to;

- Share the results of sediment transport studies and provide input during the development of responsive WQC conditions for the South Coast Basin.
- Address hydromodifications in channelized streams and provide input during the development of responsive WQC conditions for the South Coast Basin.
- Work with WQC staff to develop reach based approach requirements when issuing WQCs for bank stabilization projects.

Onsite Septic Systems

Over 30 percent of Oregonians currently treat their wastewater through the use of onsite septic systems, primarily residential systems. DEQ regulates the siting, design, installation, and ongoing operation and maintenance of onsite septic systems either directly or by

delegation/contract. In the South Coast, DEQ directly manages the onsite program in Coos County and provides oversight of the onsite program in Curry County where Curry County manages the program under contract with DEQ. DEQ and its contract agents also ensure that septic tank pumpers have the necessary equipment to safely pump and transport septage. In addition, DEQ certifies and licenses installers, pumpers, and maintenance providers, and reviews and approves products such as septic tanks, alternative treatment technologies, and alternative drain field products.

Investigation of and response to complaints of sewage surfacing in South Coast Basin is limited by personnel and resources. Letters are sent notifying responsible persons of alleged violations, requesting compliance if the alleged violation is accurate. Follow-up is not possible in many instances.

The onsite program is entirely fee supported. Application fees cover the costs of issuing permits, evaluating sites for potential septic approvals, and the costs for enforcement and complaint investigation. During times when we have high volumes of applications, staff resources are often limited for compliance work. People who have submitted applications want immediate action and there is little time to follow up on complaints. During recessionary periods when there are few new applications funding often limits staff availability. A properly funded complaint investigation program would allow follow up and correction of systems that are contributing to surface water pollution and creating public health problems in Oregon.

Most lending institutions require that a property's septic tank be pumped prior to sales. Examination of the septic tank alone will tell only a very small part of the story about the system and its level of treatment. DEQ does not currently require existing system inspections to evaluate ongoing onsite system function. Without careful maintenance, septic systems can fail prematurely resulting in polluted streams and groundwater. Treatment failure can also occur when the system components reach the end of their design lifetime and begin to degrade. For instance, metal septic tanks installed in the 1970's have likely rusted through and are no longer water tight. Through time soils can become less effective at treating wastewater and this is why repair areas are identified during the site evaluation process for new systems. Many landowners do not realize the value of these repair areas and often conduct incompatible activities in the area such as building a driveway or garage or confining livestock.

Oregon's federally designated Coastal Zone encompasses almost all Oregon watersheds that drain to the Pacific Ocean. The entire South Coast Basin is within the Coastal Zone. Oregon Legislature established the Oregon Coastal Conservation and Development Commission, the report and recommendations of which form the backbone of the four Coastal Statewide Planning Goals. Within this zone, the Oregon Coastal Management Program applies to the land and water areas, except for those lands owned by the federal government or those held in trust under Indian tribal jurisdiction.

In order to approve Oregon's Coastal Nonpoint Program NOAA and EPA have required DEQ to develop rules to implement actions addressing existing onsite system maintenance. South Coast Basin file reviews indicate that there are a large number of systems that are at the end of their expected design lifetime or were placed closer to waterbodies than they would be under current criteria. The existence of these conditions has not constituted a failure to perform that the DEQ historically has acted on. Onsite systems may be adversely impacting water quality without surfacing sewage to the ground.

DEQ is currently developing rules to implement actions to address existing onsite system maintenance. These rules will promote the inspection of onsite systems at time of property transfer by trained/certified inspectors. Rules will be considered for adoption in early 2014 with implementation beginning shortly thereafter. DEQ worked with the Oregon Association of Realtors (OAR) during the 2013 legislative session to amend the Sellers Disclosure Statement to include questions about onsite system maintenance and inspections.

DEQ's ability to manage existing onsite system maintenance should improve as we implement these new requirements but only to the extent that DEQ implements strong, system based inspections. The success of DEQ's current approach depends heavily on the real estate community and on the prospective purchaser's level of interest is in assuring the on-site system is functional. DEQ is partnering with OAR to educate realtors and inform homeowners and potential homebuyers of the importance of onsite septic system inspections and regular maintenance. DEQ's new rules also define onsite system inspector minimum qualifications and standardize system inspections and documentation thereof. DEQ will collect information on onsite system inspections from homebuyers and onsite system evaluators to evaluate the effectiveness of this approach.

Because the new rules only apply at the time of property transfer continued outreach, education, and financial incentives for homeowners operating onsite systems through time is critical. If water quality studies indicate that onsite systems continue to contribute to water quality problems, the state and/or local entities that have responsibility for septic systems will be required to adopt area specific measures to address the pollution. These entities would need to show how they will meet their responsibilities, which could include implementing technologies, best management practices or other measures to reduce pollution.

Action and Alignment Opportunities (Onsite Septic Systems)

ACTION: Maintenance Program
Begin onsite maintenance program implementation in the coastal zone (includes all of the South Coast).

ACTION: Education and Outreach
The toxics section of this document discusses municipal effluent pollutant test results for emerging contaminants, pharmaceuticals and personal care products. Additional information should be collected to characterize the potential pollutant loads from septic systems (discharge to groundwater). Education and outreach about onsite systems should include discussion about these contaminants. Proper disposal options should be investigated and publicized (waste pick up events, drug turn in locations, etc.)

ACTION: Continue to act as an information resource promoting individual landowner education and outreach. Work with citizens who own and manage an onsite septic system to assure they are knowledgeable about their treatment system, repair needs, and the importance of repair area protection.

ACTION: Funding Assistance
Landowner fear of cost to repair seems to be the primary disincentive for individual actions to assess the functionality of existing onsite systems. The need for funding assistance and incentive is clear and efforts to access the State Revolving Fund for support have been unsuccessful.

Allowing not for profit entities to be eligible applicants could help facilitate leveraging of multiple funding sources to address onsite system upgrades. An example might be NeighborWorks Umpqua. NeighborWorks Umpqua is a community-focused not for profit organization helping residents of Coos and Curry Counties to build businesses, homes and affordable housing. The organization also helps government and other agencies provide needed infrastructure, conserve resources, and develop a stable local economy.

DEQ introduced Senate Bill 83 in 2011 which would have resulted in returning fines for onsite septic system violations to the program to fund training, education and outreach, repair or replacement of failing septic systems, and for working with communities on area-wide septic system problems. This bill was sent to committee and did not move forward. DEQ will continue to seek to develop opportunities for funding assistance to help landowners to maintain, manage, and upgrade onsite systems as needed.

ACTION: Special Projects
DEQ should consider the implementation of a special on-site project in the South Coast Basin where the level of public health concern warrants that action. A special project could provide for resources and geographic focus to evaluate the conditions of septic systems in a certain area. DEQ will support viable area wide solutions such as connection to sewer or development of decentralized wastewater treatment options.

ACTION: Continue to track progress in the development of Microbial Source Tracking techniques which have the potential to better define the sources of bacterial loads.

Alignment Opportunity: Collect and provide bacteria, nutrient, and emerging contaminant data to the on-site program to help focus and support education and outreach efforts. Align surface water quality data with onsite program priorities to identify areas where septic systems adversely impact water quality and as such are good candidates for special projects.

Water Reuse

DEQ encourages water reuse as a strategy for protecting Oregon's water resources. Water reuse means using water again that has been previously used for another purpose. Reusing water reduces the demand to use potable water for uses, such as irrigation, that don't require highly treated water. Water reuse can effectively improve water quality by reducing the discharge of pollutants to water bodies and reducing withdrawals from surface water sources. Water reuse for non-potable purposes allows individuals, municipalities, and industrial facilities to use lower quality water sources for beneficial purposes. DEQ encourages three general categories of water reuse: gray water, recycled water, and industrial wastewater.

Gray water refers to water from showers, baths, bathroom sinks, kitchen sinks and laundries. Gray water can be reused for limited activities, such as subsurface irrigation with minimal treatment. In August 2011, the Oregon Environmental Quality Commission adopted new administrative rules (OAR 340-053) for gray water reuse and disposal system. Under the new rules, most individual homeowners and small businesses can reuse gray water by obtaining an inexpensive WPCF general permit from DEQ.

Recycled water refers to treated effluent from a municipal wastewater treatment facility. Oregon's administrative rules (OAR 340-055) identify four classes of recycled water (Class A, B, C, and D), based on various levels of treatment, that can be reused for specific beneficial purposes. Class A water is the most highly treated and disinfected; Class D recycled water is

the least treated and disinfected. DEQ regulates recycled water use through a wastewater treatment facility's WPCF or NPDES permit. DEQ works with the OHA and OWRD on the permitting of this practice. DEQ staff also work with municipal facilities to ensure proper operation and management of wastewater treatment facilities that pursue water reuse. Facility permits require management plans for water reuse and must submit an annual report on recycled water use to DEQ. Over 120 (or greater than one-third) of Oregon's municipal wastewater treatment facilities are permitted to operate a recycled water use program. Most recycled water is used for irrigation of crops and golf courses. In response to growing interest in sustainable water management, DEQ has issued three permits for three urban facilities (i.e., building-scale) to treat and reuse water onsite, including uses such as toilet and urinal flushing, evaporative cooling, and landscape irrigation.

Industrial wastewater refers to treated effluent from an industrial process, manufacturing or business, or from the development or recovery of any natural resource. An example of industrial wastewater is water derived from the processing of fruit, vegetable, or other food products. DEQ regulates industrial water reuse through both general permits and facility-specific individual permits. DEQ staff also work with industrial facilities to ensure proper operation and management of wastewater treatment facilities that pursue water reuse. Facility permits require management plans for water reuse. In addition to a number of individual permits issued for industrial water reuse, DEQ currently regulates more than 175 food processing facilities through general permits, which allow the reuse of industrial process waters for irrigation purposes.

Action and Alignment Opportunities (Point Source)

ACTION: DEQ is implementing the administrative rules for gray water reuse and disposal systems adopted by the EQC in August 2011 and began accepting gray water permit applications in the spring 2012. DEQ Wastewater Permitting staff will coordinate with wastewater treatment facilities and other interested stakeholders and continue exploring opportunities for improving water quality through recycled water and industrial water reuse. DEQ will coordinate with permittees on improved annual reporting on water reuse activities.

Alignment Opportunity: Nonpoint source staff can assist with local stakeholder outreach as part of the gray water program implementation. Water Reuse staff can work with the groundwater and NPS programs to provide outreach to local communities, building authorities, gray water system designers and gray water users to ensure systems are operated and maintained to protect water quality.

Alignment Opportunity: Align the Integrated Water Resource Strategy work with Water Reuse program efforts to maximize benefits, deliver overarching message, and prioritize outreach and education.

Water Quality Monitoring

Monitoring and analysis programs conducted by the DEQ Laboratory and Environmental Assessment Division provide the foundation for restoring, maintaining and enhancing Oregon's environmental quality. DEQ scientists maintain monitoring networks for air, water, and land, and conduct special studies to determine the status, trends and sources of impairment for Oregon's environmental quality. Collecting data is essential to understanding the health of Oregon's

environment. Monitoring data is used to determine whether environmental standards are being met, the sources of pollution, and the impact of pollution on human and environmental health.

Water quality monitoring and assessment provides the foundation for water quality management actions at DEQ and in coordination with other state and federal natural resource agencies, counties and municipalities. DEQ's water quality monitoring programs work in conjunction with other local and regional monitoring efforts to provide information on the status and trends of water quality in the South Coast Basin. In addition, monitoring is conducted to determine if water quality supports beneficial uses and if water quality standards are met. Streams that do not meet specific water quality standards are placed on the 303d list and will have TMDLs developed for them. In order to develop TMDLs (and Implementation Ready TMDLs), studies must be conducted to determine sources of pollutants and to quantify pollutants affecting the water body and how those vary over time.

DEQ is also engaged in several other types of monitoring studies, including the following:

National Aquatic Resource Surveys (NARS)

EPA's National Aquatic Resource Survey (NARS) programs (**Fact Sheet**) apply a probability or random based monitoring design and select core indicators appropriate for designated beneficial uses. The program is designed to provide EPA with important information about water quality at the national scale and how to protect, maintain, and restore water quality. EPA has designed a five year rotating schedule around the key aquatic resources; National Coastal Condition Assessment (see Estuary conditions), National Lakes Assessment (see Hazardous Algal Blooms), National Rivers and Streams Assessment (see Biomonitoring), and the National Wetland Condition Assessment (see Wetlands)

Probability-based monitoring designs randomly select sites where monitoring will occur and then extrapolates that information to represent the entire resource (Overton et al., 1990). This type of environmental sampling is not designed to be used for site specific assessments, but rather as a tool to define the quality of a larger group of water bodies. DEQ laboratory staff plan to continue monitoring in support of EPA NARS survey programs as resources allow.

Ambient Monitoring Program

Oregon Water Quality Index (OWQI) (DEQ, 2012b)

The ambient water quality monitoring network consists of 131 statewide locations. The network includes 12 sites in the South Coast Basin that are sampled six times annually for conventional water quality pollutants including, water temperature, dissolved oxygen, pH, conductivity, turbidity, alkalinity, bacteria, total organic carbon and nutrients, which includes total phosphorus, dissolved orthophosphate, nitrate/nitrite, and ammonia. Information collected at these sites is used to assess general water quality conditions using the Oregon Water Quality Index (OWQI) and to assess the trends at these locations.

Surface water quality conditions in the South Coast Basin were examined using data from DEQ's OWQI. This index provides a general assessment of water quality at a site by combining information from eight different sub-indices: temperature (T), dissolved oxygen (DO), pH, biochemical oxygen demand (BOD), total solids (TS), nutrients (nitrogen (N) and phosphorus (P)) and bacteria (BACT). The table below shows the five index score condition classes ranging from excellent to very poor. To account for differences in water quality between low flow summer months (June - September) and higher flow fall, winter, and spring (FWS, October - May), average values for summer and FWS were calculated and compared.

Table 59 – Oregon Water Quality Index Scoring Brackets	
OWQI Category	**Score**
Very Poor (red)	Less than 60
Poor (orange)	60-79
Fair (yellow)	80-84
Good (green)	85-90
Excellent (blue)	90-100

Water Quality Scores and Trends 2001-2010

The South Coast Basin has twelve surface water locations that are included in DEQ's long-term ambient WQ monitoring program. Three sites are in excellent condition (blue), three sites are in good condition (green), three sites are in fair condition (yellow), one site is in poor condition (orange), and two sites are in very poor condition (red). Downward arrows in the figures below indicate significantly declining trends in water quality condition at two sites (Seasonal-Kendall trend analysis 90+). The Winchuck River upstream of highway 101 (Peavine Bridge) is one of five sites in the state with the best water quality even though the site shows a significant decreasing trend. A significant decreasing water quality trend was also observed at the North Fork Coquille River at Hwy 42. No significant trends were observed for other sites during the ten year period of record 2001-2010.

Figure 49 – South Coast Basin 10-Year Mean OWQI Scores

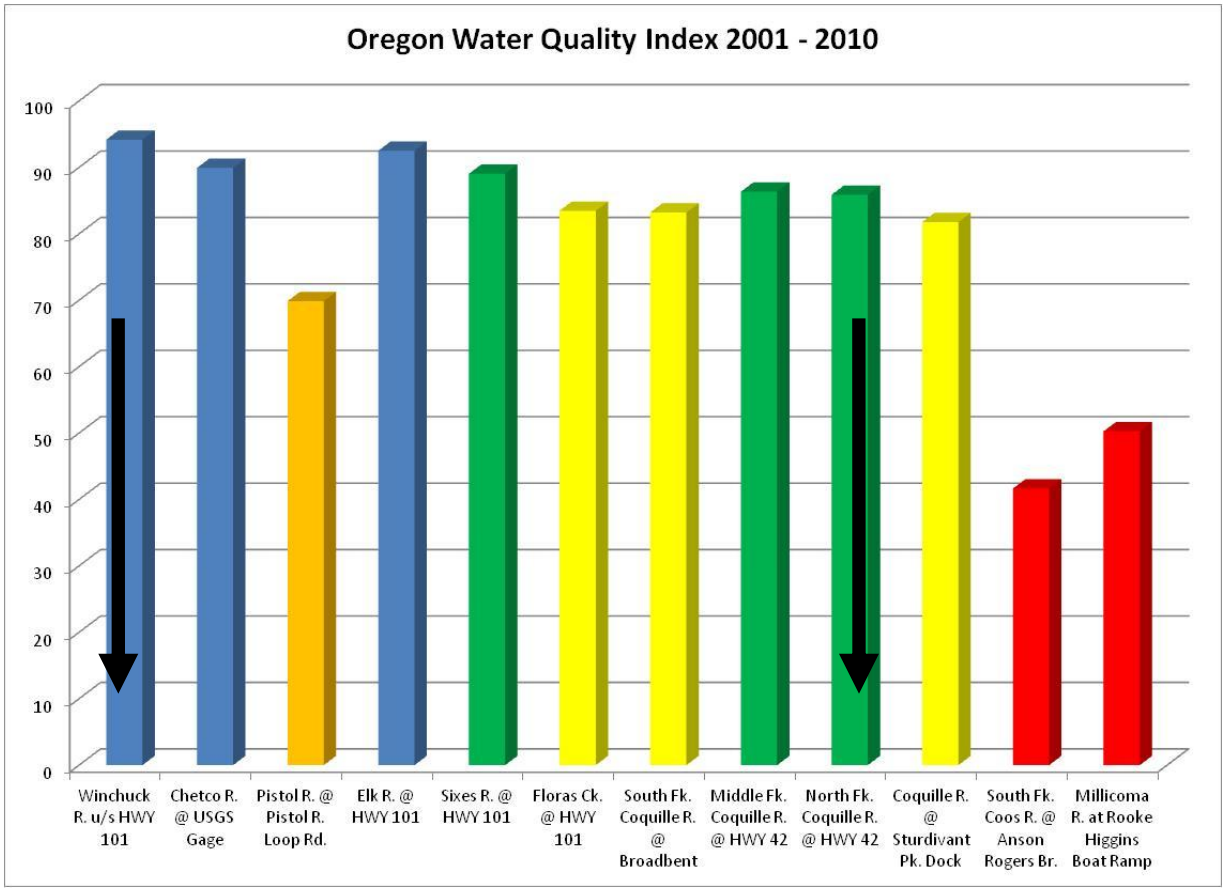
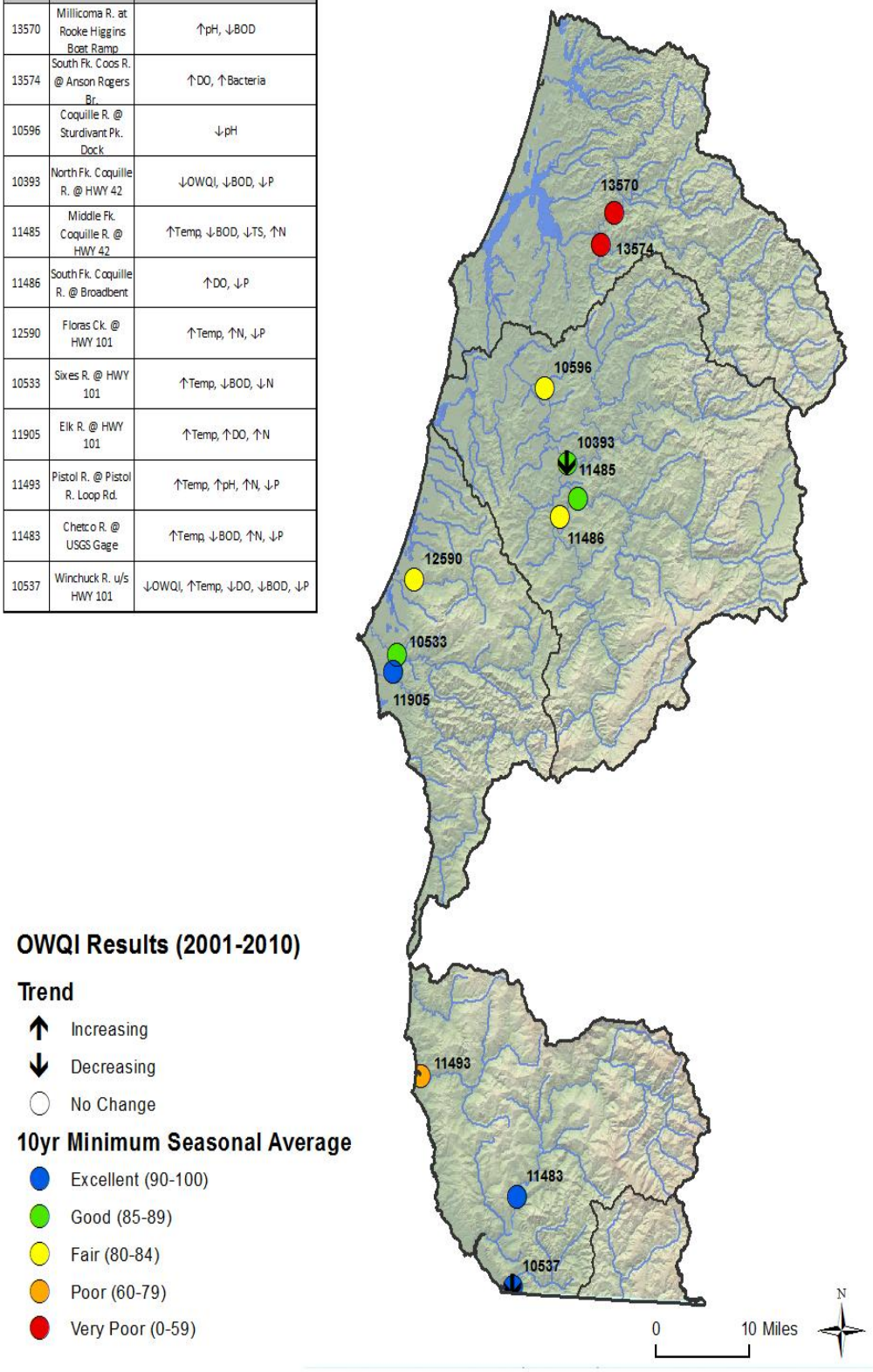


Figure 50 – South Coast Basin Water Quality Index Conditions

Station	Site	Trend - Idex and Sub-indicies
13570	Millicoma R. at Rooke Higgins Boat Ramp	↑pH, ↓BOD
13574	South Fk. Coos R. @ Anson Rogers Br.	↑DO, ↑Bacteria
10596	Coquille R. @ Sturdivant Pk. Dock	↓pH
10393	North Fk. Coquille R. @ HWY 42	↓OWQI, ↓BOD, ↓P
11485	Middle Fk. Coquille R. @ HWY 42	↑Temp, ↓BOD, ↓TS, ↑N
11486	South Fk. Coquille R. @ Broadbent	↑DO, ↓P
12590	Floras Ck. @ HWY 101	↑Temp, ↑N, ↓P
10533	Sixes R. @ HWY 101	↑Temp, ↓BOD, ↓N
11905	Elk R. @ HWY 101	↑Temp, ↑DO, ↑N
11493	Pistol R. @ Pistol R. Loop Rd.	↑Temp, ↑pH, ↑N, ↓P
11483	Chetco R. @ USGS Gage	↑Temp, ↓BOD, ↑N, ↓P
10537	Winchuck R. u/s HWY 101	↓OWQI, ↑Temp, ↓DO, ↓BOD, ↓P



OWQI Sub Indices

A sub index score is developed for each of the OWQI parameters. The sub index scores are then combined to develop the OWQI score. Examination of sub index scores can help better focus which parameters are driving the overall OWQI score.

Table 60 – 2001-2010 Poor Water Quality Sub Index Scores at Ambient Monitoring Sites	
Site	**Parameter Sub-Index Scores <80 (Poor)**
Winchuck River u/s HWY 101	None
Chetco River @ USGS Gage	Temperature, Total Solids
Pistol River @ Pistol River Loop Road	Total Solids
Elk River at HWY 101	None
Sixes River at HWY 101	None
Floras Creek @ Hwy 101	Temperature, Total Solids, Nitrogen
Middle Fork Coquille River @ Hwy 42	Temperature, Total Solids
North Fork Coquille River @ Hwy 42	Total Solids, Nitrogen
South Fork Coquille River @ Broadbent	Temperature, Total Solids
Coquille River @ Sturdivant Park	Temperature, Total Solids
SF Coos River @ Anson Rodgers Br	Temperature, DO, Total Solids
Millicoma River @ Rooke Higgins BR	Temperature, DO, Total Solids, Nitrogen

In the Pistol River example below the entire period of record has been assessed. Note that the parameters total solids, phosphorus, and BOD sub-indices (dashed lines) track well with the OWQI scores (solid lines) illustrating that these parameters are having a large influence on OWQI scores through time.

Figure 51 – Pistol River at Pistol River Loop Road Total Solids Sub-index

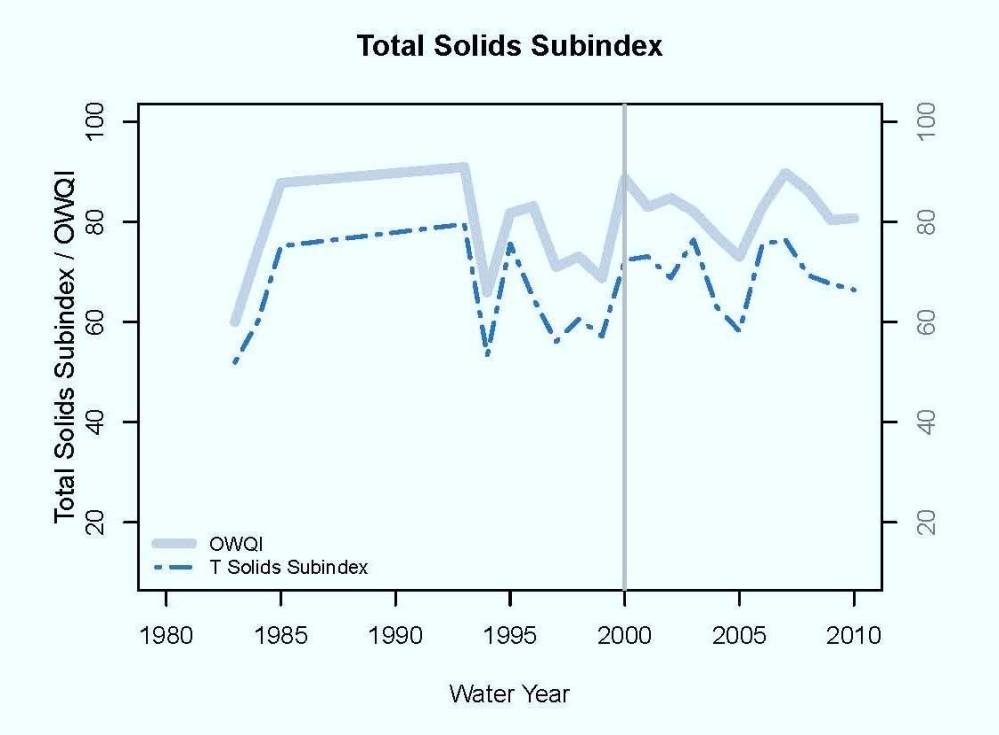


Figure 52 – Pistol River at Pistol River Loop Road Phosphorus Sub-index

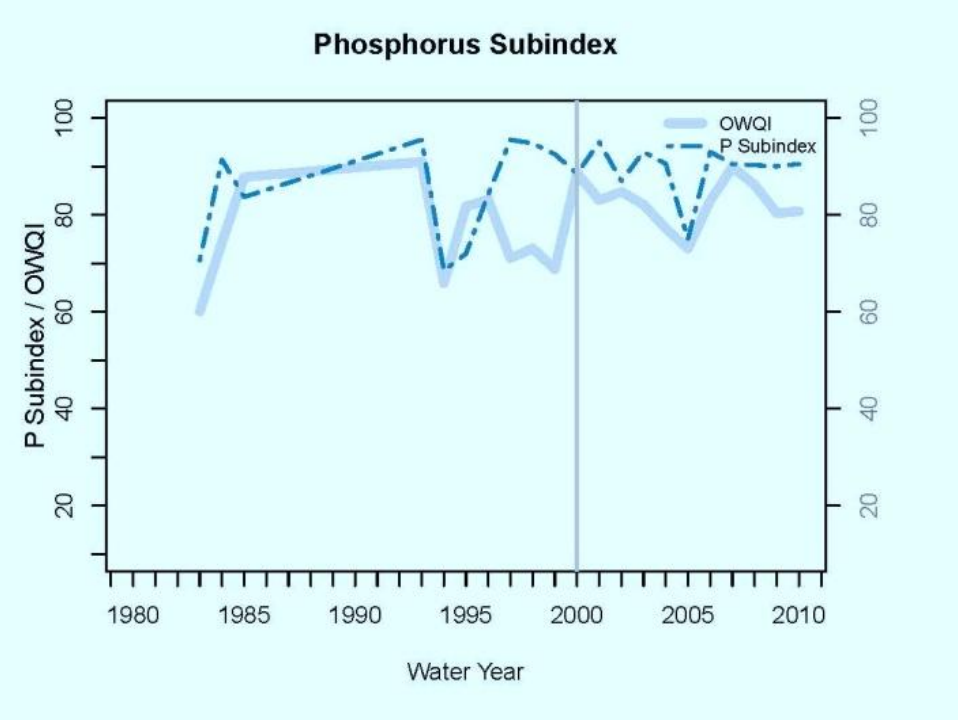
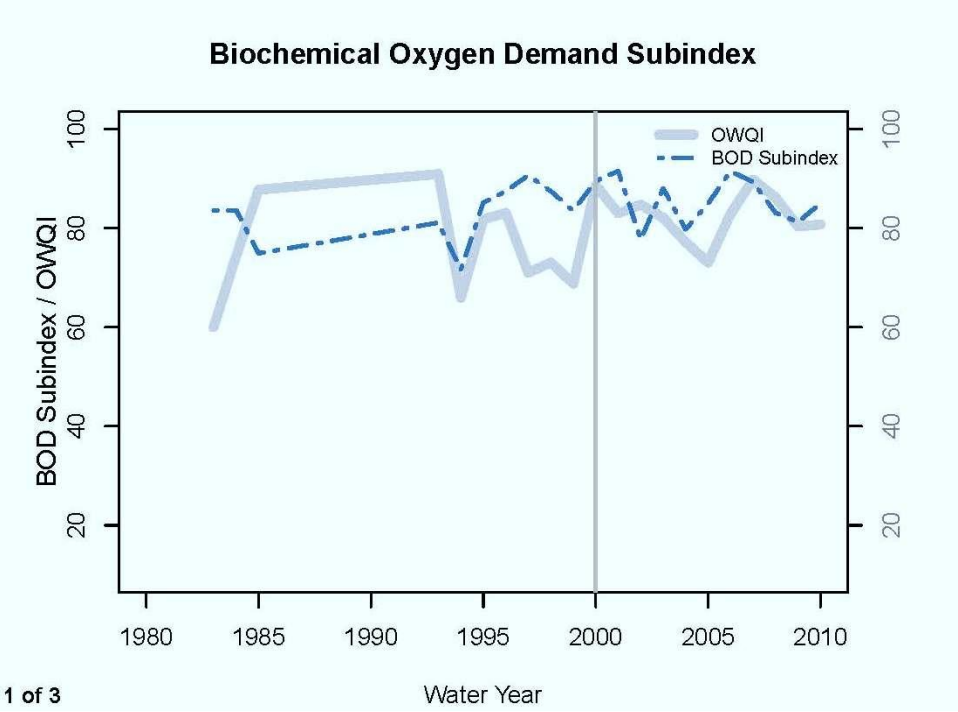


Figure 53 – Pistol River at Pistol River Loop Road Biochemical Oxygen Demand Sub-index



Ambient Site Detail That Should be Considered When Interpreting OWQI Scores

(1) Pistol River at Pistol River Loop Road – *Seasonally Marine*
This site is dominated by fresh water flows January through May. During the period June through September, estuarine conditions prevail with conductivities over 200 µmhos/cm at 25° C. Salinity ranges upward to as high as nine parts per thousand. Conditions in November are variable, indicative of episodically estuarine conditions with periods of fresh water dominance.

(2) Coos River at Rooke Higgins Boat Ramp and **(3)** South Fork Coos River at Anson Rogers Bridge – *Seasonally Marine*
These sites are generally dominated by fresh water flows during the period January through May. Estuarine conditions prevail during the drier months usually beginning in June and continuing through October with specific conductivities greater than 200 µmhos upward to salinities ranging as high as twenty parts/thousand. Conditions in November are variable indicative of episodic estuarine conditions with periods of fresh water dominance.

For these three sites both the freshwater and estuarine water quality standards are attained throughout most of the period of record although dissolved oxygen levels below the estuarine criteria have been recorded in July and September.

(4) North Fork Coquille River at Hwy 42 – *Tidal backwater*
The Coquille River mainstem begins at the North and South Forks confluence. This area experiences tidal influences which lead to fresh water backwatering on a daily basis. When the tide is out, samples collected at this ambient site represent water quality conditions for the North Fork. When tides are in, samples collected at the North Fork ambient site can represent a combination of water quality conditions (North and South Forks as well as contributions from the mainstem).

Conductivities are higher in the mainstem Coquille River and can be utilized as a mechanism to discern between results which represent backwater and conditions that represent the North Fork Coquille River. Caution should be used when evaluating this data to assure that backwater water quality conditions are not solely attributed to the North Fork.

(5) Coquille River Mainstem @ Sturdivant Park – *Tidal backwater*
This site is tidally influenced leading to fresh water backwatering on a daily basis. In addition, both the City of Coquille WWTP and the Roseburg Forest Products log pond discharge to this area and may influence water quality measurements at this ambient site.

OWQI Limitations

The OWQI trend analysis assesses changes in general water quality, specifically those parameters included in the OWQI. Changes in toxics concentrations, habitat, or biology are not considered. Some parameters assessed in the OWQI may be subject to diel fluctuations and are sensitive to time of day sampling. These parameters include temperature, dissolved oxygen, pH, and nutrients. Temporally intensive monitoring efforts may be useful in fully understanding these parameters. Please see the Water Quality Condition Assessment Approach Section for additional information. In addition the OWQI trend analysis also does not consider variations in meteorological or hydrological conditions, variations in sample time of

day, or for tidal stage or bar conditions. Because of these unaccounted for variables use of the OWQI must be done carefully and within the context of the analyses.

The OWQI utilizes only the fresh water criterion and as a result index values are negatively impacted at three ambient monitoring sites with seasonal marine influence in the South Coast Basin. These marine influenced sites are subject to episodic estuarine conditions. At these locations estuarine criteria should be applied when a measurable marine influence is present. These three sites have index values of poor and very poor which may be somewhat misleading.

Tidal backwatering occurs at two sites complicating the interpretation of these data sets. Because the stream is not free flowing (water moves both upstream and downstream at these locations) residence time is extended. Caution should be used when evaluating this data to assure that backwater conditions are accounted for when interpreting water quality datasets.

Biomonitoring

CONCERN: Fish and Aquatic Life, Macroinvertebrate Assemblages

DEQ conducted state wide biomonitoring to begin to determine the relationship between water quality, habitat conditions, and biological condition. South Coast Basin data are summarized here and detailed site descriptions, location, and site condition information can be found in Appendix F. The data used for this summary was pulled together from various projects over the years. Macroinvertebrate samples were collected at 100 sites on smaller wadeable streams from 1998 – 2007. The results of this survey provides an estimate of the status of compliance with the biocriteria requiring Oregon's waters to be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities. There are currently 27 segments identified for biocriteria impairments on the 2010 303d list of impaired waters.

Non-Point Source Stressors

Information on optimal conditions for macroinvertebrate taxa were used to model potential causes of stress to macroinvertebrate assemblages. Using macroinvertebrates alone, DEQ inferred seasonal maximum temperature and percent fine sediments at a site.

The inferred conditions at a site were then compared to inferred conditions observed at reference sites in the same ecoregion. Overall model results indicated that 54% of sites sampled were observed to be in good (least disturbed) conditions, 10% were in moderately disturbed conditions, and 36% are in the most disturbed condition.

For more information on DEQ's biological condition and stressor ID models, see:
http://www.deq.state.or.us/lab/techrpts/docs/10-lab-004.pdf and
http://www.deq.state.or.us/lab/techrpts/docs/10-LAB-005.pdf

Temperature Stress

Most sites (62%) in the South Coast showed good condition for temperature stress, with few sites in fair condition (4%). About 34% of the sites showed poor conditions for temperature stress, meaning the macroinvertebrates at these sites showed higher temperature preferences and tolerances than the macroinvertebrates at most reference sites.

Sediment Stress

Forty one percent of sites were in good condition for fine sediment stress, 26% were in poor condition, and 33% of the sites were found to be in fair condition. Sites in fair condition may be

indicating early signs of excess fine sediments. Fine sediment appears to be a greater stressor to macroinvertebrates in the South Coast than temperature.

Figure 54 – Condition Assessments Using Macroinvertebrate Indices

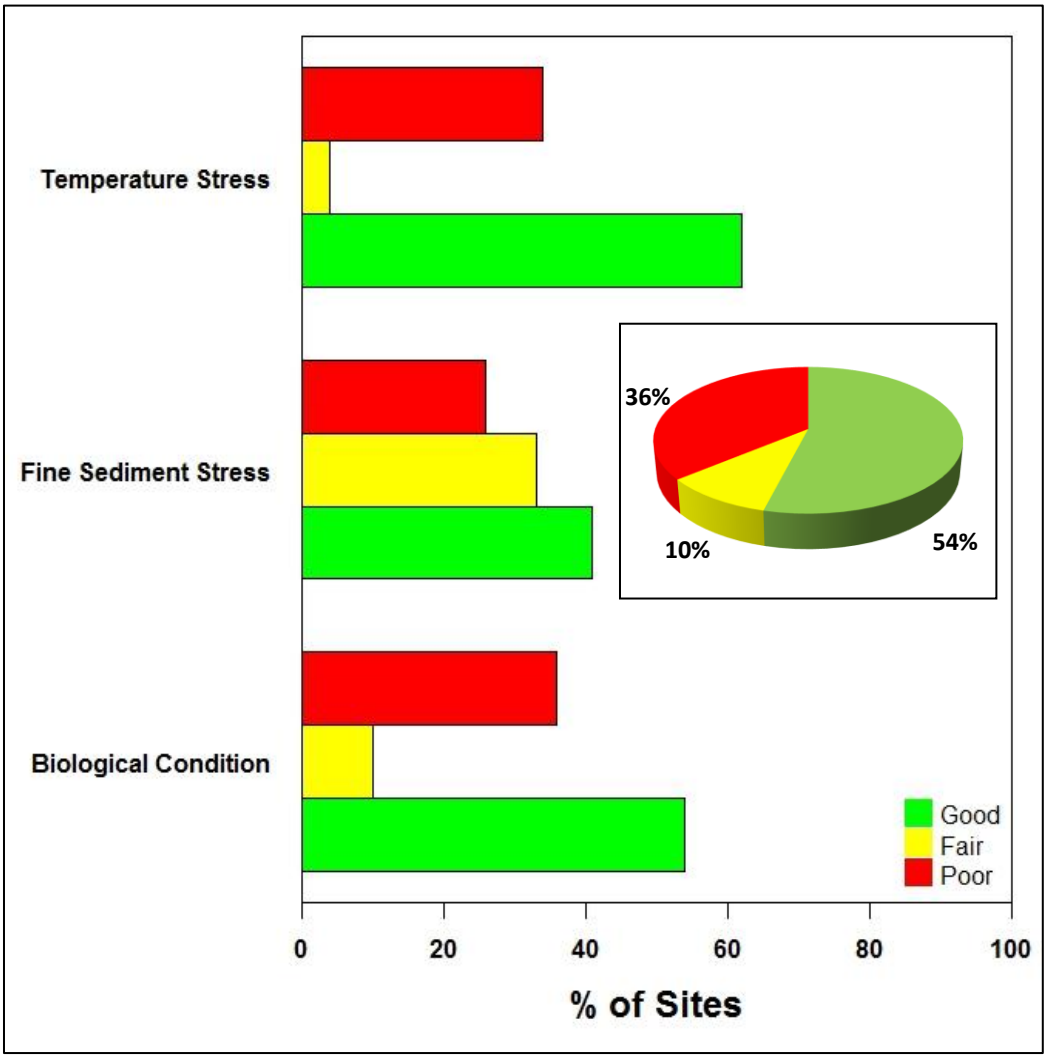
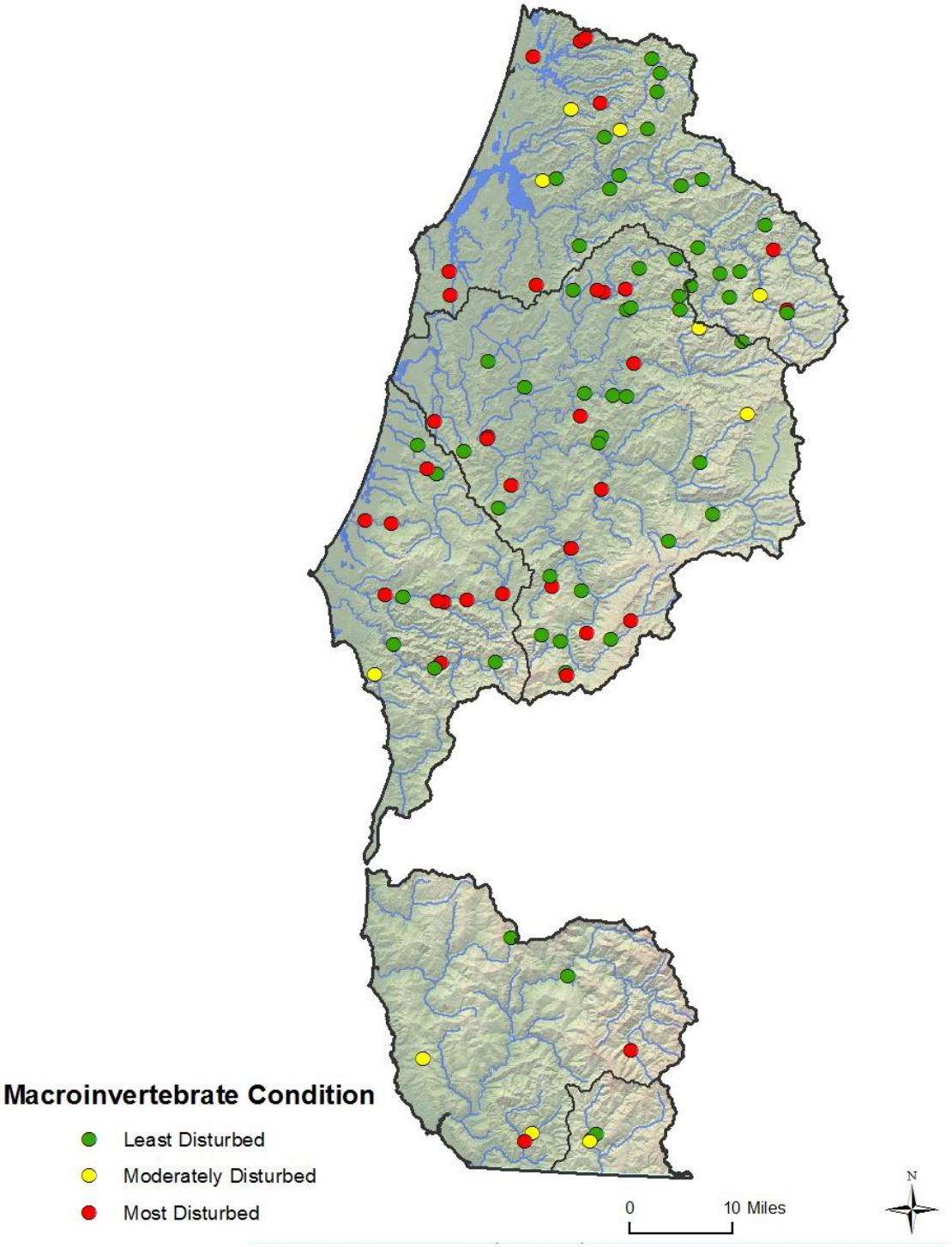


Table 61 – Level of Disturbance Summary by Sub-basin				
4th Field HUC	Level of Disturbance			Total Number of Sites
	Least	Moderate	Most	
Coos Sub Basin	19	4	9	32
Coquille Sub Basin	25	2	16	43
Sixes Sub Basin	6	1	9	16
Chetco Sub Basin	2	2	2	6
Smith Sub Basin	2	1	0	3

Figure 55 – Macroinvertebrate Assemblages - Location and Condition Class



Coastal Coho Chemical Contaminant Monitoring

CONCERN: Fish and Aquatic Life Water Column Contaminants

As part of the Oregon Plan Coastal Coho Study DEQ collected water samples for the analyses of 123 pesticide compounds at eight South Coast Basin ambient monitoring sites in April of 2009. This was the first broad based screening for pesticides in surface waters in the South Coast Basin.

	Table 62 – 2009 Pesticide Sampling Stations		
LASAR Number	**Site Name**	**Compounds Detected**	**Concentration ng/L (parts per trillion)**
12590	Floras Creek @ Hwy 101 So of Langlois	None	
10533	Sixes River @ Hwy 101 Bridge	Hexazinone	93.15
11485	Middle Fork Coquille River @ Hwy 42	None	
10393	North Fork Coquille River @ Hwy 42	Atrazine	9.1
11486	South Fork Coquille River @ Broadbent	Atrazine	4.2
10596	Coquille River @ Sturdivant Park	Atrazine	6.3/5.7
13570	Millicoma Rvr @ Rooke Higgins Boat Rmp	None	
13574	SF Coos River Anson Rogers Bridge	Atrazine	4.3

Atrazine was the most widely detected pesticide and was present in five of the eight sites sampled. Atrazine is a herbicide used by agricultural, forest products, and residential communities to control broadleaf and grassy weeds. The EPA is estimates the aquatic ecosystem level of concern as approximately 10 parts per billion (ppb) for atrazine over a 60-day period. Atrazine levels detected during South Coast Basin monitoring efforts are well below this threshold. EPA will initiate a registration review for Atrazine in mid 2013.

Hexazinone is an herbicide used to control a broad spectrum of weeds and is also used by the agricultural, forest products and residential communities. It is used as a non-selective herbicide in non-cropland areas and as a selective herbicide in reforestation practices. Hexazinone and its degradation products appear to be persistent and mobile in soil and aquatic environments and studies indicate that hexazinone may be of concern for both groundwater and surface water contamination.

Toxics Monitoring Program (TMP)

The Oregon Department of Environmental Quality received funds from the 2007 Oregon Legislature to establish a watershed-based toxics monitoring program for Oregon's waters. DEQ began implementing the program in early 2008 with an initial focus on the Willamette Basin. Since 2008, DEQ laboratory staff collected water samples in ten basins across the state. This sampling is continuing through 2012 and 2013 to complete the initial statewide effort.

Once the initial statewide monitoring rotation is complete, DEQ will review these efforts and use the data to guide future sampling strategy. Staff will review other toxic pollutant monitoring data and work with other agencies and stakeholders to address existing information gaps. In addition, DEQ will align its toxics monitoring program with other toxics initiatives at the agency including the Pesticide Stewardship Partnerships, Drinking Water Protection Program (DWPP), and the agency's Toxics Reduction Strategy. The overall goal of the program is to work with local stakeholders to utilize the information generated to guide local toxics reduction efforts, restoration plans, and additional data collection.

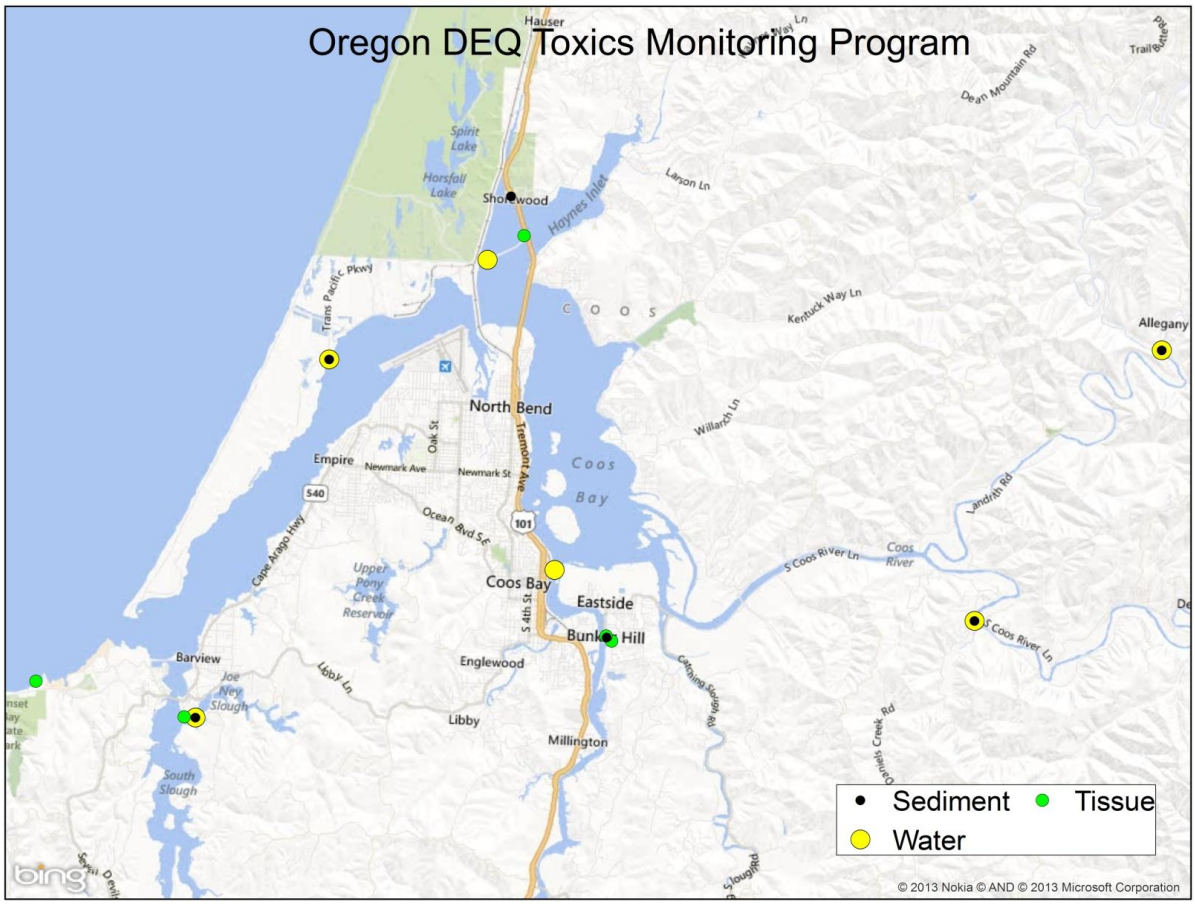
The goal of the TMP is to measure and assess the state's surface waters and aquatic resources for the presence of toxic pollutants, and where possible, identify the sources of the pollutants. The TMP focuses on measuring chemicals produced intentionally or unintentionally as the result of industrial, municipal, or agricultural processes whose physical and chemical characteristics have been demonstrated to impair the normal functioning of biological systems at low exposure levels. The TMP measures more than 270 pollutants of interest in water and/or fish, including; volatile and semi volatile organics, poly-aromatic hydrocarbons, poly-chlorinated biphenyls, poly-brominated flame retardants, dioxins and furans, select metals, select current-use/legacy pesticides and emerging contaminants (i.e., pharmaceuticals, personal care products, and plasticizers ("P3 List")) including selected SB 737 priority pollutants based upon their toxicity, bio-accumulation potential, and persistence. The ultimate scope of the TMP is to measure the concentrations of toxic pollutants in surface water and aquatic resources in all 13 major basins of the State. While the primary focus of the TMP is on surface water and aquatic resources, where possible the program will work with internal and external stakeholders and partners to also assess ground water for the presence of organic and inorganic pollutants.

In 2013, DEQ's Toxics Monitoring Program focused monitoring efforts in the South Coast Basin sampling shellfish, sediment, and surface water. A public meeting was held to obtain local input regarding site selection and area concerns. Many more sites were suggested than could be included in the 2013 monitoring effort but these suggestions will be retained for future consideration. The final results of the 2013 TMP sampling effort should be available in 2015.

Oregon's Toxics Monitoring Program supports multiple agency priorities including the implementation of:

- Fish Consumption Rates
- SB 737 recommendations
- Pesticide Stewardship Partnership
- Drinking Water Source Protection
- WQ Integrated Report
- NPDES Permit Program
- Agency Toxic Reduction Strategy
- TMDL and NPS Programs

Figure 56 – 2013 Coos Bay TMP Sample Sites



Volunteer and Partner Monitoring

The Volunteer Monitoring Program's goal is to involve Oregonians in identifying and solving the state's water quality problems. The program provides support including technical assistance in monitoring design, equipment use, data management and analysis. Volunteer groups participating in the program are eligible to receive high quality monitoring equipment on loan. The objectives of the program are to provide resources to groups interested in conducting volunteer monitoring, expand and support the volunteer monitoring efforts across the state, promote consistent, comparable data collection techniques , improve and document the quality of data collected by volunteer groups, and to support the transformation of volunteer generated water quality data into information. Volunteer data is managed and entered into the DEQ water quality database LASAR. Data are primarily used by volunteer organizations for the identification and justification of restoration activities, local decision making and education and outreach efforts. DEQ views this data as a valuable source of information and uses high quality data sets for watershed assessments and reporting, determining if the state's waters meet water quality standards, and for TMDL implementation, documentation, and development.
The Volunteer Monitoring Coordinator receives, grades, and manages data from the program. DEQ plans to continue to promote South Coast Basin volunteer monitoring efforts.

TMDL Intensive Monitoring

More intensive monitoring efforts are often initiated to expand upon spatially and temporally limited data sets to better characterize water quality conditions and support the development of

TMDLs. Intensive continuous water quality studies were conducted to better understand the temporal and/or spatial variability of the following parameters:

- *Dissolved oxygen and pH* conditions; intensive three day studies were conducted. The parameters dissolved oxygen, conductivity/salinity, and pH were recorded continuously at 15 minute intervals
- *Bacterial loading* due to runoff; samples were collected for analyses in conjunction with rainfall events during both the rising and falling hydrographs
- Stream *temperatures*; continuous monitoring devices were deployed to measure temperature at ½ hour intervals during the period of interest. Flows were monitored in conjunction with these deployments in most cases.

Action and Alignment Opportunities (Laboratory)

ACTION: As resources allow continue to support OHA hazardous algal bloom surveillance efforts when visually significant blooms are reported.

ACTION: Incorporate meteorological and hydrological conditions as well as sample time of day into ambient data interpretation.

ACTION: The Oregon Water Quality Index (OWQI) utilizes only the fresh water criterion and as a result index values are negatively impacted during periods of marine influence. An adjustment of the OWQI protocol to better characterize sites where tidal and marine influence are present should be made.

ACTION: Ambient monitoring does not specifically seek to align with storm events so runoff related bacterial loading is poorly understood in the Sixes and Chetco sub-basins. Bacterial loading studies need to be conducted in areas where bacterial loading has been identified as a parameter of concern.

ACTION: Ambient site bacterial monitoring has been discontinued due to shipping and other resource challenges. Because the surveillance of bacterial conditions is important to assure beneficial uses sensitive to bacterial loading are protected, ambient network bacterial sampling should be continued. The lab should work to establish local analytical support if needed to facilitate this.

ACTION: Many South Coast Basin streams are not sampled as part of the DEQ ambient network. Efforts should be made to characterize these waterbodies as resources and/or partnerships allow.

ACTION: Continue support for flow monitoring in the Coos 4th Field HUC.

ACTION: Continue working to find resources to sample water quality conditions in order to characterize conditions in South Coast Basin beaches that have little to no data available for review.

ACTION: Initiate source assessment monitoring where beaches had been identified as water quality limited on the 2010 303 (d) list in preparation for the development of TMDLs.

ACTION: Continue to seek partners interested in monitoring beach bacterial conditions and assessing pollutant sources to beaches. Support these activities with 319 funding as possible.

ACTION: Continue working to find resources to sample lake water quality and algal conditions in order to characterize conditions in South Coast Basin lakes where little to no data is available for review.

ACTION: Work with partners and/or apply DEQ resources to identify, protect, and maximize areas of cold water refuge.

ACTION: Support the use of biological assemblages as an element for use in effectiveness monitoring studies.

ACTION: At a minimum, a random survey of macroinvertebrates should be planned prior to the next Basin Assessment effort in order to gain a better understanding of conditions for this beneficial use. At least 30 sites should be surveyed, with 50 sites being the preferred sample size. This should be repeated once every five years to gain an understanding of trends (improving or declining conditions) in the aquatic life use.

ACTION: Additional sources of data for the beneficial use aquatic life should be incorporated in future assessments, as well as exploring the development of partnerships to expand on macroinvertebrate monitoring. At a minimum, the US Forest Service has long-term monitoring programs in place that collect macroinvertebrates (as well as other stream health indicators). Efficiencies could be maximized by using USFS data to assess conditions on federally owned lands, while DEQ focuses monitoring efforts on characterizing macroinvertebrates conditions on non-federally owned lands. This could significantly reduce the amount of resources (i.e., funding) required to do random monitoring across the state. It would require a significant investment in coordination with other agencies to ensure compatible monitoring plans, however the benefits vastly outweigh the costs.

ACTION: Find support of future macroinvertebrate assessments in the basin. A random survey of macroinvertebrates should be planned prior to the next basin assessment in order to gain a better understanding of the condition of this beneficial use. At least 30 sites should be surveyed, with 50 sites being the preferred sample size. This should be repeated once every five years to gain an understanding of trends (improving or declining conditions) in the aquatic life use.

ACTION: Conduct additional pesticide monitoring to better characterize pesticide levels in South Coast Basin surface water.

ACTION: Continue ambient monitoring to assess status and trends and use data to support TMDL development and TMDL effectiveness monitoring.

ACTION: Continue to work with the Volunteer Monitoring Coordinator and South Coast Basin entities interested in monitoring of water quality conditions. Engage with participating entities to identify data needs, fill data gaps, and characterize baseline water quality conditions and track water quality responses to restoration and enhancement project implementation. Provide technical assistance to assure the generation of high quality, broadly usable, data sets.

ACTION: Improved Data Management. All programs in water quality would benefit by having any new water quality data regularly and routinely uploaded into an accessible database. By improving data management and accessibility the best available information can be used by DEQ programs and the public. This will allow the identification of data gaps and monitoring to fill

data needs to be completed prior to a given DEQ action (e.g. permit issuance). Improved data management will facilitate the use of information derived from water quality data to guide the establishment of conditions and/or permit limits protective of beneficial uses.

DEQs data management tool (LASAR) is currently undergoing upgrades to increase capacity and resolve data upload challenges. In some instances datasets include parameters that LASAR is not capable of housing. DEQ will need to assess this problem and determine if LASAR parameter fields need to be expanded or if alternate databases need to be developed.

ACTION: Explore avenues to make third party data readily available to support improved decision making and data gaps analysis. These data might include studies conducted by consultants in support of DEQ programs as well as data collected as part of point source permit requirements.

ACTION: Investigate forming a South Coast Basin Water Monitoring Council that would participate in a broader Oregon Water Monitoring Council (OWMC). Goals of such a group would be to bring everyone together to discuss; who is doing what where, water quality indicators; Quality Assurance Project Plan (QAPP) and Sampling and Analysis Plan (SAP) development, planning to fill data gaps, and avenues to share information.

ACTION: More fish tissue data will be needed to better characterize mercury in South Coast Basin streams, lakes, and estuaries.

ACTION: Sampling of fish tissue from a single fish collected from Isthmus Slough at Eastside (1979) and at Stock Slough at mouth (1981) showed elevated levels of total mercury. Additional sampling from these areas should be conducted to characterize current mercury levels present in fish.

ACTION: Sampling for butyltin compounds in tissue may provide feedback regarding local ship fabrication and repair facility cleanup response. Shellfish tissue should be included in future toxics sampling efforts to determine trending of chemical constituent levels. Softshell clams should be resampled from Catching, North, and Isthmus sloughs as well as Jordon Cove.

ACTION: Prior to implementing additional toxics monitoring work the results from the CEMAP and Coos Bay Toxics Project sampling should be reviewed and utilized to help determine priority pollutants and potential hot spots to guide sample site selection.

Alignment Opportunities: Align biomonitoring work with TMDL effectiveness monitoring. Use biological indexes as the method to indicate change in watershed conditions and beneficial use support.

Alignment Opportunities: Laboratory and TMDL staff should collaborate to develop and implement a TMDL effectiveness monitoring program.

Alignment Opportunities: Continued trend analysis and sharing of results with NPS and PS programs.

ACTION: Early in 2013 hold public meeting(s) to secure input from the public regarding local concerns and potential sample locations for incorporation into the TMP monitoring plan. .

ACTION: Work with the DEQ laboratory and groundwater program staff to bolster the groundwater monitoring component of the TMP in the South Coast Basin.

ACTION: In 2013 collect and analyze South Coast Basin samples for toxic pollutants during the spring summer and fall.

ACTION: Complete TMP sample analysis and share results with sources and local communities. Analysis should include determination of risk to public water supplies.

ACTION: Consider the development of Cranberry Growers Pesticide Stewardship Partnership

Safe Drinking Water Act Implementation

CONCERN: Public Water Supply

The 1996 amendments to the federal Safe Drinking Water Act included funding for public drinking water supply system improvements to meet existing and future human health standards, identify public drinking water supply source areas and inventory potential contamination sources. A primary goal of the amendments was to help reduce the risk of pollution to public water systems, including contamination that could potentially result in loss of the drinking water resource.

Based on data provided by the Oregon Health Authority (OHA) Drinking Water Program there are seventy five public drinking water systems in the South Coast Basin serving approximately 76,000 people. Fifty one of these systems are supplied primarily by groundwater sources and the remaining twenty four are primarily served by surface water. These public water systems (PWS) are listed with additional detail in Appendix I.

Note that this section only addresses drinking water issues identified for public water systems. A recent query of OWRD's water rights database for private domestic points of surface water diversion (using a threshold of 0.005 cubic feet per second for domestic water rights that are household use only, not irrigation) identified nine hundred thirty one private domestic water rights in the South Coast Basin. The quality of drinking water supplied by these private drinking water systems is not regularly monitored. There are also numerous private groundwater wells for domestic use and these are discussed in more detail in the next section. DEQ hears regularly from individuals with concerns regarding the impacts of land development and pesticide applications on privately owned and operated drinking water systems.

DEQ drinking water protection staff has prioritized technical assistance and prevention activities for public water systems based on detections of bacteria, nitrates and low levels of toxics in drinking water. Turbidity is also a periodic issue in the basin. Existing data shows that there are potential groundwater impacts to surface water but we have very little data in surface water upstream of intakes. Safe Drinking Water Act monitoring data is required for about seventy three chemicals in finished (post-treatment) water only. There are no requirements for testing other contaminants that pose potential risks to public water systems, including "emerging contaminants" such as pharmaceuticals, chemicals associated with personal care products, and many ubiquitous pesticides and semi-volatile and volatile organic chemicals. DEQ and the OHA initiated a statewide monitoring project to determine if there are levels of concern of emerging

contaminants in source waters. To date, limited monitoring for these contaminants has occurred in the basin. More data is needed in the South Coast Basin to help assess whether source water is being negatively impacted by biosolids applications, high density septic systems, pesticide applications, forest management practices, intensive agricultural activities (berries, bulbs).

Drinking Water Source Monitoring Project

DEQs Drinking Water Source Monitoring Project includes collecting groundwater and surface water samples from high-risk drinking water sources. DEQ Laboratory staff collected samples above surface water intakes and at well heads. The geographic scope of the project is limited and the list of analytes includes Oregon-specific herbicides, insecticides, pharmaceuticals, volatile organic compounds, fire retardants, PAHs, and plasticizers. The purpose of the Source Monitoring is to collect data from multiple contaminant sources to assist in determining priorities for technical assistance and prevention, and to collect screening level data on whether there are potential human health risks beyond those routinely monitored within the Safe Drinking Water Act regulations.

In September 2010 and June 2012 surface water upstream of the City of Port Orford's intake on Hubbard Creek and from Floras Creek (Langlois), Eel Lake (Lakeside Water District), and Geiger/Ferry Creeks (City of Bandon) were sampled as part of the Drinking Water source Monitoring Project. The data showed that low levels of several contaminants at concentrations well below human health benchmarks were present and confirmed the presence of low levels of steroids and hormones (cholesterol, beta-sitosterol, and stigmastanol), and of bis (2-ethylhexyl) phthalate. The presence of natural sterols (except in the case of Ferry Geiger Creeks) indicates that these surface water sources are affected by upstream discharges of human and or animal wastes.

These results provide a basis for prioritizing pollutant reduction strategies for drinking water in the basin, but more data may be needed to help identify the source of these contaminants and develop specific technical assistance and management strategies. In addition, there are data gaps for other locations upstream of drinking water intakes that were not selected as sampling sites.

Safe Drinking Water Act Monitoring

As of 2012 Safe Drinking Water Act monitoring data indicates that nine water systems served by surface water have experienced contamination problems in finished water. Contaminants of concern include volatile organic compounds (two systems), synthetic organic compounds (three systems), inorganics (nitrate or nickel in two systems), turbidity (four systems), and bacteria (three systems). In addition, low levels of several chemical contaminants were found in raw drinking water as part of DEQ's Drinking Water Source Monitoring Project.

As part of recent Safe Drinking Water Act requirements, a number of public drinking water systems with intakes in the South Coast Basin were required to conduct up to two years of *E.coli* monitoring to determine if they are at risk from cryptosporidium or other pathogenic microorganisms entering the drinking water supply. Thirteen PWSs in the South Coast Basin (City of Bandon, Garden Valley Water Association, Langlois Water District, City of Myrtle Point, City of Port Orford, Rainbow Rock Condominiums, Weiss Estates Water System, Camp Myrtlewood, Coos County Parks – Laverne, Coos County Parks - West Laverne, Rainbow Rock Village Mobile Home Park and Sleepy Hollow RV Park) reported *e. Coli* counts over 100 per 100 ml during the two-year period. Facilities with bacterial levels over 100 e coli/100 ml are

required to test for cryptosporidium and/or install adequate filtration capability to remove cryptosporidium.

As a result of elevated *E. coli* counts Rainbow Rock Condominiums and Sleepy Hollow RV Park both plan to install additional treatment in lieu of conducting testing for cryptosporidium. The City of Myrtle Point initiated sampling for cryptosporidium after encountering elevated E. coli counts but subsequent testing did not identify the presence of cryptosporidium so no additional treatment is required at this time.

Table 63 – Compounds Detected Above Action Levels* for Public Water Systems

Water Type	Analyte Name	PWS ID	PWS Name	Pop	Sub-basin	Watershed	Count of Detects	Min of Concentration mg/L	Max of Concentration mg/L	MCL mg/L
GW	Coliform (TCR)	91213	Upper Chetco Elem SD 23	46	Chetco	Chetco River	1	1	1	
GW	Coliform (TCR)	95127	Salmon Run Golf Course	100			2	1	1	
SW	Di(2-Ethylhexyl) Phthalate	1361	Rainbow Rock Condominiums	80		Cape Ferrelo Frontal	1	0.0014	0.0014	
GU	Nitrate	1062	Rainbow Rock Village MHP	200			1	6.57	6.57	
GU	Trichloro ethylene	1062	Rainbow Rock Village MHP	200			1	0.0012	0.0012	0
GW	Coliform (TCR)	575	North Bayside Estates - North	65	Coos	Coos Bay Frontal	2	1	1	
GW	Coliform (TCR)	1463	North Bayside Estates-South	40			1	1	1	
GW	Coliform (TCR)	5364	Mt View Terrace Home Park	45			6	1	1	
GW	Coliform (TCR)	90859	Watson Ranch Golf	30			1	1	1	
GW	Coliform (TCR)	94595	Hauser Bar & Grill	50		Lakeside Frontal	3	1	1	
GW	*e. Coli*	575	North Bayside Estates - North	65		Coos Bay Frontal	1	1	1	
GW	Nitrate	90858	Kentuck Golf Course	200			1	7.8	7.8	
SW	Coliform (TCR)	5581	Weiss Estates Water System	27	Coquille	Lower Coquille R	1	1	1	
GW	Coliform (TCR)	90541	Camas Valley School	180		Middle Fork Coquille R	2	1	1	
GW	Coliform (TCR)	92706	USFS Daphne Grove CG	48		South Fork Coquille R	1	1	1	
SW	Di(2-Ethylhexyl) Phthalate	213	City of Coquille	4,939		Lower Coquille R	1	0.0018	0.0018	
SW	Di(2-Ethylhexyl) Phthalate	672	City of Powers	750		South Fork Coquille R	1	0.0009	0.0009	

Table 63 – Compounds Detected Above Action Levels* for Public Water Systems										
Water Type	Analyte Name	PWS ID	PWS Name	Pop	Sub-basin	Watershed	Count of Detects	Min of Concentration mg/L	Max of Concentration mg/L	MCL mg/L
SW	Nickel	74	City of Bandon	2,990		Lower Coquille R	3	0.0605	0.0605	0.1
SW	Turbidity	74	City of Bandon	2,990			2	122	615	
SW	Turbidity	213	City of Coquille	4,939			1	13	13	
SW	Xylenes, Total	74	City of Bandon	2,990			1	0.0007	0.0007	
SW	Coliform (TCR)	466	Langlois Water District	600	Sixes	New River Frontal	1	1	1	
GW	Coliform (TCR)	5860	Old Sheep Ranch Water Assoc	56			3	1	1	
GW	Coliform (TCR)	91018	OPRD Humbug Mtn Camp - Overnight	200		Humbug Mountain-Nesika Beach Frontal	2	1	1	
GW	Coliform (TCR)	91194	OPRD Arizona Beach State Park - Day Use	133			1	1	1	
GW	Coliform (TCR)	94398	Elk River Campground	52		Elk River	1	1	1	
GW	Coliform (TCR)	94556	Lake Bradley Christian Camp	100		New River Frontal	1	1	1	
GW	*e. Coli*	5860	Old Sheep Ranch Water Assoc	56			2	1	1	
GW	*e. Coli*	94398	Elk River Campground	52		Elk River	1	1	1	
SW	Turbidity	466	Langlois Water District	600		New River Frontal	1	72	72	
SW	Coliform (TCR)	95332	Myrtle Tree RV Park	30	unmapped	unmapped	2	1	1	
SW	*e. Coli*	95332	Myrtle Tree RV Park	30			2	1	1	
SW	Turbidity	94283	Sleepy Hollow RV Park	25			2	9.1	16	

Source: Oregon SDWIS Database: January 1, 2000 through July 5, 2011
*****Table includes summary of detections above an "action" level. In general, the action level for volatile and synthetic organic compounds (VOCs and SOCs) is concentration > 0. For inorganic compounds (IOCs), arsenic and nitrate, the action level used is ½ of the MCL. Action level for coliform, *e Coli* and fecal is detection >0 in a repeat sample. For turbidity action level is >5 NTU.

Five public water systems served by surface water have closed or modified a source due to contamination. These include the cities of Coquille, Powers, Myrtle Point, Port Orford and Langlois Water District. In each of these cases, the surface water intake was affected by turbidity.

Table 64 – Public Water System Source Closures* Due to Pollutants							
Public Water System/Source affected	**City**	**GW/SW-PWS#**	**Population Served**	**Pollutant**	**Status**	**Sub-basin**	**Watershed**
Rink Creek and Coquille River intakes	Coquille	SW - 00213	4,939	Turbidity	T	Coquille	Lower Coquille
South Fork Coquille River intake	Powers	SW - 00672	700	Turbidity	T	Coquille	Middle Main Coquille
North Fork Coquille River intake	Myrtle Point	SW - 00551	2,451	Turbidity	T	Coquille	North Fork Coquille
Garrison Lake and Hubbard Creek intakes	Port Orford	SW - 00670	1,190	Turbidity	T	Sixes	Humbug/ Nesika/ Frontal
Floras Creek intake	Langlois Water District	SW - 00466	600	Turbidity	T	Sixes	New River Frontal

** Data from January 2004 through July 2009. Agencies do not have one database of system closures---this data is pulled from several sources, therefore it may not be all inclusive; this data includes closures of individual wells within a system or a temporary closure of a surface water intake.*

KEY
NT - new treatment, NW – abandoned polluted well; installing new well(s), M – Modifications to existing system/treatment (may include improving filtration or taking polluted wells offline, etc.), T- Temporary effect due to current condition of watershed and a single event, such as a storm or drought

Turbidity

Turbidity is also an issue for South Coast Basin public water systems. Elevated turbidity often results in increased back flushing and additional chemicals in the treatment process, thus increasing overall treatment costs to the public water systems and communities. Contaminants adsorbed to the surface of entrained particles in turbid water can also pose a threat. In addition, high turbidity due to organic matter in raw water requires more chemicals to treat and is associated with the formation of disinfection byproducts during the drinking water treatment process. Eight of the fourteen surface water supplied PWSs in the South Coast Basin that are required to monitor for disinfection byproducts have received OHA alerts over the years for high levels of trihalomethanes and/or haloacetic acids in their source water. In 2010 DEQ included a water quality limited assessment methodology for drinking water turbidity. Impairments to the beneficial use drinking water supply are indicated by Public Water System operator reports that high turbidity days (days with turbidity ≥5 NTU) are causing operational difficulty and source water data validate this impairment. The data are considered to validate impairment if more than 45 high turbidity days per year occur for any year for which data are available. DEQ evaluated as case studies a total of eight public water systems in the North and Middle Oregon Coast Range area and used available turbidity data to analyze long-term trends. DEQ's analysis concludes that there are long-term concerns about system viability or increased treatment costs at five systems based on large numbers of high-turbidity days and/or increasing numbers of high-turbidity days recorded in daily water samples for these systems. Also, DEQ found that turbidity is increasing in the long term in Drinking Water Source Areas for five systems, remains stable at one system, and is decreasing at two others. No South Coast Basin drinking water system turbidity records have been reviewed to date. Soils in the basin are in large part naturally highly erodible and as such especially susceptible to ground disturbing activities.

Areas Sensitive to Soil Erosion

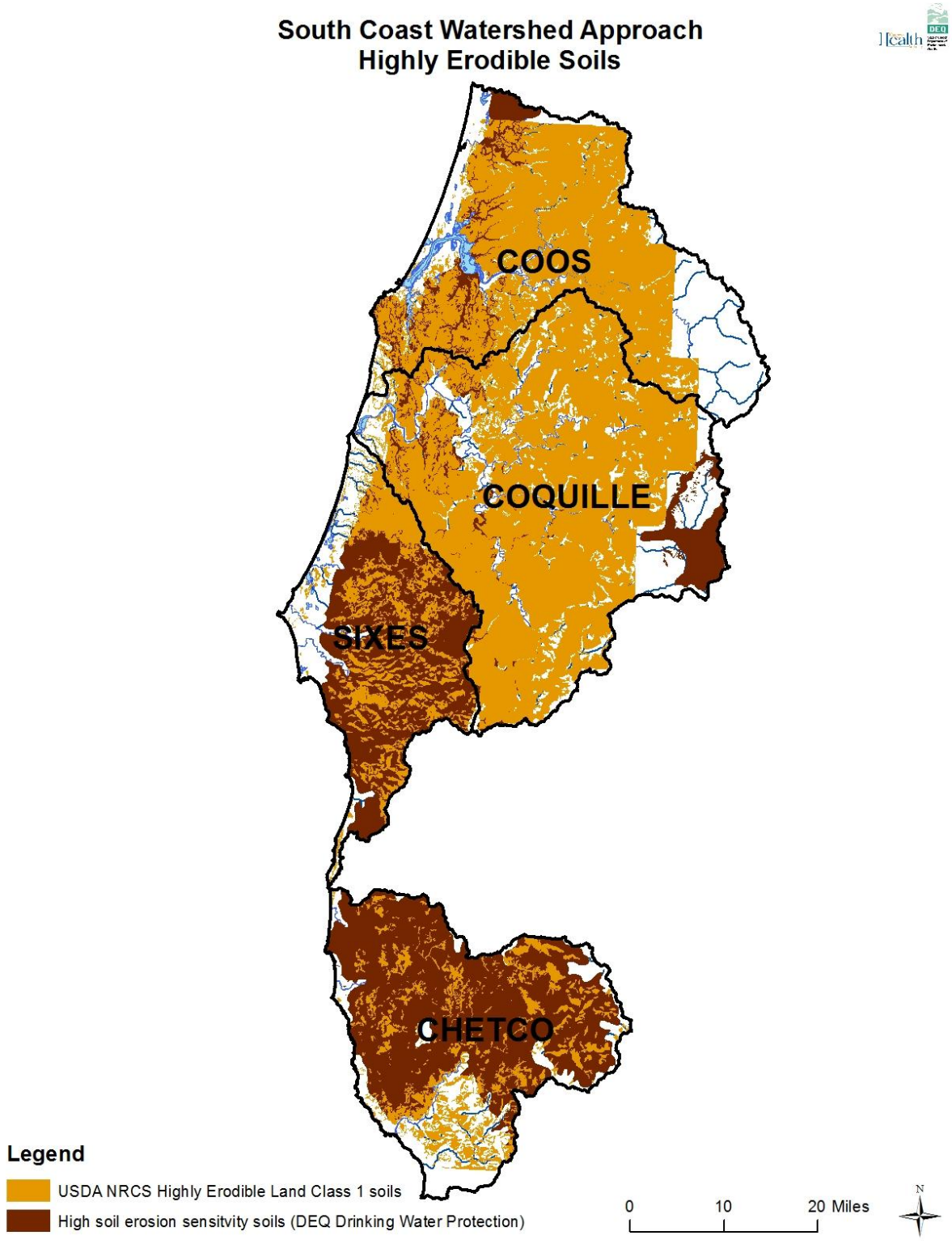
DEQ examined soil high soil erodibility as an indicator of areas where management activities posed a risk for turbidity impairments for drinking water source waters. This GIS data developed by DEQ is based on a slope >= 30 degrees and a K Factor of 0.25 (or greater). **K** factor is the soil erodibility factor which represents both susceptibility of soil to erosion and the rate of runoff, as measured under the standard unit plot condition. Soils high in clay have low K values, about 0.05 to 0.15, because they resistant to detachment. Coarse textured soils, such as sandy soils, have low K values, about 0.05 to 0.2, because of low runoff even though these soils are easily detached. Medium textured soils, such as the silt loam soils, have a moderate K values, about 0.25 to 0.4, because they are moderately susceptible to detachment and they produce moderate runoff. Soils having a high silt content are the most erodible of all soils. They are easily detached; tend to crust and produce high rates of runoff. Values of K for these soils tend to be greater than 0.4.

A high soil erodibility GIS layer was developed by DEQ using multiple sources of soil survey data and was processed using the Soils Data Viewer (using a weighted average for each map unit). If the erodible soils are represented by USFS Soil Resource Inventory (SRI) data the erosion potential is based on a representative attribute provided and may be based on sedimentation yield potential, sediment, or surface erosion potential depending upon which attribute they provided. The NRCS Soil Survey Geographic database (SSURGO) and SRI data were used as the first priority and remaining areas not covered by these two data sets was filled in using the NRCS State Soil Geographic (STATSGO) Database to develop a combined state-wide dataset.

Highly Erodible Land. The USDA Natural Resource Conservation Service (NRCS) Highly Erodible Land (HEL) class GIS data for soil erodibility was utilized to determine lands susceptible to high soil erosion based on the Universal Soil Loss Equation. The NRCS Highly Erodible Land (HEL) class data was also utilized.

The HEL soils GIS data comes from USDA Natural Resource Conservation Service (NRCS) data. NRCS used a modified Universal Soil Loss Equation to identify highly erodible and potentially high erodible land. The resulting classifications (assigned to individual map units) are: 1 = highly erodible land, 2 = potentially highly erodible land, and 3 = not highly erodible. NRCS recommends using Highly Erodible Land (HEL) class data to better represent soil erodibility after a crop had been removed from the land. The map below displays only the HEL Class 1 soils and combines soil erosion data from both the High Soil Erodibility and Highly Erodible Land class approaches.

Figure 57 – South Coast Basin Highly Erodible Soils



Source Water Assessments

As documented in Source Water Assessment reports (DEQ, 2003) for community public water systems in the South Coast Basin, the following are potential sources of contamination identified within drinking water source areas that pose the greatest risk to source water:

- Forest management activities including roads and harvesting
- Agricultural-related activities including : CAFOs, grazing animals, chemical applications associated with irrigated and non-irrigated crops
- Transportation-related activities including: stream crossings, high use roadways and corridors, railroads, and runoff from parking lots
- Wood/pulp/paper processing and mills
- Stormwater detention ponds and outfalls from urban residential, commercial and industrial sources
- Mining, industrial and manufacturing activities
- Septic systems and wastewater treatment plants

Executive summaries of the individual PWS Source Water Assessments are available at http://www.deq.state.or.us/wq/dwp/swrpts.asp.

Other potential sources of contamination to surface water may include areas of groundwater contamination discharging to surface water. Of the 51 South Coast Basin public water systems relying on groundwater, approximately two-thirds (34) are within a quarter mile of surface waters and 43 are within a half mile of surface waters. Fifteen public water systems served by groundwater have experienced groundwater contamination problems. Contaminants of concern include nitrate (1 system) and bacteria (14 water systems). This information indicates the potential influence of surface water on groundwater in the South Coast Basin.

City of Bandon 319 Drinking Water Contaminant Special Project

Utilizing 319 funding the City of Bandon conducted intensive contaminant monitoring to characterize source water contaminants present in Ferry and Geiger Creeks. The watershed supports high density cranberry cultivation.

Source water samples were collected beginning in March 2001 through March 2002 from Ferry Creek and the middle and Geiger Creek ponds. Sediment samples were collected in October 2001 and February 2002 from the Geiger Creek pond. Samples were analyzed by Pacific Agricultural Laboratory for twenty-four pesticides including organophosphate insecticides, pyrethroids, herbicides, and fungicides. There were four pesticides detected: Dichlobenil (Casoron), Napropamide (Devrinol), Norflurazon (Evetal), and Copper. Finish water sampling was also conducted as part of this project. Data were reviewed and interpreted in a 2002 report titled “Review of the Herbicide Monitoring Results and Relation to Aquatic Toxicity Data for the Ferry and Geiger Creek Chemical Contaminant Monitoring Project”.

Sediment samples had copper concentrations that ranged from 6.6 to 23 ppm. Sediment standards have not been adopted but the Dredged Material Evaluation Framework (DMEF) Screening Level for copper was 390 ppm.

Dichlobenil was detected in nine of seventeen water samples collected with a MRL of 0.000060 ppm and a maximum concentration of 0.0016 ppm. These concentrations are two to three orders of magnitude below toxicity effects data for trout, invertebrates, and plants. Dichlobenil was detected in all five sediment samples with a minimum concentration of 0.20 ppm and a

maximum concentration of 0.29 ppm. Sediment standards have not been adopted and the DMEF does not have a Screening Level for dichlobenil.

Napropamide was detected in three of seventeen water samples collected with a reporting level of 0.000300 ppm and a maximum concentration of 0.004400 ppm. These concentrations are three to four orders of magnitude below the toxicity effects data for trout, invertebrates, and plants. Napropamide was detected in all five sediment samples with a minimum concentration of 0.084 ppm and a maximum concentration of 0.140 ppm. Sediment standards have not been adopted and the DMEF does not have a Screening Level for napropamide.

Norflurazon was detected in one of the seventeen water samples collected at a concentration of 0.000083 ppm. The MRL for norflurazon was 0.000060 ppm. The detected concentration was approximately four orders of magnitude lower than the effects levels for fish and three orders of magnitude lower than the effects levels for aquatic plants. Norflurazon was detected in one sediment sample at a concentration of 0.064 ppm. Sediment standards have not been adopted and the DMEF does not have a Screening Level for napropamide.

The reporting level for copper was 0.030 ppm which is above the water quality for copper. Because of this it is not possible to determine if these water samples violated the water quality standards for copper. Analytical methods with reporting levels below the water quality criteria for copper do exist and these methods should be used in the future.

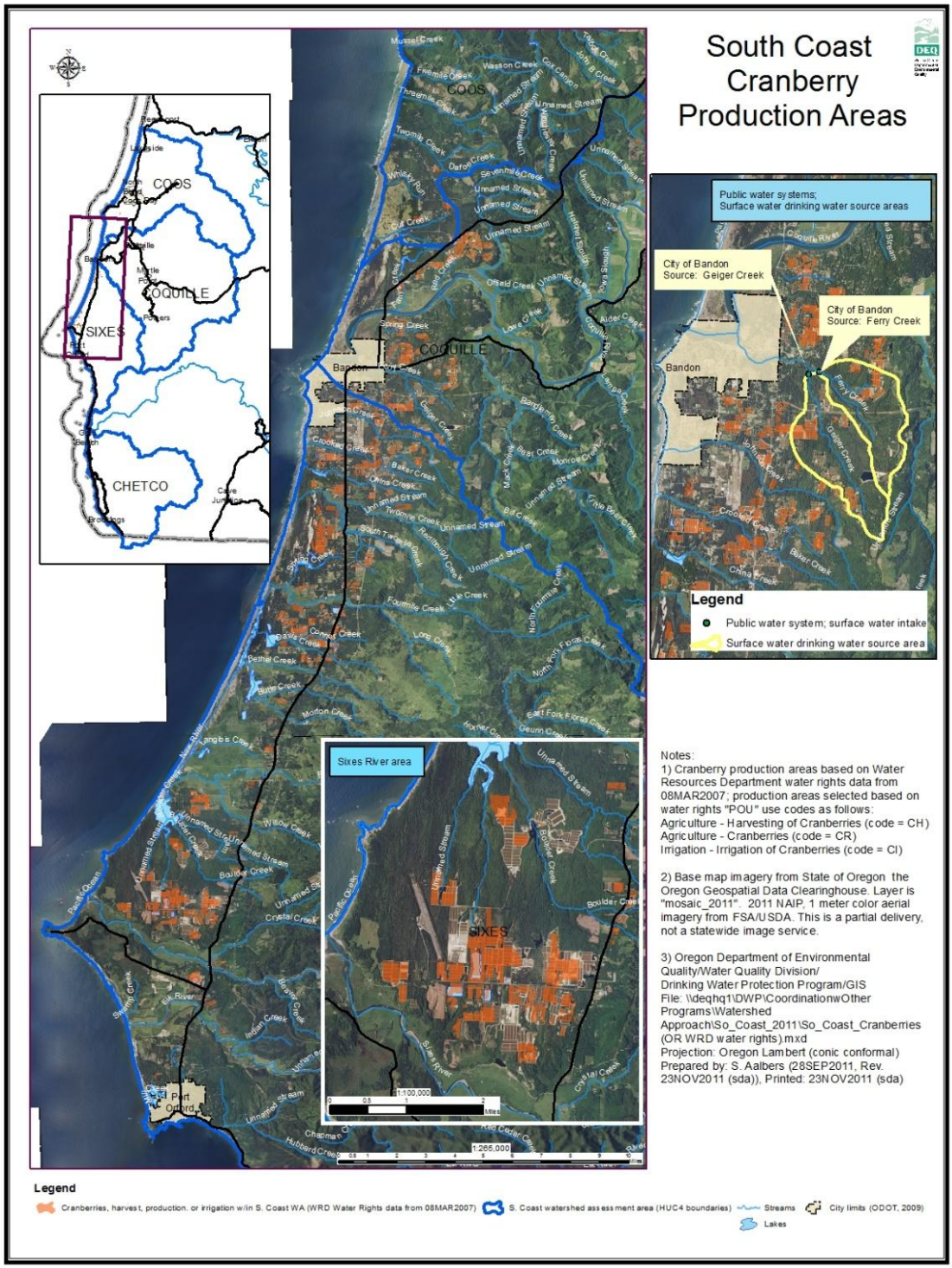
Aquatic toxicity data was reviewed for the pesticides dichlobenil, napropamide, and norflurazon. Most of the data found were from short term studies, generally less than 96 hours. Dichlobenil was detected frequently and throughout the sampling period at Geiger Creek. The water sample data indicate that aquatic life may be chronically exposed to dichlobenil. This could also be the case for napropamide, norflurazon, and copper. Sufficient aquatic toxicity data were not found to evaluate the risk to aquatic life from chronic exposure to these herbicides.

Mortality was the endpoint most commonly reported in the aquatic toxicity data reviewed for fish with some reports on growth and reproduction. There was no information found on endocrine disrupting effects of dichlobenil, napropamide, or norflurazon. These effects could occur at lower levels than the endpoints reported. However, aquatic plants would be expected to be sensitive to these pesticides because herbicides are designed to interfere with plant processes. The effects levels reported were orders of magnitude below the measured concentrations of the herbicides.

Aquatic life is exposed to complex mixtures of chemicals as evidenced by the multiple detections of chemicals in the water samples. Aquatic toxicity data are almost always for single chemical exposures. Chemical mixtures could increase, decrease, or have no effect on the toxicity of the individual chemicals. There was no data found on the interactions of the complex mixture of pesticides detected in this study.

The sampling of water and sediments were conducted randomly and were not timed to pesticide usage. Therefore, the sampling schedule was not designed to detect maximum concentrations. The concentrations measured may not be the maximum concentrations but may represent minimum or average concentrations. The current data may underestimate the water column concentrations for these chemicals and therefore underestimate the exposure of aquatic life to the pesticides.

Figure 58 – South Coast Basin Cranberry Production



Groundwater Program

CONCERN: Groundwater and Private Water Supplies

Nitrate, bacteria, metals: arsenic, boron, fluoride, mercury

Seventy percent of Oregon's population depends on groundwater for their daily water needs via private, public and industrial water wells. Groundwater can travel very slowly, and once contaminated, can be very difficult and expensive to attempt to clean up. This contamination affects not only the immediate uses of groundwater, such as drinking water supplies, but may also have pronounced effects on surface water quality. DEQ has primary responsibility for implementing groundwater protection in Oregon. DEQ uses a combination of programs to help prevent groundwater contamination from point and nonpoint sources of pollution, clean up pollution sources, and to monitor and assess groundwater and drinking water quality. DEQ implements some programs though partnerships with the OHA, OWRD, ODA, Oregon State University (OSU), and other state, local, and private organizations, businesses and individuals.

Klamath Mountain Geological Province

The Klamath Mountains are bordered to the north by the Coast Range province, to the west by the Pacific Ocean, and to the east by the broad Bear Creek/ Rogue Valley Basin. The Chetco River sub-basin traverses through the Klamath Mountain provinces.[2] The rocks of the Klamath Mountain province started over 250 million years ago as oceanic island groups (archipelago islands) and oceanic crust. The ocean crust and island mass was then thrusted onto and over the continent and secured with intrusive molten rock (granite) during the process. At least a dozen separate terranes (a group of rocks that formed in one place, became mobile, and then were accreted/attached to another terrane by plate tectonics) have been identified in the Klamaths.[3] The geology of this province actually has much more in common with Oregon's Blue Mountains and California's Sierra Nevada Mountains than any of the adjacent mountains or provinces.

The processes that led to the creation of the Klamaths enriched the rocks with gold, copper, nickel, chromite and other metals. The metal content of the Klamaths has had a significant effect on the geochemistry of the groundwater. Although there have been relatively few groundwater studies in the South Coast - Klamath Mountain region , the data suggest that natural groundwater quality of some areas has slightly elevated to elevated levels of arsenic, fluoride, nickel, chromium, iron, and manganese. There are some domestic wells in parts of the Rogue Basin near the Klamaths with elevated levels of these metals. Compared to those areas further east, the high levels of precipitation that occur in the South Coast may dilute metal concentrations in the groundwater.

Coast Range Geomorphic Province

The South Coast portion of Coast Range has the Coquille River as the southern boundary; the Cascade Range is to the east, and the Pacific Ocean to the west. The Coast Range continues north into Washington. In southern Oregon, the Coast Range likely began as an ocean island chain that collided with North America more than 60 million years ago. Now the Coast Range is a 30-40 mile wide swath of mountains, with an average elevation of 1,500 feet.

The Coast Range overlies an active subduction zone called the Juan de Fuca plate. Most of the mountains within the Coast Range are composed of pillow basalts that indicate they were

[2] Geology of Oregon, 4th Edition, Orr, Orr and Baldwin
[3] In Search of Ancient Oregon, Ellen Morris Bishop

deposited underwater during a period of intensive volcanic activity. Interbedded with seafloor sediments, the basalts were uplifted when they collided with the continental plate. These accreted oceanic volcanic sediments, interspersed with extensive marine sandstones and siltstones, are often contorted and tilted at high angles. Other geologic features observed are mainly the result of erosion and weather forces that carve steam beds and valleys out of the rock formations. As with the older Klamath accreted terranes, the Coast Range composition of pillow basalt flows and interbedded marine sediments have a significant amount of brackish material remaining between flow zones and in the sedimentary portions. As such, the groundwater pumped from these zones is often unsuitable for domestic consumption in some locations.

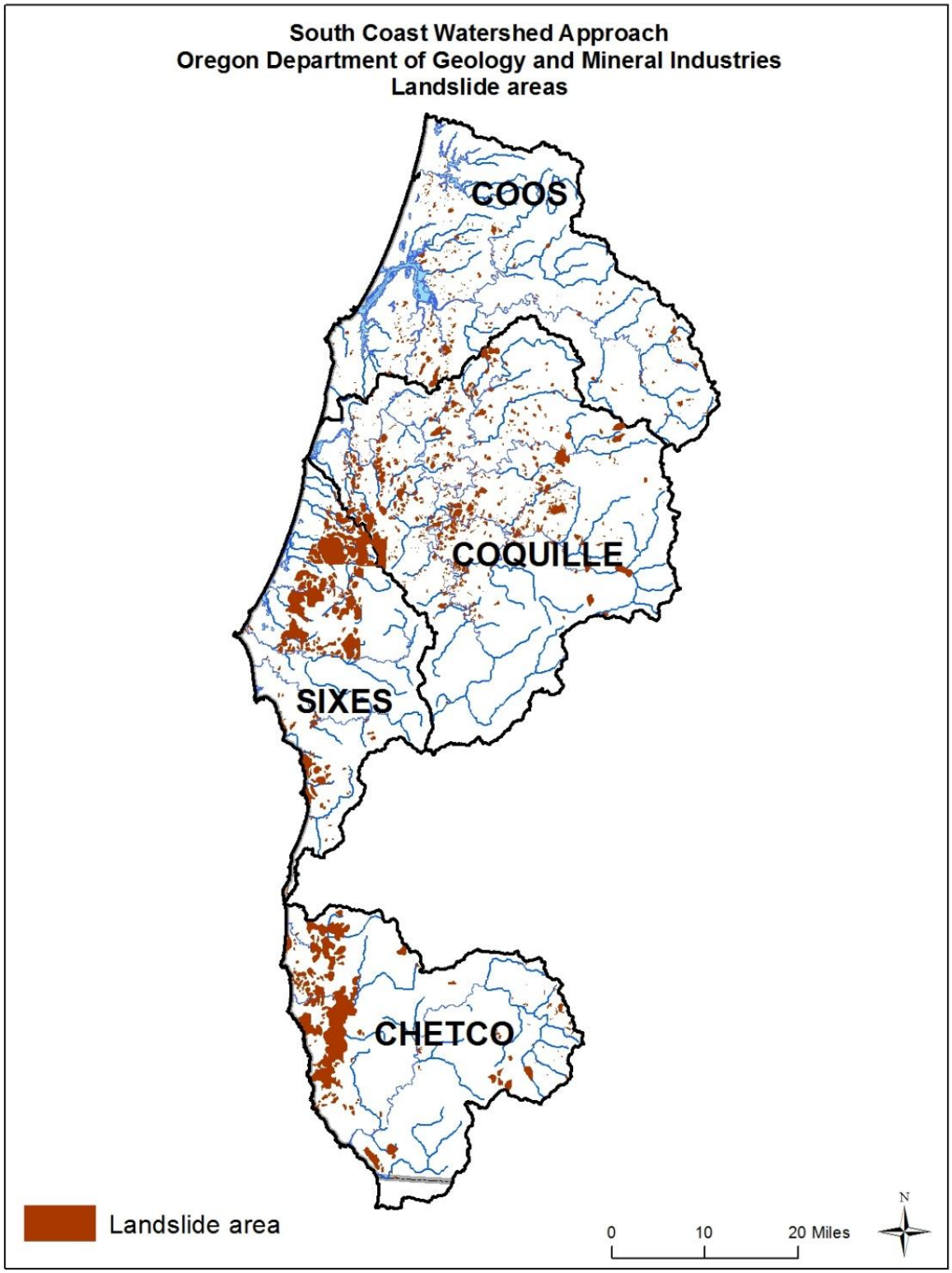
Continued geologic activity during the late Pleistocene (150,000 to 12,000 years ago) has led to the development of marine terraces along the Oregon coast. These features provide evidence of historic sea level changes and indicate zones of structural uplift along the coast that is likely the result of continued movement along faults.[4] The western edge of the Coast Range also includes coastal headlands broken with fairly regular distribution of estuaries, shallow bays, beaches, and sand dunes. Both the Coos and the Coquille Rivers flow from the Coast Range into broad estuaries,[5] where the saltwater tide often reaches 20-30 miles upstream.

The mountains of the South Coast have soils of varying depth, but sometimes the soils are only a thin veneer that may be inches to a few feet in depth. The intense precipitation that occurs in this coastal area often soaks through the soil. The water then encounters a less permeable zone and runs along this layer until it surfaces as natural seeps. In steep terrains, these shallow surface flows often lead to saturated soil slides. Slides are commonly triggered by heavy rain, rapid snow melt, earthquakes, grading/removing material from bottom of slope or adding loads to the top of the slope, or concentrating water onto a slope (for example, from agriculture and landscape irrigation, roof downspouts, or broken water/sewer lines). Slides generally occur on moderate to steep slopes, especially in weak soil and rock.

From Bandon and to the north, the abundant sand along the shore can dam streams and creates lakes of varying depths and sizes. These freshwater dunal lakes along the coast are short-lived regional features (geologically speaking). While the dunal sands can be an excellent aquifer beneath these coastal lakes, there is a fragile boundary between the fresh water and the saltwater. In addition, the dunal sands do not have well developed natural soil layers to protect and minimize groundwater impacts from land uses. Virtually all communities along the South Coast rely on groundwater obtained from these unconsolidated aquifers.

[4] A Brief Summary of Oregon Coast Range Geology, Geomorphology, Tectonics, and Climate Geology 4/510: Tectonic Geomorphology, University of Oregon 2008
[5] Geology of Oregon, 4th Edition, Orr, Orr and Baldwin

Figure 59 – DOGAMI Landslide Areas



Harbor Bench Special Studies

There were two independent DEQ studies conducted in southwestern Curry County. In 1986, lily agriculture fields were assessed by collecting groundwater samples from 10 domestic wells. The groundwater was analyzed for nutrients, pesticides and general chemistry. Elevated nitrate levels up to 12 milligrams per liter (mg/L) were present in the shallow groundwater samples. There were also low level pesticide detections of 1, 2 dichloropropane, aldicarb (Temik) and aldicarb metabolites in the groundwater. Aldicarb was last used in this area in 1988; 1, 2 dichloropropane was a minor ingredient in a nematicide (Telone II) used in the same area. Select wells from this study were re-sampled in 1987, confirming the original results.

In 1991, DEQ completed a second groundwater study at Harbor Bench to evaluate the levels of nitrate and pesticides in the shallow groundwater. Several of the original wells from the 1986 study were included along with new well locations. The pesticides were analyzed by ODA and OSU. The screening method used by ODA did not detect any pesticides, but there was no information regarding the detection limits used during this screening process. OSU analyzed five samples for 11 pesticides, and found nothing present above the detection limit. DEQ's laboratory found 1, 2 dichloropropane present at low levels in two wells, but did not test for aldicarb. All wells had nitrate present, two were greater than 5.0 mg/L.

Landfills

There are a number of terminated, closed, and open landfills in the South Coast area. In general, evidence of groundwater impacts for landfills that have conducted groundwater monitoring indicates the impacts are limited to zones around the landfill.

In Coos County, the Beaver Hill Landfill received ash from the on-site municipal solid waste incinerator. The incinerator was closed in 2013 and the site now acts as a transfer location. The newer landfill cells are lined and leachate is collected and treated although older cells at the landfill were not adequately lined to protect groundwater. Although levels of some parameters are greater than the Maximum Contaminant Level (MCL), thus far, groundwater contamination has been limited to the area adjacent the landfill. Mercury has been found in the groundwater, but it is believed to have been leached from the bedrock by the high pH leachate.

Coos County has several other permitted landfills. The Bandon Landfill was first used in 1967 for municipal solid waste, and it closed in 1994. Low levels of volatile organic compounds (VOC) in the groundwater have been note in the past. The Joe Ney Landfill is a closed construction and demolition landfill, and the groundwater tested there shows the presence of several VOCs. In addition, there are several permitted wood waste landfills in Coos County that typically do not have liners or leachate collection systems. Localized impacts to groundwater from wood waste facilities typically include iron, manganese and total dissolved solids.

Curry County has two permitted municipal landfills that are both unlined. The Port Orford Landfill is a closed municipal solid waste facility that is currently impacting groundwater with arsenic. The South Coast landfill is a comingled ash and wood waste fill. Both landfills have monitoring wells and show groundwater impacts from the waste units. There are also a number of terminated solid waste permits for non-municipal landfills (i.e., sludge, wood waste, etc) in Curry County.

Domestic Well Water Quality - Real Estate Transfer Data

Public and private (domestic) water supply wells are the beneficial uses most susceptible to groundwater contamination. Although Public Water Supply systems (PWS) are required to

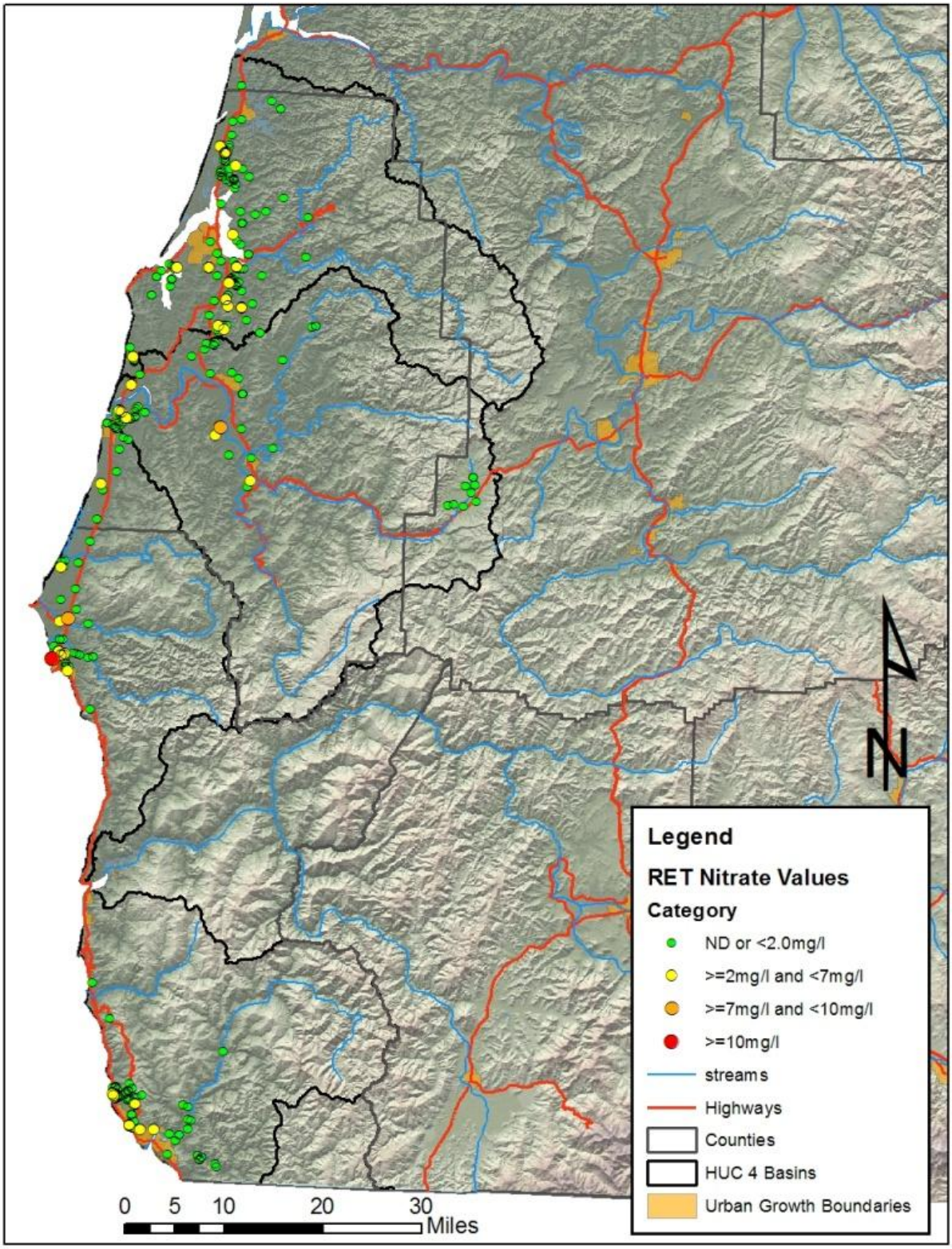
regularly test the water quality and meet the maximum concentration levels (MCL) for selected parameters, there are no such requirements for domestic wells used for drinking water. The only law that requires water quality testing of private wells and reporting to the state is the Real Estate Transaction law (RET). This law is triggered when property ownership is transferred and requires the sellers to report water test results for nitrate, arsenic and bacteria to the State. http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/Monitoring/Pages/dwt.aspx

Typical sources of nitrate contamination for most domestic wells are from fertilizers and animal and human wastes. Bacterial contamination of well water usually indicates a problem with the well construction, while arsenic contamination is often indicative of a constituent of the native bedrock. Although saltwater intrusion due to over pumping of shallow unconfined aquifers can be problematic, nonpoint source contamination is the most common threat to domestic well water quality.

When examined, data from the RET for Coos and Curry County found little evidence of wide-scale groundwater contamination from nonpoint sources. Testing results from the 1989-2006 investigations (four hundred two domestic wells) showed only eight wells with nitrate between five and 10 mg/L and one well with greater than 10 mg/L. There is a nitrate MCL of 10 mg/L, established for public water supplies. There are no water quality standards for domestic wells.

Arsenic was tested in one hundred forty two water samples and except for one sample at 4 ppb; all results were “ND” - not detected. One hundred and thirty nine wells had a positive test result for total coliform and eight were positive for fecal coliform.

Figure 60 – RET Nitrate Values



Action and Alignment Opportunities (Drinking Water)

ACTION: Current and Future Drinking Water Toxics Monitoring
DEQ and the OHA have initiated a statewide monitoring project to determine if there are levels of concern of emerging contaminants in source waters. Data show there is potential for groundwater and surface impacts but there is a lack of robust groundwater or surface water data representative of source waters. Safe drinking water act monitoring data is required for finished (post-treatment) water only. There are no requirements for testing other contaminants that pose potential risks to public water systems, including "emerging contaminants" such as pharmaceuticals, chemicals associated with personal care products, and many ubiquitous pesticides and semi-volatile and volatile organic chemicals. Some monitoring of source waters for these contaminants has occurred through the Drinking Water Source Water Monitoring project to date. More data is needed in the South Coast Basin to help assess whether source water is being negatively impacted by biosolids applications, high density septic systems, pesticide applications, and forest management practices. Important data gaps include:

- Additional monitoring for toxics in areas upstream from drinking water system intakes
- Location and extent of existing and future biosolids applications sites
- Increased monitoring of pharmaceuticals, personal care products and other emerging contaminants in vicinity of high density septic systems and biosolids application sites
- Data to assess transport of contaminants via groundwater inputs to surface water
- Data to better characterize the risk of algal toxins to public water systems
- Data to better characterize the risks to public water systems from elevated turbidity associated with forest management practices and roads
- Data to better characterize correlations between storm events and impacts to public water systems from specific contaminants including fecal coliform and turbidity
- Analysis of land use patterns and disturbances and how they relate to facility source water turbidity data

Alignment Opportunities: NPS program staff work with surface and ground water program staff to develop a monitoring plan to address data gaps and align these monitoring efforts with those of other programs as possible.

Alignment Opportunities: Work with surface and ground water as well as NPS program staff to develop outreach strategies.

Alignment Opportunities: Coordinate with point source and onsite program staff to address septic issues, and biosolid application and gray water concerns.

ACTION: A number of public water systems in Oregon have installed continuous turbidity monitoring equipment yielding high quality data on turbidity levels in untreated drinking water. A plan for installing this equipment at public water systems throughout the Basin would be a major benefit for assessing impacts. Continued coordination with partnering agencies to share research results, monitoring data, and mapping is also recommended.

ACTION: Work to secure resources to review turbidity records from South Coast Basin drinking water system source water testing to determine if turbidity is present at sufficient levels to impair the drinking water beneficial use.

ACTION: Consider ways to work with drinking water systems to share their monitoring information collected as an OHA requirement. Although many facilities are moving to digital data repositories many continue to record this information in hard copy. Encourage digital monitoring records to facilitate data sharing and interpretation.

ACTION: Engage the DEQ laboratory in developing an acceptable QA/QC plan so that the quality of the data collected daily at drinking water facilities is characterized and is more usable.

ACTION: Promote the consideration of threats identified in Source Water Assessments when developing and implementing water quality restoration and enhancement projects.

ACTION: Consider the inclusion of Source Water Protection planning when developing watershed assessments and restoration and enhancement plans.

Alignment Opportunities: The integration of drinking water protection with other agency programs including spill response, household hazardous waste collection, hazardous waste cleanup, underground storage tank cleanup, toxics reduction, water quality permitting and pollution prevention technical assistance for preventing contamination of public water supplies.

ACTION: Conduct an assessment of South Coast Basin groundwater quality to inform education, outreach, and coordination opportunities.

ACTION: Design and conduct an outreach and education plan for the basin. Present groundwater protection and domestic drinking water information at various residential venues. Provide free nitrate well water 'screening'. Using this nitrate data, determine locations that would be appropriate for additional assessment and technical assistance.

ACTION: Work with ODA to develop advanced best management practices for CAFO waste management and develop a research forum on determining nitrogen loading rates that are protective of groundwater.

ACTION: Coordinate on setting measurement goals for the action plan nitrate level, work with realtors and health care providers to disseminate information about nitrate in groundwater and design a planning tool kit for ground water protection for use by local jurisdictions.

ACTION: Conduct additional monitoring of ground water in areas of intensive agriculture to better characterize groundwater conditions in these areas. Intensive agricultural activities in the South Coast Basin are primarily cranberry and lily bulb production.

Total Maximum Daily Loads and Water Quality Implementation Plans

Few TMDLs have been completed in the South Coast Basin. Unresolved litigation is currently preventing the development of TMDLs in Oregon. Because of this, a schedule for completion of outstanding multi-parameter TMDLs cannot be developed at this time. Appendix A details

parameters designated as impaired by sub-basin and as TMDLs are developed all pertinent parameters will be incorporated as possible.

DEQ has committed to develop TMDLs, which include the development and issuance of sector specific enforceable load allocations and well developed implementation plans which identify "safe harbor" Best Management Practices ("BMPs"). This approach will help strengthen the reasonable assurance that the selected BMPs will achieve load and waste load allocations by securing a greater level of stakeholder buy in and by providing more detailed assessments and implementation plans during the TMDL development process rather than in the 18 months following EPA's approval of the TMDL.

Table 65 – South Coast Basin Approved TMDLs

Watershed (USGS 4th Field Name)	Water Body (Stream/Lake)	Parameter
Coos (DEQ, 2007)	Benson Creek	Sedimentation**
	Big Creek	
	Johnson Creek	
	Shutter Creek	
	North and South Tenmile Lakes	Chlorophyll a
		Aquatic Weeds Or Algae
		Sedimentation**
Coquille (DEQ,1996, 2000b, 2001)	**Coquille River***	Dissolved Oxygen*
	Johnson Creek	Temperature
	Rock Creek	
	South Fork Coquille River	
Sixes (DEQ, 1988b)	**Garrison Lake***	Aquatic Weeds Or Algae
		pH
		Phosphorus

***** Point Source only TMDLs – NPS component to be added at review/revision

** Sedimentation is a surrogate for phosphorus loading (listed parameter - Algae and Chlorophyll a) and sediment accrual rates influence the distribution of aquatic weeds (listed parameter - Aquatic Weeds)

The Tenmile Lakes TMDL identified designated management agencies (DMA) with jurisdiction over nonpoint source pollution sources. Many of these DMAs have submitted implementation plans as required by OAR 340-042-0080. These plans describe actions to reduce a DMA's contribution to water quality impairments. On agricultural land these implementation plans are developed through ODA's SB1010 process. On state and private forestlands, the ODF has the lead in providing water quality protection through the Forest Practices Act and long range management plans. In the urban and rural landscape, local governments take the lead in developing TMDL implementation plans.

Land use within the scope of the Upper South Fork Coquille River is limited to federal and private forests. The TMDL (ODEQ, 2001) for this area identified only the US Forest Service and ODF as DMAs. The USFS developed a Water Quality Restoration Plan for lands under their jurisdiction in this area (ODEQ, 2000b). ODF implements the Forest Practices Act as the management plan of private forest lands.

Under most circumstances, TMDL implementation plans rely heavily on the cooperative efforts of landowners and land managers. Local watershed councils, soil and water conservation districts or other organizations serve as community-based coordination points for implementation. The TMDL program incorporates DEQ's commitment to The Oregon Plan for Salmon and Watersheds designed to restore the healthy function of Oregon's natural aquatic systems. By cooperatively developing total maximum daily loads with other state and federal agencies DEQ provides the needed scientific information for understanding water quality problems and guidance for developing successful management plans.

Table 66 – Status of DMA Implementation Plan Development as of 2012

DMAs and Responsible Participants	Upper South Fork Coquille River TMDL (1996)	Tenmile Lake Watershed TMDL (2007)
Oregon Department of Environmental Quality	In place	In place
Oregon Department of Forestry, ODF	In place	In place
United State Forest Service, USFS	In place	NA
Coos County	These land uses are not present in this area.	**Needed**
Douglas County		**Needed**
City of Lakeside		In place
Oregon Department of Transportation, ODOT		In place
Oregon Department of Fish and Wildlife, ODFW		In place
Oregon Department of State Lands, DSL		In place
Oregon State Marine Board, OSMB		**Needed**
Oregon Department of Agriculture, ODA		In place

TMDLS and Implementation Plans – Focused Actions

When TMDLs have been completed for the Basin entities with jurisdiction over activities that may impact water quality, are required to submit implementation plans describing timelines and actions that will be taken to reduce the activities impact on water quality. On agricultural land these implementation plans are developed through the Oregon Department of Agriculture's Area Plan process. On state and private forestlands, the Department of Forestry has the lead in providing water quality protection through the Forest Practices Act and long range management plans. In urban and rural landscapes, local governments take the lead in developing TMDL implementation plans. Drainage Districts will be asked to develop implementation plans to address the maintenance and operation of drainage facilities. The US Forest Service and the Bureau of Land Management develop water quality restoration plans for lands under their jurisdiction. DEQ works with these entities in an iterative manner guided by mutual agreements or statements of understanding which incorporate adaptive management approaches.

Forestry and Oregon's CZMA Nonpoint Pollution Control Program

DEQ is working in to implement Oregon's Coastal Zone Management Area Nonpoint Pollution Control Program. This program will address gaps in current programs for coast area that are mandated by the Coastal Zone Management Act (CZMA) under NOAA Coastal Zone Act Reauthorization Amendments (CZARA) Section 6217 Requirements. In order for Oregon to receive program approval, DEQ must address additional forestry measures relating to medium, small and non-fish bearing streams, high-risk landslide areas, and the impacts of road operation and maintenance, particularly legacy roads. Because over 63% of the basin's area is comprised of forestry related land uses, managing forestry activities to minimize water quality impacts is a very important focus area.

On July 1, 2013, Oregon submitted its plan to address the additional forestry measures. The state's submittal included a description of Oregon's regulatory and policy framework for managing private forestlands to ensure protection of water quality and associated beneficial uses. This framework involves a comprehensive, science-based program of regulatory and voluntary measures that includes periodic evaluation and course correction to ensure environmental outcomes can be achieved. Oregon's Environmental Quality Commission and Board of Forestry work closely together to achieve compliance with water quality standards on forestlands. Also key to Oregon's framework is a strong land-use system that seeks to conserve working forestlands.

Elements of Oregon's approach to addressing forestry measures include:

- Current Board of Forestry consideration of additional protections for small and medium sized streams where fish are present, based on recent scientific findings that current rules may not sufficiently protect these streams from temperature increases after harvest,
- Ongoing investment in monitoring to determine the effectiveness of rules, with a commitment to making adjustments as necessary to meet standards. Oregon and other partners have invested in long term evaluations of water quality in several areas containing streams where there are no fish.
- Enhancement of landslide protections, with rules that require leave trees along slide-prone streams, to slow downstream movement and add large wood to streams. Forestland owners must also avoid locating roads, must not build skid roads, and must prevent deep or extensive ground disturbance during log felling and yarding in high-risk landslide areas.
- New rules adopted in 2002-03 addressing forest roads, including avoiding road construction in critical locations, limiting road use in wet weather, and requiring drainage systems that direct runoff away from streams.
- Older roads are addressed through voluntary measures (more than $93 million in landowner investment), and Forest Practices Act restrictions on delivering sediment to streams still apply.

Action and Alignment Opportunities (TMDL)

ACTION: The completion of TMDLs in the South Coast Basin is a high priority action. TMDLs will be developed on a 4th field HUC basis. Only very minor point sources are present in the Sixes and Chetco sub-basins as compared to the Coos and Coquille sub-basins. TMDL development in general, but more specifically for temperature, is difficult to estimate due to litigation that currently puts DEQ's temperature criteria in question.

As new water quality concerns are identified and/or as 303d listing of impaired waters are adjusted additional monitoring may be required. Data collection will be needed to address the following water quality concerns:

- Intergravel dissolved oxygen – spawning periods
- NPS nutrient loading and periphyton biomass
- Biocriteria
- Mercury in fish tissue
- Harmful algae blooms
- Invasive aquatic weeds
- Toxic constituents

ACTION: TMDL Implementation. Continue to working with DMAs to develop and implement Water Quality Implementation Plans and report implementation progress as required.

ACTION: Total Maximum Daily Loads (TMDLs) will be developed to address bacteria listings within the South Coast Basin. Flow based loading capacities are being developed and percent reduction targets will be determined for various stream flow ranges.

ACTION: DO and pH TMDLs will be developed for impaired streams in the South Coast Basin. Allocations for stream temperatures and nutrient loading will be established for point and nonpoint sources. Widespread intensive monitoring has been conducted over the last several years in preparation for the development of dissolved oxygen and pH TMDLs.

ACTION: Focus nutrient and organic matter pollution reduction efforts on Isthmus Slough pending the development of the dissolved oxygen TMDL for that area.

ACTION: Develop TMDLs for temperature impaired water bodies.

ACTION: In cases where non-attainment of water quality standards occur, DEQ may implement source controls in the form of Total Maximum Daily Loads (TMDLs) or permit adjustments. Monitoring provides the basis for instituting source controls as well as critical feedback regarding the effectiveness of pollution abatement actions.

ACTION: Continue to track progress in the development of Microbial Source Tracking techniques which have the potential to better define the sources of bacterial loads.

ACTION: The Tenmile Lakes TMDL identified several areas where the adequacy and or application of Forest Practices Act measures appear to contribute to pollutant loading. These areas include management measures relating to landslides, road construction and maintenance, debris torrents, and riparian management areas. Please see the Tenmile Lakes TMDL for additional detail.

ACTION: Add Coos Bay to the National Estuary Program (NEP) Eligible Projects List and/or seek other funding to support more in depth estuary investigation and planning. The potential for development and industrialization in close proximity to sensitive natural resources is high in this deep draft shipping estuary. Special studies to fully inform development decision are critically needed.

ACTION: Although it may not be realistic to strive for water quality conditions that would fully support shellfish growing during larger storms it seems a reasonable first step to work toward

water quality that would allow shellfish harvesting during the two to five year return intervals (95-98 percent chance of occurring in any one year, likely repeatedly). This would mean that shellfish growing waters would attain the bacterial criterion of 14 FC/100mL in response to two storms delivering up to 2.68 inches and five year storms delivering up to 3.81 inches of rainfall in a 24 hour period. The two year target would nearly double the amount of rainfall allowed for continued shellfish harvest.

ACTION: DEQ is currently reviewing both the turbidity and sedimentation water quality criteria which will likely lead to new assessment criteria. When the methodology and associated sedimentation guidance is completed, the DEQ may establish sedimentation TMDLs in response to biocriteria and sedimentation impairments.

In the meantime DEQ expects decreases in sedimentation to result from the implementation of temperature TMDLs. Wide mature riparian vegetation buffers will filter sediment from upslope sources. The establishment of healthy riparian vegetation will help to protect stream banks from erosion in addition to providing stream shade. Because of the adverse impacts sediment loads may have on channel stability DEQ has been working with partners on upland and instream sediment abatement projects since the early 1990s.

ACTION*:* Continued collaboration is needed between the point source permit writers and the TMDL group as implementing a TMDL often includes revising industrial and municipal wastewater permits to incorporate revised permit limits based on TMDL derived waste load allocations.

ACTION: Regional Coordination. Continue regional coordination between the designated management agencies, DEQ, and other partners and stakeholders. As TMDL implementation moves forward the greatest water quality improvements are likely to be achieved through regional planning, prioritization, and implementation. The first five years of TMDL implementation is focused on assessments and prioritization of projects, revision to ordinances and codes, and development of public outreach programs. The level of project implementation will increase for the following five year implementation plan.

ACTION: Implementation Plan Monitoring. As the South Coast Basin continues to move forward to the TMDL implementation phase, focus must remain on working with DMAs to ensure that implementation plans are implemented as described and adapted over time. Modifications to implementation plans are expected to occur on an annual basis, while reviews of the TMDLs are expected to occur approximately five years after the final approval of the TMDLs, or whenever deemed necessary by DEQ. All plans have reporting requirements and should be reviewed by DEQ on an annual basis.

ACTION: Effectiveness Monitoring. Effectiveness monitoring schemes need further development as additional TMDLs are completed. Effectiveness monitoring activities will need to be strategically applied throughout the South Coast Basin to ensure that implementation actions are improving water quality and will ultimately support beneficial uses. EPA has developed guidance for measuring effectiveness on the 6th field (12 digit HUC) scale.

Alignment Opportunity: TMDL implementation will require the alignment of multiple DEQ programs including NPS, PS, SRF, policy, and laboratory staff. Ongoing continued collaboration will be required with a wide variety state and federal entities.

ACTION: Special attention will be needed to assure that water quality management planning efforts are sufficient to assure implementation of Coastal Zone Management Act requirements. With a large portion of the basin managed in forest land uses addressing Forest Practices Act sedimentation (high risk landslide area and road and landing management) and temperature (the adequacy of riparian buffers) related measures is an extremely high priority.

ACTION: With a large portion of the basin managed in forest land uses addressing the adequacy of Forest Practices Act sedimentation (high risk landslide area and road and landing management) and temperature (riparian buffers) related measures is an extremely high priority.

Compliance and Enforcement

DEQ has a range of compliance and enforcement tools including technical assistance, compliance inspections, warning letters, field citations, compliance orders, mutual agreement and orders (MAOs), and formal enforcement actions. DEQ regularly conducts inspections of projects, facilities, permitted entities and reviews monitoring data to determine compliance with DEQ permits and state laws. DEQ also investigates complaints received from the public and other agencies about possible violations.

When an inspector determines a violation exists or has occurred, the inspector determines the appropriate level of enforcement by consulting DEQ's "Enforcement Guidance for Field Staff". The Guidance directs the inspector how to respond to any given violation depending on the circumstances surrounding the violation (e.g. whether the violation has been repeated in the last 36 months, whether it was beyond the reasonable control of the violator, etc.). The purpose of the Guidance is to ensure that DEQ enforcement is consistent and fair, regardless of the region or office where the violation originates.

Warning Letters (WL) are often used to inform responsible parties that a threat to water quality exists and the WL outlines steps that should be taken in order to move conditions into a state of compliance. If the responsible party responds appropriately to a warning letter no further action is taken. DEQ provides technical assistance during compliance site visits and in most instances threats to water quality are resolved without formal enforcement action.

For the most serious violations, the Enforcement Guidance directs an inspector to write a Pre-Enforcement Notice (PEN) and refer the matter to the Office of Compliance and Enforcement (OCE) for formal enforcement action (FEA). A referral is assigned to an environmental law specialist (ELS) who specializes in specific DEQ programs. All enforcement actions are entered into a searchable database. There is currently no way to search the enforcement database by basin. The pie charts in the figures below summarize the South Coast Basin enforcement categories for two time periods, 1994-1997 and 1998-2011.

The ELS drafts and issues the formal enforcement action, and if the Respondent appeals the matter the ELS schedules an "informal discussion" with the Respondent and the inspector. Information gleaned during the informal discussions often results in a settlement offer. The Respondent may also choose to proceed to a contested case hearing before an administrative law judge (ALJ). ALJs are assigned by the Office of Administrative Hearings and are often specific to regions within the state. The ALJ will issue an opinion (officially known as a "proposed order"). The violator has the right to appeal the opinion to the EQC and, beyond that, to the Oregon Court of Appeals.

Supplemental Environmental Project (SEP)

As an alternative to paying the civil penalty to the state of Oregon's general fund, state law allows respondents to pay up to 80% of their civil penalty towards a Supplemental Environmental Project (SEP). An SEP is a project that primarily benefits public health or the environment in the geographic region where the violation took place. It can be an on-the-ground stream bank restoration project, an education pamphlet that informs people of the risks of spreading invasive species, trash removal, etc. DEQ encourages respondents to perform SEPs. An SEP may be proposed at any time after an FEA is issued. While DEQ encourages Respondents to perform SEPs, DEQ cannot outwardly advocate for one SEP over another. DEQ does however maintain a small list of SEP ideas that includes a list of non-profit groups, watershed councils, and other potential SEP partners that we pass out to respondents interested in doing an SEP.

Figure 61 – South Coast Enforcement Categories 1994-1997

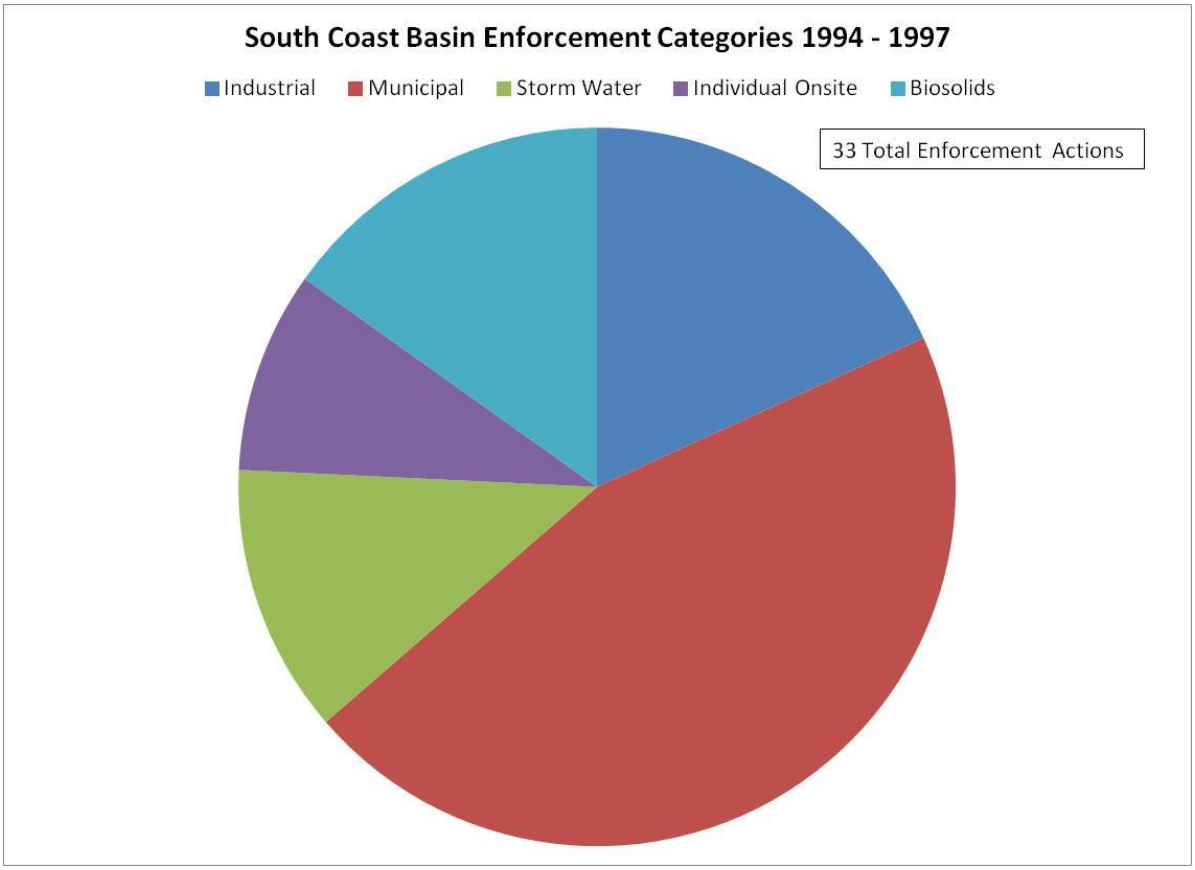
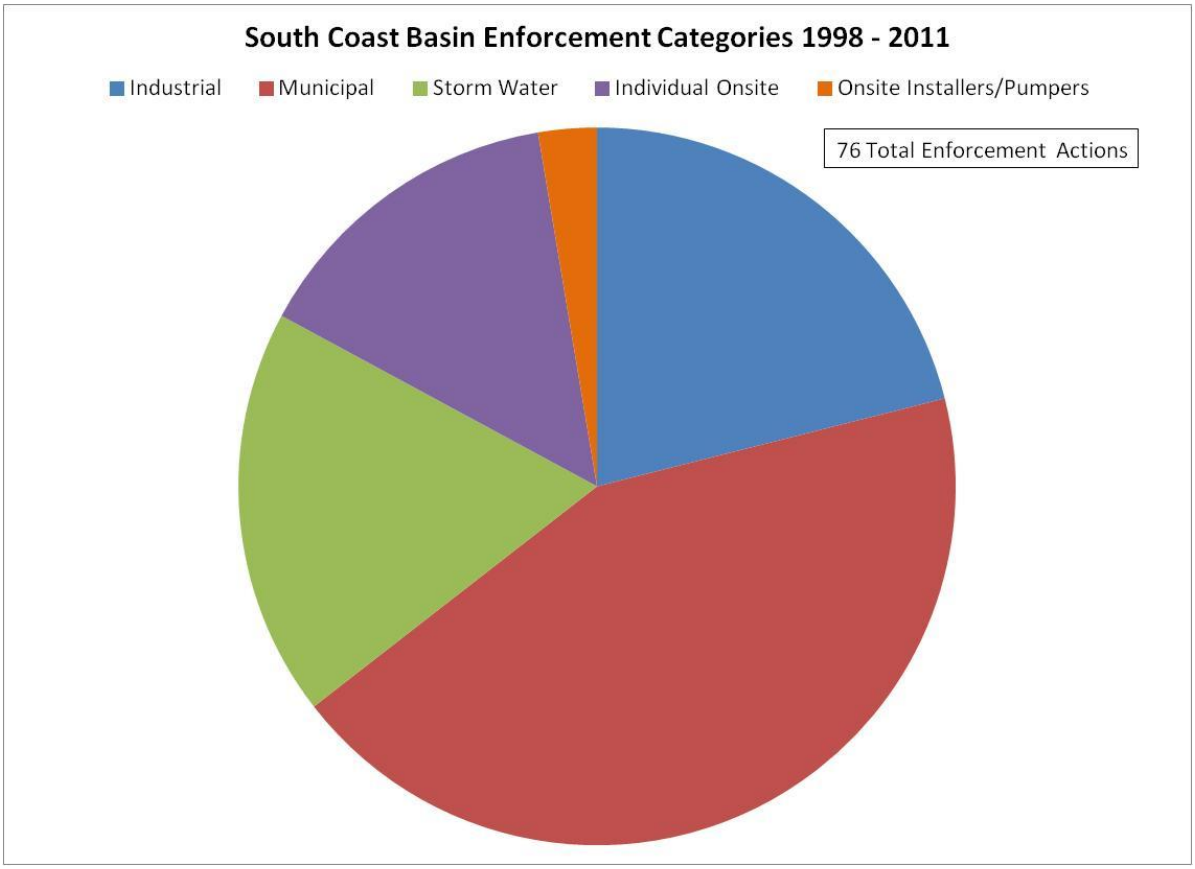


Figure 62 – South Coast Enforcement Categories 1998-2011



Action and Alignment Opportunities (Enforcement)

ACTION: Assign one ELS to handle all WQ formal enforcement actions within a basin. This would allow for an improved understanding of area management issues and concerns.

ACTION: Change formal enforcement action case numbers to include a basin identifier so that enforcement efforts within a particular basin are easier to identify and search. Include a field for basin identification in the development of the ACES database.

ACTION: Develop SEP ideas and SEP partners within a basin in order to facilitate and encourage respondents to perform SEPs. Focus SEP projects on water quality basin priorities (e.g. if temperature is a problem, include tree planting SEPs in the SEP idea list).

Financial and Technical Assistance

Clean Water State Revolving Fund (CWSRF) Loan program

DEQ administers the Clean Water State Revolving Fund loan program which is capitalized through federal appropriations. The CWSRF loan program can provide financial assistance to

public entities (cities, special districts, tribal governments) to address water quality problems. Since 2000, DEQ has provided over $21 million in loans to cities and districts within the South Coast Basin. For additional information see http://www.deq.state.or.us/wq/loans/loans.htm.

Table 67 – State Revolving Fund Loans

Binding Date	Loan No	Borrower	Description	Amount
10/29/1992	12911	City of Bandon	Secondary Treatment Plant (GO Pledge)	1,500,000
12/30/1992	12912		Secondary Treatment Plant (Revenue Pledge)	1,500,000
12/22/1992	24291	City of Coquille	Sewer Separation and I/I Correction	1,384,953
6/9/2011	24293		Wastewater System Improvements	186,406
12/28/2006	24293			50,000
5/21/2009	24293			3,000,000
10/9/2007	24293			3,886,440
2/22/2010	37813	City of Gold Beach	Wastewater Treatment Upgrades	5,000,000
4/6/2011	37814		Interim for Treatment Upgrades	3,944,000
9/23/1997	18230	City of Brookings	Wastewater Treatment System Improvements	13,100,000
2/24/2005	54436	City of Lakeside	Interim for System Improvements	2,111,150
10/17/2007	54436			1,222,000
3/30/2004	74351	City of Powers	I&I Removal	347,605
1/22/2002	74350		Wastewater System Inspection	19,630
10/17/2005	19151	Bunker Hill Sanitary District	Wastewater Pipeline Replacement	106,479
4/21/2010	21923	Charleston Sanitary District	Pump Station Relocation	1,035,150
6/17/2005	21920		Pump Station Rebuild	71,750
12/17/2004	21920			354,000
3/17/2005	21921		Pump Stations Upgrade	92,040
Total of Record				$38,911,603
Total Since 2000				$21,240,244

A wide variety of projects are eligible for the SRF program. Point source eligible projects include upgrades to existing wastewater treatment facilities or collection systems, new wastewater facilities and storm water projects under certain circumstances. Nonpoint source eligible projects include, but are not limited to, irrigation system improvements, septic system repairs, riparian habitat restoration and source water protection. Eligible planning projects

include water quality data collection and measurement, evaluation, analysis, security evaluations, report preparation, environmental review and any other reasonable activity leading to a written plan. Applicants are encouraged to consult with their regional CWSRF project officer when completing an application to ensure the project is eligible for funding and meets all application requirements.

Local Community Loan Program
SRF funds are made available to Oregon's public agencies to prevent or mitigate various types of water pollution. Traditionally public agencies use these funds to establish or upgrade municipal sewer systems. However, some public agencies (often rural counties, soil and water conservation districts, or irrigation districts) also have an opportunity to address local water pollution. The Local Community Loan Program encourages public agencies to use DEQ's financing to establish their own local loan program to address local water pollution within their jurisdiction.

Through this program, the public agency receives a loan from DEQ and uses those funds to establish a loan program within their agency. The public agency then can make local loans to citizens or other constituents to address specific types of local water pollution. The advantage to this approach is that it provides financial resources to public agencies that they might not otherwise have to assist citizens with local sources of water pollution.

Sponsorship Option
DEQ's Clean Water State Revolving Fund loan program allows a public agency to apply for a wastewater treatment or collection system project loan and a water resource activity as a combined loan. This "sponsorship option" encourages communities to pursue water restoration or protection projects in conjunction with "traditional" wastewater projects by offering a financial incentive with minimal impact to ratepayers.

Traditional wastewater projects include building or improving a sewer interceptor, pump station, treatment process, biosolids disposal process or other activities. Water resource activities are generally nonpoint source projects that improve Oregon's water quality through restoration or protection of a streamside area or wetland.

Green Project Reserve
Federal capitalization grant requirements become conditions that must be met for DEQ to receive its federal funding allocation. The annual federal capitalization grant provides additional funding to the CWSRF that increases DEQ's capacity to fund water quality improvement projects. The federal fiscal year 2012 capitalization grant award for DEQ's CWSRF program will be in the amount of $15,966,000. The SRF Intended Use Plan (IUP) addresses requirements to fund green projects and to provide additional subsidization, which DEQ offers in the form of principal forgiveness.

The federal fiscal year 2012 capitalization grant will require DEQ to use at least 10 percent of the grant (which equates to $1,596,600) for projects that qualify for funding under the green project reserve. This IUP identifies and describes projects that meet EPA's criteria for the green project reserve. The descriptions indicate in which of four categories the project qualifies: green infrastructure, water efficiency improvements, energy efficiency improvements, or environmentally innovative activities.

The Green Project Reserve funds eligible projects that incorporate components such as green practices, reduction of the environmental footprint of wastewater treatment, collection and distribution, climate change, water and energy conservation, implementation of more sustainable solutions to wet weather flows, and advanced innovative approaches to water management. Wastewater utilities can take savings derived from reducing water losses and energy consumption and use them for public health and environmental enhancement projects.

Clean Watersheds Needs Survey

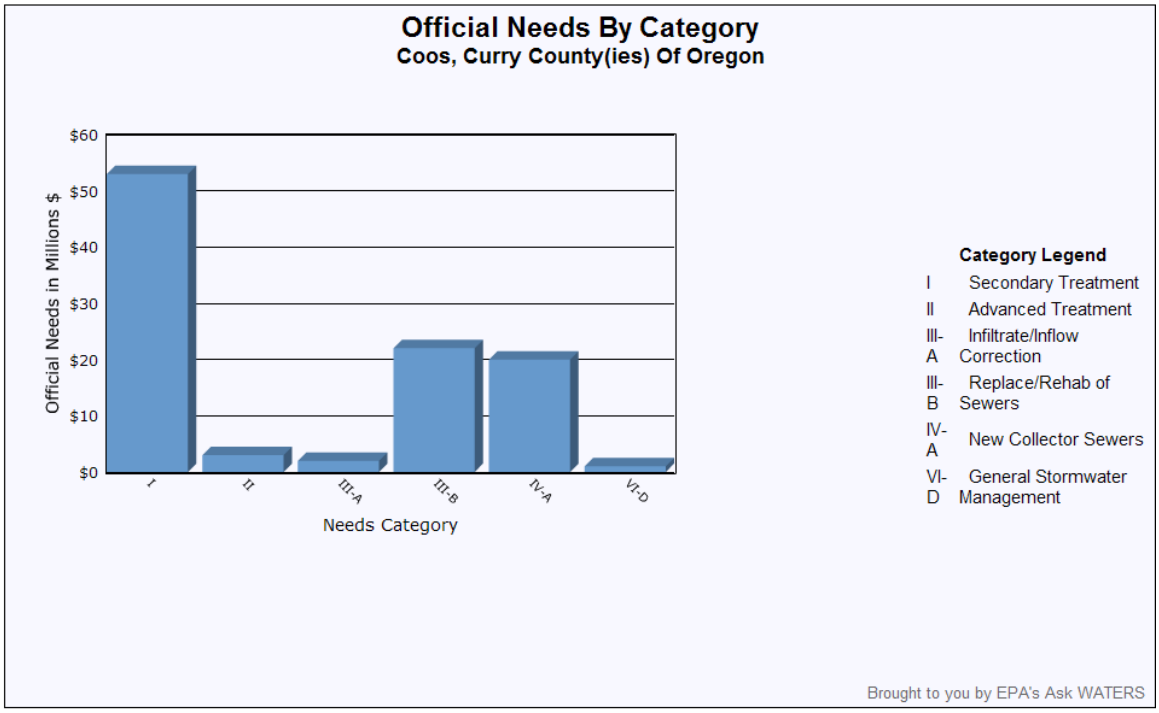
The Clean Watersheds Needs Survey (CWNS) is a collaborative effort between 47 states, the District of Columbia, U.S. territories and EPA. The CWNS is conducted every four years in response to Sections 205(a) and 516 of the Clean Water Act and serves as a comprehensive assessment of the capital needs to meet the water quality goals set in the Clean Water Act. Every four years, the states and EPA collect information about: publicly owned wastewater collection and treatment facilities, stormwater and combined sewer overflows (CSOs) control facilities, nonpoint source (NPS) pollution control projects, and decentralized wastewater management.

The 2008 CWNS report includes the unfunded capital costs of projects as of January 1, 2008 that addresses a water quality or a water quality-related public health problem existing as of January 1, 2008, or expected to occur within the next 20 years. Documentation criteria are in place but needs that did not meet these documentation criteria were classified as unofficial cost estimates.

Communities across the country face significant challenges to sustaining water/wastewater infrastructure. The report helps Congress and others effectively manage clean water infrastructure and other pollution control needs. Congress uses the data to inform legislation; state environmental agencies, legislatures, and governor's offices use the data to help administer environmental programs; and academia and industry use the data to help with water quality research and technology support.

The results of the 2012 CWNS will be delivered to Congress in mid 2014. It should be noted that the 2012 survey categories are extensive and include nearly all water quality improvement activities that will be required to meet TMDL load allocations.

Figure 63 – South Coast Basin 2008 Clean Watershed Needs by Category



Action and Alignment Opportunities (Community Assistance)

ACTION: Sponsorship Option
Encourage cities to identify qualifying nonpoint source activities for consideration under the Sponsorship Option in conjunction with a municipal wastewater project. A combined CWSRF loan may be available at a substantially discounted interest rate through the Sponsorship Option.

Alignment Opportunity: The Nonpoint source program should work with the SRF program to identify nonpoint source projects that may help CWSRF recipients qualify for Sponsorship Option funding. http://www.deq.state.or.us/wq/loans/docs/CurrentRule051410.pdf

Alignment Opportunity: Stormwater Management Planning and Implementation
The Nonpoint source program should work with the SRF program to promote the development of stormwater master plans and water quality implementation plans by local jurisdiction as required by TMDLs. Eligible planning projects include water quality data collection and measurement, evaluation, analysis, security evaluations, report preparation, environmental review, and any other reasonable activity leading to a written plan.

ACTION: Onsite System Funding Assistance
Landowner fear of cost to repair onsite wastewater treatment systems seems to be the primary disincentive for individual actions to assess the functionality of existing onsite systems. The need for funding assistance and incentive is clear and efforts to access the State Revolving Fund for support have been unsuccessful.

Allowing not for profit entities to be eligible applicants could help facilitate leveraging of multiple funding sources to address onsite system upgrades. An example might be NeighborWorks Umpqua. NeighborWorks Umpqua is a community-focused not for profit organization helping residents of Coos and Curry Counties to build businesses, homes and affordable housing. The organization also helps government and other agencies provide needed infrastructure, conserve resources and develop a stable local economy.

ACTION: Leveraging USDA Funding
Often an agricultural landowner is not able to implement their farm plan because USDA requires the project be implemented by the landowner and then the USDA payment (75% usually) is reimbursed to the landowner. Many landowners have problems or significant delays in implementation, because of the need to find financing to fund 75% of the project up front.

DEQ could seek to partner with agricultural interests (Farm Services Agency, NRCS, ODA, and SWCDs) to set up an SRF fund to help initiate implementation of WQ protections integrated into farm plans. This would be a low risk loan for DEQ to make. SRF could fund the initial 75% of implementation which would be paid back when USDA reimburses for the practices. Our Ag partners could help identify agricultural operators who need the financial assistance and what WQ protection measures are needed. They also enter into agreements with landowners regarding implementation and maintenance of practices so there would be a built in check and balance system.

Farm plans are developed by NRCS and "practices" are evaluated for their potential to reduce pollutant loads so it would also be fairly straight forward to determine reductions in pollutant loading from these projects and measurable WQ improvements. In addition NRCS has recently announced a change in the way they plan to do business. They are going to be more active in recruiting projects rather than waiting for landowners to come in and request. This is a real step forward because NRCS may now seek to implement watershed treatments verses scattered projects.

DEQ will seek to implement a pilot project to partner SRF and USDA funding in the NRCS Southwest Area Basin (Rogue, Umpqua, and South Coast Basins).

Alignment: Ten percent of the loan program's annual capitalization grant is set aside to fund green infrastructure, water or energy efficiency improvements or other environmentally innovative activities. The federal fiscal year 2012 capitalization grant requires DEQ to use at least 10 percent of the grant (which equates to $1,596,600) for projects that qualify for funding under the green project reserve. DEQ's loans can fund both nonpoint source and point source projects. This represents a great opportunity for the SRF program to align with the nonpoint source program to identify nonpoint source projects within the South Coast Basin.

ACTION: Clean Water Needs Survey
Explore the possibility and benefit of incorporating detailed NPS project needs into the CWNS.

Section 319 Grants - Nonpoint Source Pollution Control

Agencies and stakeholders with jurisdiction over activities that impact water quality in the South Coast Basin consist of a network of federal, state, and local agencies and non-governmental organizations, as well as private landowners. Oregon DEQ's role is to communicate regularly with these entities to facilitate opportunities with these stakeholders to protect, enhance, restore

and monitor South Coast Basin watersheds. What follows is a very brief overview of selected implementation actions and activities in the basin.

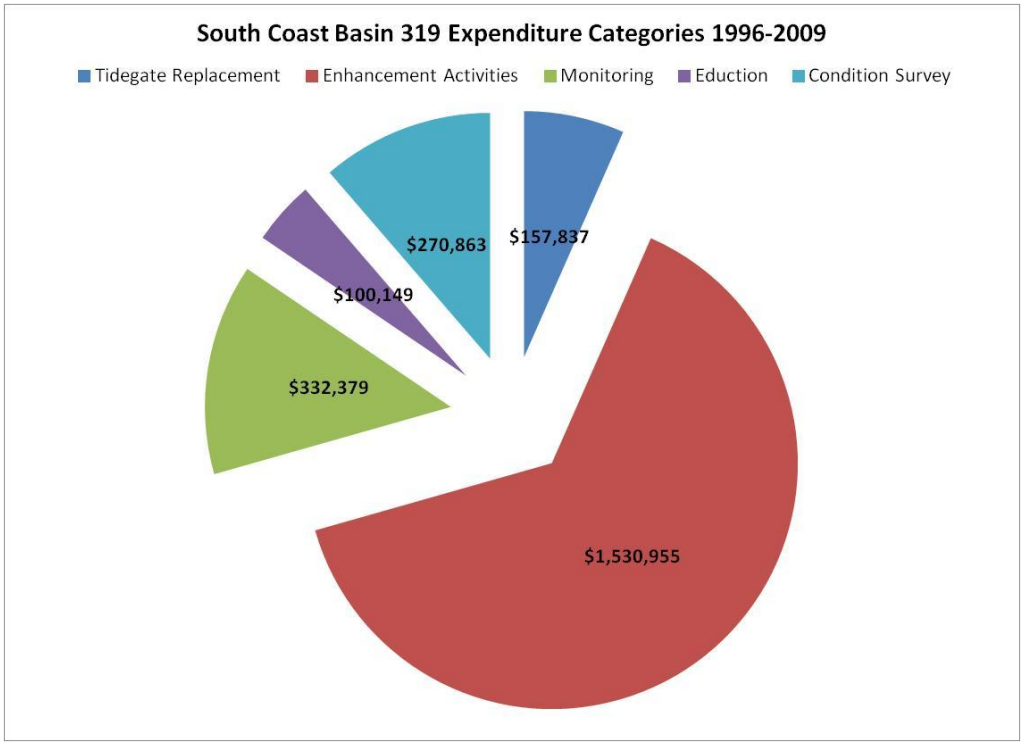
Section 319 of the federal Clean Water Act requires states to have nonpoint source management programs based on assessments of the amounts and origins of nonpoint source pollution in the state. Nonpoint source pollution comes from numerous diffuse sources such as runoff from roads, farms and construction sites. This type of pollution is thought to be the largest source of water quality impairment in Oregon and for the country. DEQ provides grant money to local organizations for nonpoint source projects such as public education and watershed restoration.

Between 1996 and 2009 DEQ invested nearly $1.5 million in 319 funding in the South Coast Basin. Match for this funding approached $1 million with a total investment of nearly $2.4 million. Match funding comes from diverse sources and the availability of 319 funding allows DEQ to leverage other funding to water quality issues and projects.

Approximately 64% of the South Coast Basin 319 grant funds have focused on the ground enhancement activities such as riparian enhancement and sediment abatement projects, 14% on monitoring, 11% on condition surveys and planning primarily focusing on riparian and road and landing areas, 14% on monitoring, and 4% on educational activities.

During TMDL development 319 funding is an important source of funding for monitoring and assessment. Section 319 grant funding fills a funding gap in these areas. More overall funding tends to be available for on the ground implementation activities from other grant sources. Post TMDL development, the funding focus will likely change toward the development of required water quality implementation plans.

Figure 64 – 319 Investment History



Action and Alignment Opportunities (319)

ACTION: Develop basin priorities for inclusion in the annual 319 request for proposals and distribute the South Coast Basin's portion of the grant to fund project proposals based on identified priorities.

Alignment Opportunity: Prepare a South Coast Basin 319 project success story for inclusion in the annual report of nonpoint source program accomplishments.

Alignment Opportunity: Align 319 priorities with the development of TMDLs through monitoring and assessment and through the development of water quality implementation and management plan components. Focus on implementation actions that will result in temperature, bacteria and sediment improvements on urban, agricultural and forested lands, and will address stormwater management in urban areas.

Alignment Opportunity: Evaluate opportunities to align with the SRFs green infrastructure and Sponsorship Option funding to implement projects that are not funded through the 319 program.

ACTION: Continue to work with other sources of grant funding to leverage resources toward water quality improvement projects. The Oregon Watershed Enhancement Board is the largest source of restoration and enhancement finding in the state of Oregon and DEQ regional staff review grant applications in an effort to promote water quality improvements and participate in Regional Review Teams tasked with recommending funding and identifying priority actions.

South Coast Basin Action Matrix

Purpose

The Department of Environmental Quality (DEQ) is undertaking a Watershed Approach to assist in managing water quality in the State of Oregon. A key component of this approach is an action matrix that can be used along with the Status Report to adaptively manage water quality actions within a geographic area. This Action Matrix identifies potential actions and opportunities for the alignment of DEQ water quality programs and activities. The intent of this Action Matrix is to help guide DEQ's water quality management activities in the South Coast Basin for the next five years. Periodic updates are expected as part of the adaptive management process within DEQ and with stakeholders. The next major update is anticipated in 2016.

The Water Quality program's primary functions and program activities are described in detail in the Status Report and this information is followed by identified action items and opportunities for alignment with other programs and partners. Action items, alignment opportunities and partnerships are assembled in an Action Matrix Summary Table. These actions are grouped by how soon the actions should be implemented: the next 18 months (N), the next 18 months to three years (M), or the next three to five years (L).

Goals

The goal of the South Coast Basin Water Quality Action Matrix is to identify water quality program priorities and identify actions to address existing problems and prevent future water quality related problems within the South Coast Basin. An additional goal is to help direct program priorities and facilitate the alignment of water quality programs within the DEQ as articulated in the 2011-2013 DEQ Agency Request Budget.

- Align water quality monitoring to basin needs
- Align individual permit issuance to the basin plans
- Align TMDL development and implementation to the basin plans
- Align nonpoint source implementation work to priorities in the basins
- Align groundwater protection work with needs outlined in the basin plans
- Align drinking water protection work with needs outlined in the basin plans

Summary of Water Quality Resource Concerns by Geographic Area

The following table summarizes the status of surface water related resources in the South Coast Basin as identified through existing data or information, knowledge of DEQ staff, or from local stakeholders. More detailed information can be found in the South Coast Basin Status Report.

Table 68 – Summary of Water Quality Resource Concerns by Geographic Area														
Sub-basin Name	**Bacteria**	**Biological Stressors Harmful Algae Blooms**	**Temperature**	**Dissolved Oxygen**	**Nutrients, pH Chlorophyll a**	**Altered Hydrology**	**Habitat Modification**	**Flow Modification**	**Sediment / Turbidity**	**Toxics: Emerging Contaminants, PCPs, Pharmaceuticals**	**Toxics: Metals**	**Toxics: Mercury**	**Toxics: Pesticides**
Coos													
Coquille													
Sixes													
Chetco													
South Coast Beaches													

	Generally poor condition, **substantial** concern for water quality
	Deteriorating condition, **moderate** concern for water quality
	Generally good condition, **low** concern for water quality
	Unknown condition or lack of data

South Coast Basin Partners

The table below identifies many but not all of the water quality implementation partnerships existing in the South Coast Basin. As previously stated the vast majority of successful water quality improvement actions are accomplished through cooperative partnerships.

Table 69 – South Coast Basin Partners	
Partner	**Focus Area**
Indian Tribes	Cultural and other natural resource interests. Water quality (WQ) monitoring. Land management (tribal, trust, fee, and ceded lands) including forest, agricultural and urban landscapes.
Federal Partners	
Bureau of Indian Affairs (BIA)	Administers trust responsibility program, maintains federal government-to-government relationships with recognized Indian tribes, promotes and supports tribal self-determination.
Bureau of Land Management (BLM) United State Forest Service (USFS)	Protects and manages national forests and grasslands in a sustainable manner for multiple-uses. Northwest Forest Plan guides land management. BLM manages O and C Lands.
United State Army Corps of Engineers (USACE)	Maintain channels, harbors and waterways for transportation of commerce, support to national security and recreation. Provide technical expertise for sediment characterization, evaluation and management. Participate in water resource development projects

Table 69 – South Coast Basin Partners	
Partner	**Focus Area**
	(navigation, flood damage, ecosystem restoration). Conduct fill and removal permitting and secure tribal and endangered species act consultations. Reduce flood risks with structural and non-structural measures.
Natural Resource Conservation Service	Work with landowners through conservation planning and assistance to benefit the soil, water, air, plants, and animals and result in productive lands and healthy ecosystems. Provide financial assistance for conservation activities.
Farm Services Agency	Serves farmers, ranchers, and agricultural partners through the delivery of effective, efficient agricultural programs (commodity, loan and loan guarantee, conservation, and disaster relief programs).
National Oceanic and Atmospheric Association, National Marine Fisheries Service (NMFS), United States Fish and Wild life Service (USFWS)	NMFS and the USFWS implement the Endangered Species Act (ESA). Generally, USFWS manages land and freshwater species, while NMFS manages marine and "anadromous" species.
Environmental Protection Agency (EPA)	Develop and enforce clean water act (CWA) regulation, provide grant and low interest loan assistance, study environmental issues, sponsor partnerships, provide educate, outreach, and technical assistance, provide CWA delegate oversight
State Agencies	
Oregon Department of Forestry (ODF) Board of Forestry (BOF)	Regulate WQ on non-federal forestlands through the Forest Practices Act (FPA). Supervises forest policy in Oregon. Implements the Oregon Plan by promoting private land volunteer enhancement measures. Directly oversees the management of the Elliott State Forest. Monitors and applies adaptive management.
Oregon Department of Agriculture (ODA)	Develop agricultural WQ management (AWQM) plans and enforce rules that address WQ issues on agricultural lands. Conduct WQ education and outreach, select and implements focus area programs, partners with DEQ to identify WQ monitoring needs, applies adaptive management.
Oregon Department of Transportation (ODOT)	WQ protection measures during construction, operation, and maintenance of the state and federal transportation system. Vegetation and sediment management.
Oregon Department of State Lands (DSL) *South Slough National Estuarine Research Reserve (NERRS)*	Jurisdiction over waterways, wetland management and protection, state forest land management. Fill and removal permitting, waterway and grazing leases, natural resource management funding. Partners with NOAA to manage NERRS, a network of estuarine habitats protected and managed for the purposes of long-term research, education, and coastal stewardship.
Oregon Department of Fish and	Develop and apply conservation strategy for native fish

Table 69 – South Coast Basin Partners	
Partner	**Focus Area**
Wildlife (ODFW) Restoration and Enhancement Board (R & E) Oregon Fish and Wildlife Commission	and wildlife and their habitats. Regulate fishing and hunting activities. Provide technical assistance and funding for fish restoration and enhancement projects.
Oregon State Marine Board (OSMB)	Administers boating safety educational programs, marine law enforcement and improved boating facilities. Establish and enforce statewide boating regulations. Technical training and equipment to marine patrol officers and grants and engineering services to local governments to develop and maintain accessible boating facilities and protect WQ. Actively promotes safe and sustainable boating.
Oregon Department of Geology and Mineral Industries (DOGAMI)	Regulates natural resource extraction (surface mining, oil and gas, and geothermal), implements the federal Clean Water Act General Stormwater Permit and the State Water Pollution Control Facility Permit at aggregate mine sites that utilize upland sources (may include instream sources also).
Oregon Parks and Recreation Department (OPRD)	Public park management and natural resource enhancement.
Oregon Water Resources Department (OWRD)	Administers laws governing surface and ground water resources. Protects existing water rights, facilitate voluntary stream flow restoration, increase the understanding of the demands on the water resources, provide accurate and accessible water resource data, and facilitate water supply solutions.
Oregon Department of Land Conservation and Development (DLCD)	Provides regional representatives who assist local governments in the implementation of statewide land use planning program by providing technical and educational assistance to local government planners and officials, the general public, and interest groups. Provides financial assistance to urban and rural communities. Administers the Coastal Management Program emphasizing conservation of coastal resources (estuaries, shorelands, beaches and dunes, and ocean resources), provides financial and planning assistance to local governments, implements a coastal hazards and assessment program, supports the Oregon Ocean Policy Advisory Council, maintains an online Oregon Coastal Atlas, and has authority under federal law to review federal programs and activities for consistency with coastal program standards.
Oregon State Police (OSP)	Enforcement of fish, wildlife, and commercial fishing laws, protection of natural resources, enforces boating, livestock and environmental protection laws, responds to emergency situations.
Oregon Plan for Salmon and	Implementation of voluntary measures to restore native

Table 69 – South Coast Basin Partners	
Partner	**Focus Area**
Watersheds	fish populations and aquatic systems, coordinate state, federal, and tribal actions, monitor watershed health, and provides scientific oversight. Promotes easement programs for wetlands and riparian habitats.
Oregon Watershed Enhancement Board (OWEB)	Implementation of the Oregon Plan for Salmon and Watersheds provides grants to help Oregonians protect and improve WQ and natural areas, support for watershed council operation.
Entities Managing Corridors	
Bonneville Power, Coos Curry Electric, Pacific Power, rail lines, pipeline corridors, Port Districts, other	WQ protection during construction, operation, and maintenance activities. Riparian vegetation and sediment management.
Local Jurisdictions/Governmental Entities	
Cities	Management of lands in direct ownership (parks, city buildings, roads, etc), wastewater, stormwater, and drinking water management, land use and comprehensive planning, and the development and application of local ordinances through education, variance procedures, and enforcement.
Counties	Management of lands in direct ownership (parks, city buildings, roads, etc), stormwater, land use and comprehensive planning, and the development and application of local ordinances through education, variance procedures, and enforcement.
Port Authorities	Management of port facilities (marinas, service and fueling areas, live aboard communities, transient communities, sub tidal ownership, etc.), dredging activities, recreational facilities
Soil and Water Conservation Districts (SWCD)	Serve as Local Management Agencies (LMAs) funded by ODA to conduct outreach and education, provide technical assistance, develop individual farm plans for operations in the planning area, work with landowners to implement management practices, and help landowners secure funding to cost-share WQ improvement practices.
Special Drainage Districts	Management of conveyance systems designed to enhance drainage and control tidal influences and in some instances salinity (tidegates).
Academia	
Oregon State University (OSU) Extension	Convey research-based knowledge to improve natural resource productivity, WQ, and fishery habitat.
Non Governmental Entities	
Watershed Councils	Locally organized, voluntary, non-regulatory groups established to improve the conditions of watersheds. Widely represent diverse interests in the. Plan watershed protection and restoration strategies in a holistic way. Collaborate to identify issues, promote cooperative solutions, focus resources, agree on goals

Table 69 – South Coast Basin Partners	
Partner	**Focus Area**
	for watershed protection and enhancement, and foster communication among all watershed interests.
Coos Waterkeepers, Audubon, Surfrider Foundation, Oregon Shores Conservation Coalition, The Nature Conservancy, Port Orford Ocean Resource Team (POORT), Friends of the Elk River, Friends of the Coquille River, Wild River Coast Alliance, Freshwater Trust, Oregon Trout, and many others.	Non-Governmental Organizations focusing activities on WQ protection, enhancement, and restoration.

General Priority Concerns in the South Coast Basin

The South Coast Basin Status report identified a number of water quality resource needs that can be used to establish priorities for the basin. Actions specific to address these priority concerns and areas of geographic focus will be identified as the Watershed Approach continues through sub-program discussion and discussions with TMDL Designated Management Agencies, permittees, and stakeholders in the basin. Discussions will also include an identification of subprogram and partnership alignment opportunities that will serve to increase the effectiveness and efficiency of any actions taken.

General Priorities:

- Work with partners to implement action plans to address temperature basin-wide. (Where possible, these actions should additionally address flow modification, habitat modification and sedimentation);
- Work with partners to implement action plans to address nutrients and bacteria;
- Work with partners to develop and implement a strategy to address HABs;
- Work with partners to measure the effectiveness of our actions;
- Monitor for toxics to include surface waters, drinking source water protection, and ground water.
- Provide improved information and data access to support permitting decisions and monitoring and implementation efforts

Water Quality Programs, Activities, and Alignment Opportunities

Near Term (N) = Next 18 months,
Mid Term (M) = 18 months to 3 years,
Far Term (F) = 3 to 5 years

T = Team Member
L = Agency Lead
X = Involved Program

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
737 results and prevention/reduction plans to be shared with NPS program, PS program, groundwater, drinking water programs	N		X	X	X						X		X	X		X			T		L	X	T		County Health Departments, permitted facilities, local jurisdictions
0700 - Examine the impacts to channel form to assure compliance with temperature criteria/TMDLs.	N																		X		L				Mining Associations, Federal Land Managers
0900 - Seafood Processing. Review statewide DMRs effluent bacteria data at time of permit renewal to determine the need for individual permits for these facilities.	N																		X		L				ODA
0900 - Seafood Processing. Review DMR land application records and rainfall information to determine if land application is conducted in a manner consistent with agronomic rates.	N																								ODA
0800 - Work with Oregon Department of Agriculture to better evaluate the sufficiency of manure storage capacity at CAFOs.	N														X				T		L	X			ODA

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0800 - Work with the Oregon Department of Agriculture to assure that AgWQMPs are implemented at CAFO facilities (riparian area management, off channel stock watering, grazing management, etc.)	N			X												T			T		L				ODA, SWCD
0800 - CAFO. Continue to work closely with ODA to assure CAFOs manure management activities sufficiently control bacterial loading.	N																		X		L				ODA
The DEQ Bacterial Internal Management Directive (IMD) should be revised to accurately reflect shellfish resource distributions (the upper limits of softshell and native Olympic oysters are understated) and the extent of SCB estuarine conditions. .	N																		T		L	X			ODFW, ODA (shellfish)
0700 - Work toward an improved understanding of the effects of instream dredging of mercury deposits to determine the compliance or non compliance of this activity with the state mercury water quality standard.	N																		X		L				Cleanup Program

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
SRF - Work with program to develop Local Community Loan programs to address regional NPS issues.	N			L	X	X	X							X		T		X	T						Local jurisdictions, drainage districts, other eligible entities.
SRF - develop Local Community Loan programs to address the need for onsite septic system upgrades.	N			L	X	X	T									T		X	T				X	X	Local jurisdictions, special water districts, DW providers, ODA, SWCDs
Promote the use of green infrastructure and sponsorship option funding by eligible entities to implementation of high priority NPS projects (urban stormwater management planning, UIC's, TMDL implementation, etc.).	N			L				X						X		X		X	T		T				local jurisdictions, WSCs
SRF - Prioritize future WWTP projects for facilities requiring upgrades to meet WLAs and/or WQ standards	N			L															T		T				local jurisdictions
SRF - Focus technical assistance to facilities with required upgrades in the near future.	N			L															T		T				local jurisdictions
Promote and help to develop SRF Sponsorship Option projects when permitted entities apply for SRF loans.	N			L												T		T	T		T				local jurisdictions, WSCs

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Develop opportunities to couple green infrastructure funding with NRCS/USDA/FSA funding to implement high priority projects (CAFO's, farm plans, other).	N			L												T		T	T						NRCS, USDA, FSA, Others
Ensure ACES/CEM is searchable by basin	N																L		X						
NPS, DW, Groundwater, Onsite, Industrial Stormwater, and Biosolids subprograms to provide input to Toxics Monitoring Program to aid in site selection and the identification of analytes of interest.	N	X			X	X	X					X			T	X		X	T	X	X	X	L		WSC, DW providers, permitted facilities, SSNERR, tribal governments, local jurisdictions, state and federal partners, environmental interests.
Build on existing invertebrate data through partnerships with the US Forest Service long-term monitoring programs (macroinvertebrates as well as other stream health indicators). Maximize efficiencies by using USFS data to assess conditions on federal lands.	N				X										L			X	T			X			Federal land managers

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Re-sample estuary fish and shellfish tissue for butyltin compounds in areas with historical elevated levels.	N									X		X		X	X	X			T		X	X	L		Cleanup and Solid Waste Programs
Determine a way to add bacterial monitoring to the suite of ambient parameters routinely collected and analyzed.	N				X										L				T			X			WSC, Surfriders, environmental interests
All chemistry, physical, biological, habitat data collected for any reason stored in central data base in a timely manner.	N														T				X			L			
Develop, maintain, and routinely update a more accessible, user friendly database for compilation, display, access and analysis of all appropriate forms of data from DEQ (all subprograms) and stakeholders.	N																								
Resolve data entry inaccuracies. In some instances data has been incorrectly entered into the LASAR database. An example is historical sediment and tissue data entered under the incorrect sample matrix.	N																		X			L			

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Establish third party data management system so this information can be tracked and utilized for decision making.	N				X	X								X	X	X		X	T			L			Permitted facilities, local jurisdictions, EPA, consulting community
Develop a biomonitoring strategy. Seek support of all partners and funding to implement the strategy.	N										X				L	X		X	T			X			Federal, State, Private Interests
Map location of UICs in the SCB sites and share this information with subprograms	M							L											X						
Focus SEP projects on water quality basin priorities.	N															X	L	X	T						WSCs, environmental interests
Education and outreach about emerging contaminants. Proper disposal options should be investigated and publicized (waste pick up events, drug turn in, etc.)	N	T			T	T	T				T					L		T	T		T	X	X	T	County Health Departments, local jurisdictions, permitted facilities
Determine strategy to address habitat and flow modification.	M															T		X	L						OWRD, IWRS, ODFW

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Conduct work to determine the adequacy and or application of Forest Practices Act measures for coastal lakes. Areas of concern include management measures relating to sediment (landslides, road construction and maintenance, debris torrents) and riparian management areas. Please see the Tenmile Lakes TMDL for additional detail.	N										T				T	L			T						ODF, TLBP
DEQ to secure instream water rights, as needed, to implement TMDLs.	N														X	L			T			X			OWRD
Digitize biosolid applications and records.	N	L			X	X	T												X						Permitted Facilities, ODA CAFO, seafood processors
Provide information to WWTP operators regarding suitable land application windows based on rainfall and agronomic rates.	N	L		X	X	X													T		L				ODA, NWS
Map location and extent of existing and future biosolids application sites and share with subprograms	N	L			X	X	T												X						County Health Departments

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Develop SEP partners within a basin in order to facilitate and encourage respondents to perform SEPs.	N																L	X	X						WSCs, environmental interests
Onsite - Consider the implementation of a special onsite project if the level of public health concern warrants that action.	N			X			L									X		X	T			X		X	county health, local jurisdictions, WSCs
Onsite - Support viable area wide onsite system solutions such as connection to sewer or development of decentralized wastewater treatment options.	N			X			L									X		X	T						local jurisdictions
Onsite - Begin onsite maintenance program implementation in the coastal zone.	N			T			L									T		X	X			X		T	local jurisdictions, WSCs
With a large portion of the basin managed in forest land uses addressing the adequacy of Forest Practices Act sedimentation (high risk landslide area and road and landing management) and temperature (the adequacy of riparian buffers) related measures is an extremely high priority.	N										T					L		T							ODF, BOF, EQC

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Promote the consideration of threats identified in Source Water Assessments when developing and implementing water quality restoration and enhancement projects.	N				T											X		L	T				X		WSC, DW providers
Integrated review (drinking water program, NPS TMDL, ODA, ground water) of biosolid program information to ensure no WQ impacts based on current data.	N	T			X	X										T			L						County Health Departments
Basin Coordinator to implement Watershed Approach through partner and sub-program coordination, data collection and compiling, and water quality assessment.	N	X	X	X	X	X	X	X		X	X	X	X	X	X	T	X	T	L	X	X	X	X	X	WSC, DW providers, permitted facilities, SSNERR, tribal governments, local jurisdictions, state and federal partners
Coordinate monitoring efforts (point source, laboratory, partners, volunteers, etc) to maximize data collection efforts and provide improved understanding of receiving water conditions.	N	X			X	X	X					X		X	T			X	L		T	X	X	X	WSC, DW providers, permitted facilities, SSNERR, tribal governments, local jurisdictions, state and federal partners.

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Develop a multi-program multiagency monitoring needs planning process to maximize monitoring efficiencies. Include NPS, TMDL, DW, GW, Toxics, LEAD, etc.	N	X	X		X	X	X	X				X	X	X	X	X		X	L		X	T	X	X	County Health Departments, state and federal partners, WSCs, tribal governments
Seek other funding sources for high priority WQ projects not funded by 319. Maintain regional project concepts "white paper" information.	N			X	X	X					X			X	X	X		L	T			X			WSCs
Work with volunteers and DMAs to implement long term effectiveness monitoring to determine the effectiveness of measures to improve WQ. Consider supporting these efforts by providing audited temperature devices, data management, and QAQC services. Consider identification of threshold landscape conditions that would trigger effectiveness monitoring.	N				X	X								X	T	T		T	L			X			WSCs, local jurisdictions, SSNERR, tribal governments, federal land managers
Expand DEQ sediment characterization efforts on private lands by adding new locations and repeat sampling at existing sites.	N				X										T			X	L			X	X		WSC, ODF, ODA, SWCDs

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Continue to provide support and build capacity of SCB Volunteer Monitoring Programs.	N				X											T		X	L			X			WSC, Surfriders, environmental interests
Continue to support Watershed Council and volunteer monitoring of turbidity and bacteria loading during storm events.	N				X										T			T	L			X			WSC, Surfriders, environmental interests
Fund basin-wide collaborative WQ Implementation Planning and monitoring actions in support of the development of Implementation Ready TMDLs.	N	X		X	X	X								X	X	X	X	X	L		X	X	X	X	WSC, DW providers, permitted facilities Operators, SSNERR, tribal governments, local jurisdictions, state and federal partners, environmental interests
"Insufficient data" or "Potential concern" for any pollutant or beneficial use should trigger the alignment of the monitoring plans (project or basin specific) to address those data needs.	N				X										T	X		T	L		T	X	X		Permitted facilities, WSC, local jurisdictions

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Continue to collect water quality and landscape data to support the development of TMDLs.	N	X													T				L			X	X		WSC, DW providers, WWTP Operators, SSNERR, tribal governments, local jurisdictions, state and federal partners, environmental interests.
DEQ to collaborate with ODA to provide monitoring data to inform the CAFO program.	N	X													X				L		T				ODA
Assure that stormwater general permits for industrial and construction activities are issued where required.	N													L		X			X					X	
Work with partners and the DEQ lab to characterize pollutant loads from non MS4 stormwater collection systems.	N													X	T				L			X	X		Cities, WSC
Work with local jurisdictions to allow the discharge of treated water sourcing from leaking underground storage tank (UST) remediation efforts under DEQ oversight. UST sites in close proximity to and with a high risk of delivery to surface water will be prioritized.	N													X					L						Cities, UST Program

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
SRF program to collaborate with 319 and NPS program to provide TA to develop and fund high priority projects that maximize NPS benefits.	N			T												X	X	X	L						local jurisdictions, WSCs
Assess available flow information to achieve a better understanding of where flow impaired reaches exist. Work with ODF&W and OWRD to implement actions in their priority sub-basins (Oregon Conservation Strategy (voluntary)).	N															L		X	T						ODFW, OWRD
Coordinate with ODA on AgWQMP updates.	N														X	T		X	L			X	X		ODA, SWCDs, WSCs
Provide guidance to ODA and SWCDs to help direct their new watershed focused approach.	N														X	T		X	L			X	X		ODA, SWCDs, WSCs
Address 303(d) listed impairments for the parameter sediment.	N										X				T			X	L			T			WSCs, state and federal partners
Continue to review Division 33 water right applications per OAR Chapter 690.	N															L			X						OWRD, OFDW
Insure that basin issues are considered during the development of the integrated water resources strategy with OWRD.	N															L			T						OWRD

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Encourage consideration of water rights transfer to instream flows in cases where property management is changing or public funds are being spent.	N															L			T						OWRD, ODFW, environmental interests
Provide input regarding large Coos Bay projects (pipeline, N Spit development, etc.) or other large project that may occur in the future.	N									T		T			X				L		T		X		Port of Coos Bay, environmental interests, local community
Establish and maintain strong, interactive, working relationship with tribes, sister agencies (ODA, ODF, DSL, OWRD, ODFW) and local and federal agencies that allows effective communication and support. Work in coordination with HQ staff to assure consistency statewide.	N														X	T			L			X			tribal governments, state and federal partners
Onsite - Provide surface water quality data to the onsite program to assist in the identification of areas where septic systems adversely impact water quality.	N						T								X	X			L			X			ODA - Shellfish program, county health

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Continue regional coordination with DSL and USACE on removal/fill projects needing certification.	N									T									L						ODFW
TMDL staff to provide input on 401 certification requirements for channelized stream maintenance and streambank stability projects.	N									T									L						ODFW
Investigate opportunities for collaboration between ODA (AgWQMP and CAFO) and TMDL outreach activities.	N																	T	L		T				ODA (shellfish, AgWQMP, CAFO)
Maintain knowledge regarding the status of data to represent conditions in the SCB. PS and NPS staff work closely to assure all data/information is considered to support permitting decisions.	N														T				L		T	X	X		permitted sources
Carefully track datasets that are not included in the 5 year Basin Assessment to assure that all available information is used in decision making and that WQL parameters are addressed in the four year period between data reviews.	N										T				X			X	L		T	X		X	WSCs, state and federal partners, permitted facilities

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Work with the Integrated Report Coordinator to secure all available data for review.	N										T								L			X			
As possible assist minor sources to characterize effluent toxic constituents and mixing zone concerns.	M														X				L		T	X			permitted sources
Characterize receiving waters (City of Lakeside/Tenmile Creek - dissolved oxygen, pH, nutrients, aquatic vegetation, Langlois School District/Madden Creek)	N														T				L		T	X	X		permitted sources, WSCs
Coordinate outreach, education, and financing opportunities between TMDL, Stormwater, SRF, and UIC programs (take advantage of the overlap).	N			X	X			X							T				L		T	X		T	
USGS sediment studies to be incorporated into water quality certification (WQC). Studies are available for the Chetco, South Fork Coquille River and Hunter Creek.	N									L									T						USGS, DSL, ACOE
WWTP permit requirement to notify public when unauthorized discharge or spills occur are implemented.	N																		T		L			X	local jurisdictions, OPRD

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Identify data gaps and initiate monitoring by permitted facilities to collect data needed to support permitting decisions.	N														T				T		L	X	X		permitted facilities
Point and nonpoint source staffs need to work together to evaluate the feasibility of water quality trading where warranted to maximize environmental benefit.	N			X												X		X	T		L				local jurisdictions, WSCs
Support alignment of the update of the Integrated Report database with 5 year rotation SCB Assessment. Available assessment resources could be targeted in defined watersheds for a specified period of time, thus allowing for data to be collected and assessed in a spatially and temporally "focused" manner.	N										L					X			T			X			
Develop, adopt, and implement a sedimentation listing criteria and determine impairment.	N										L				T	X		X	X			X		X	

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Salinity values recorded in the LASAR database should be carefully scrutinized for their validity. Salinity values are recorded as less then should not be utilized to determine the extent of marine influences. When this situation exists the measured conductivity values should be utilized to determine marine influence rather than salinity < (less than) estimates.	N										L								T						
Work with resource agencies to better define/refine the distribution of beneficial use at the 6th Field HUC level for resident trout and anadromous fish spawning (timing and extent). Spawning should be removed as a beneficial use in tidally influence areas. Aeration and fine substrate do not support spawning.	N										L								T		X	X			ODFW, NMFS
Work with ODA and develop a research forum on determining nitrogen loading rates that are protective of surface and groundwater (CAFO, fish waste).	M	X				X										X			T		L				ODA, Academia, CAFO Operators, Extension

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Collect data to characterize the risk from algal toxins to public drinking water systems	M				L										T				X			X			Community DW Systems
Determine if source water is being impacted by biosolids, septic systems, pesticides, and forest management.	M	X			L	L	X								X	X			X			X	X		Community DW Systems, WSC
Develop a plan and support funding the installation of turbidity monitoring equipment at public drinking water systems throughout the SCB. Use the data to determine drinking water impairments.	M				L										X	X						X			OHA, Community DW Systems
Work with OHA to secure digital daily data records from drinking water providers (pH, turbidity).	M				L										T				X			T			OHA, Community DW Systems
Collect data to better characterize risks to public water systems from elevated turbidity associated with resource lands.	M				L					X					X				X			X			OHA, Community DW Systems, WSCs
GW program coordinate with onsite program, biosolids application, gray water, and UIC to determine areas of concern.	M	X	X			L		X											X				X		

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Work to allow not for profit entities to be eligible applicants could help facilitate leveraging of multiple funding sources to address onsite system upgrades.	M			L															X						NeighborhoodWorks Umpqua
Work with SRF program to promote stormwater master planning and TMDL water quality implementation planning through the planning loan program.	M			T															L						Local jurisdictions, WSC
Continue to educate and work with local governments and organizations such as drainage districts to make funds available to these nontraditional eligible entities proposing WQ improvement projects.	M			L						X						X		X	T						Local jurisdictions, Special districts
Gather all macroinvertebrate data (REMAP, BLM, AREMP, PIBO, J. Anderson, and Xerces) and analyze data for conditions. Need methodology to integrate DEQ data with other methods.	M														L	X		X	T			X			Federal partners, WSC, Xerces

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Engage the DEQ laboratory in working with the Oregon Health Authority to develop an acceptable QA/QC plan for use by source water providers.	M				X										L				T			X			OHA, DW providers
Utilize point source compliance monitoring to inform TMDL development, implementation, and beneficial use support.	M																		L		T	X	X		Permitted Facilities
Correct errors. In some instances older datasets in LASAR do not accurately identify the sample matrix and this has resulted in 303d water quality impairment listings based upon sediment data. The data that these 303d listings are based upon should be reviewed carefully by the regional (Basin Coordinator), assessment program, and laboratory staff. The sample matrix should be confirmed and LASAR and the 303d list corrections made as necessary.	M										T								T			L			
Continue to seek partners interested in monitoring beach bacterial conditions and assessing pollutant sources to beaches.	M														T			X	L			T			WSC, Waterkeepers, Surfriders, State Parks

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Add estuary bacterial monitoring to determine compliance with the marine bacterial standard.	M										X				L	X			T			X			SSNERR, Tribes, WSC, Shellfish industry and ODA program
A survey of macroinvertebrates assemblages should be planned prior to the next Basin Assessment effort in order to gain a better understanding of conditions for this beneficial use. At least 30 sites should be surveyed (50 sites preferred). Repeated once every five years to gain an understanding of trends in the aquatic life use.	M														L	X		X	T			X			Federal and State Partners, WSC, DMAs, Academia
The OWQI utilizes fresh water criterion and as a result index values are negatively impacted during periods of marine influence. An adjustment of the OWQI protocol to better characterize sites where tidal and marine influence are present should be made.	M														X				T			L			

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DEQ develop and execute a long-term sediment monitoring effort, add additional monitoring locations in the lower reaches using EMAP non-wadeable stream monitoring protocol.	M														L				T			X			
Develop and implement consistent assessment protocols for streambank erosion, channel stability and general sedimentation condition	M														L	X		X	T			X			Federal and State Partners, WSC, DMAs, Academia
Establish a system to monitor shade conditions through time. This could be accomplished through aerial photo or LIDAR interpretation or measurement in the field with a Solar Pathfinder or Solmetric Suneye device.	M														L	T		X	T						Federal and State Partners, WSC, DMAs, Academia
Develop guidance for DEQ and partner effectiveness monitoring for TMDL parameters - consider using biological indexes as a method to show changes in watershed conditions and beneficial use support.	M														L	T		X	T						Federal and State Partners, WSC, DMAs, Academia

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The results from the CEMAP and Coos Bay Toxics sediment sampling should be utilized to help determine priority pollutants and potential hot spots. Sediment should be re-sampled every 5 years to determine trends.	M														L				X			X	T		
Develop standardized effectiveness monitoring protocols to ensure that implementation actions are improving water quality and will support beneficial uses. Encourage the use of the protocols by DMAs.	M														L	T		X	T						Federal and State Partners, WSC, DMAs, Academia
Fund in depth beach WQ monitoring and source assessment	M														X			L	T			X			WSC, Waterkeepers, Surfriders, State Parks
Fund projects that fill data gaps and/or fund monitoring of parameters where analytic capability is not available in the DEQ Laboratory.	M														X			L	T			X			WSC, DMAs
Identify funding for support of sediment assessment tools and strategies (RBS, GRAIP, survey protocol, etc.).	M														X			L	T			X			WSC, DMAs

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Organize and bring all TMDL implementation reporting into ACES.	M															T			L						
Work with HQ IR staff to update database to reflect the review of all data, to identify recent and/or on-going monitoring data for consideration, to correct listing errors, and to accurately reflect the status of TMDLs.	M										T				T	T		T	L			X			Federal and State Partners, WSC, DMAs, Academia
Develop landscape based monitoring points upstream of beach sample sites to begin to identify sources.	M														L				T			X			WSC, Waterkeepers, Surfriders, State Parks
More comprehensive collection of data to characterize the causes of hazardous algal blooms and associated impairment.	M														T				L			X			Lake Associations, WSCs
Develop and oversee a Basin-wide Monitoring Council to help coordinate monitoring, funding, project implementation and data analysis on a holistic scale. Hold annual or semiannual coordination meetings.	M				X	X									T	X		X	L		X	X	X		All Partners

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Work with partners and/or apply DEQ resources to identify areas of cold water refuge. Develop measures to protect and maximize cold water refuge.	M														T			X	L			T			Federal and State Partners, WSC, DMAs
Continue working to find resources to sample water quality and algal conditions in order to characterize conditions in South Coast Basin Lakes that have little to no data available for review.	M														T			X	L			X			OHA, WSC
Share TMP results with sources and local communities. Analysis should include determination of risk to public water supplies.	M	X			X	X									X			X	L			X	T		Local jurisdictions, environmental interests, WSC
Analyze chemical contaminant data to determine the need to implement a PSP project. Historical data indicates that both the cranberry and lily bulb industries may be candidates for a PSP project in addition to roadside management entities (ODOT, Counties).	M															T		X	L			X	X	X	ODA, Academia, Extension

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Develop TMDLs with sector specific load allocations and strong Reasonable Assurance (BMPs and milestones defined).	M				X	X									X	T		X	L			X			Federal and State Partners, WSC, DMAs
Consider the inclusion of Source Water Protection planning when developing watershed assessments and restoration and enhancement plans.	M				X	X									X	X		T	L			X			Community DW sources
Implement the CNPCP as required by EPA.	M															L		X	T						Federal and State Partners, WSC, DMAs
Continue working with other programs and stakeholders to determine potential causes and treatments of sediment impairments.	M														X	X		X	L			X			Federal and State Partners, WSC, DMAs, Academia
Evaluate contaminant data for the potential to provide an indicator of on-site septic treatment efficiency.	M						X												L				X		
Complete TMDLs for invasive aquatic weeds.	M														X	X		X	L			X			Federal and State Partners, WSC, DMAs, Academia
Complete TMDLs for bacteria.	M														X	X		X	L			X			Federal and State Partners, WSC, DMAs, Academia

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Complete TMDLs for dissolved oxygen/pH (estuaries and streams).	M														X	X		X	L			X			Federal and State Partners, WSC, DMAs, Academia
Complete TMDLs for hazardous algal blooms. Integrate statewide strategy for identifying and responding to harmful algal blooms.	M														X	X		X	L			X			Federal and State Partners, WSC, DMAs, Academia
Complete TMDLs for mercury in fish tissue. Coordinate with Oregon State-Wide Mercury TMDL process to share data and loading/deposition assessments.	M														X	X		X	L			X			Federal and State Partners, WSC, DMAs, Academia
Complete TMDLS for sediment.	M				X										T			X	L			X			Federal and State Partners, WSC, DMAs, Academia
Complete TMDLs for temperature.	M				X										T			X	L			X			Federal and State Partners, WSC, DMAs
Implement bacterial source control measures.	M			X										X											WSC, DMAs
Coordinate macroinvertebrate sampling with ODA priority outreach areas.	M														X			X	L			X			ODA, SWCD, WSC
Conduct 5 year review of IP's	M																		L						DMAs

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Pursue missing implementation plans - Coos and Douglas Counties, Oregon State Marine Board.	M																	X	L						Select DMAs, WSC
Review and comment on agricultural water quality management plans - biennial reviews.	M															X			L						ODA, SWCD, WSC
Review of BLM and USFS basin WQRPs to check adequacy to meet the TMDL.	M															X			L						Federal DMAs
Review Urban IP's for non-phase II communities to ensure that they are properly incorporating stormwater requirements.	M															X			L						Local jurisdictions
Use effectiveness monitoring results to adaptively manage/revise implementation plans.	M														X			X	L			X	X		DMAs
0400 - Log Ponds. Assure adequate mixing is present at point of discharge and that discharge occurs only in the approved period. Review DMRs to assure impacts to DO are de minimis.	M																								Permitted Facilities

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0300 - Fish Hatcheries. Review temperature management plans to assure compliance with temperature criteria.	M																		T		L				Permitted Facilities
City of Lakeside mixing zone study follow-up (dilution, copper, zinc, flow - lake level - bar relationships).	M														X				X		L	X			City of Lakeside
City of Myrtle Point mixing zone follow-up (copper, zinc, silver - assure new outfall provides adequate dilution). Include visual inspection of the outfall because of sedimentation problems.	M														X				X		L	X			City of Myrtle Point
City of Powers mixing zone follow-up (copper, assure new outfall locations provides adequate dilution)	M														X				X		L	X			City of Powers
Review effluent toxics data and evaluate the need for additional data to support an RPA. Identify data gaps and revise permit monitoring requirements or develop a DEQ monitoring plan.	M																		X		L				Permitted Sources
Integrate waste load allocations into permits when TMDLS are completed.	M																		T		L				Permitted Sources

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Begin work to facilitate nutrient trading in the future as dissolved oxygen, pH, and chlorophyll a nutrient TMDLs are developed.	M			X							X				X	X		X	T		L	X			Special Districts, entities enhancing wetlands (USFWS), academia
Better define and account for Integrated Report "Insufficient data" vs. "Potential concern" listings. Where no data exists, recommended these segments be identified as areas of potential concern. Segments identified as those having "insufficient data" could be applied to sites where data is available but minimum data requirements are not met.	M										L								T						
Define and/or refine areas where shellfish growing is identified as a beneficial use. Currently the upper limits of tidal influence is used to guide the identification of shellfish growing waters and in many instances salinity levels are not sufficient to support this beneficial use.	M										L								T			X			ODA Shellfish Program, ODFW, Clamming Organizations

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Develop and implement a more effective sedimentation standard/criteria and guidance on its application.	M										L				X	X			X			X			Federal and State Partners, WSC, DMAs, Academia
Apply assessment benchmarks for parameters with narrative criteria. Developing approaches related to nutrient loading and impacts to dissolved oxygen are a basin priority.	M										L					T		X	X			X			Academia
Work with the Cleanup Program to promote the evaluation and remediation of abandoned mines with related mercury issues.	M																								Federal partners, WSC, DEQ Cleanup Program
Where SB737 sampling indicate that contaminants are present above WQ standard thresholds determine how more data will be collected to characterize the problem and resolve issues related to difference in accepted analytical methods. City of Coos Bay PCBs are an example of this.	M										T				X						L		X		EPA, Permitted facilities

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Continue to develop an improved understanding of indicator bacterial re-growth in the environment (biofilms, non warm blooded sources/masking indicator bacteria)	M										X			X		L			X						EPA, Academia
Support improved agriculture water management and efficiency. Augment instream flows as possible.	M															X		X	T						ODA, SWCD, OWRD, DSL, ACOE
Work with ODA to develop advanced best management practices for CAFO waste management that is protective of both surface and ground water.	L	X	X	X	X	X													X		L				ODA, SWCDs
When effluent toxic data sets are of sufficient size conduct RPAs and apply WQ Based Effluent Limits (WQBELs) in permits as needed.	L														X				X		L	X	X		

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WWTP permit requirement to report unauthorized discharge or spills in a sufficient manner so as to protect public health (inform public and related organizations). Permit requirement to collect and analysis surface water samples during such an event.	L														X						L	X			Local jurisdictions, Shellfish organizations
Access to GIS source water risk analysis.	L				L	L										X			X						
Additional monitoring for toxics in areas upstream from drinking water system intakes.	L				L										X				X			X	X		Community DW Providers
Better characterize risks to public water systems from chemical contaminants (pesticide sources associated with forestry and agricultural management practices).	L				L										X				X			X	X		ODA, ODF
Analysis of land use patterns and disturbances and how they relate to source water turbidity.	L				L	L										X			X						
Characterization for risk of source water streams to toxic algae, bacteria, and turbidity.	L				L	L					X					X			X						OHA, ODA, ODF

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Characterization to assess transport of contaminants via groundwater inputs to surface water drinking sources and surface waters.	L				L	L									T	X			X			T			Cranberry and lily bulb growers
Design and conduct a groundwater outreach plan - could include free NO3 testing and determination of areas for more focused efforts (Cranberry bog, biosolid areas).	L	X				L									X	X			X			X			OSU Extension
Conduct an assessment of South Coast Basin groundwater quality to inform education, outreach, and coordination opportunities.	L	X				L									X	X			X			X			
Groundwater/Drinking Water Protection Program: DEQ and OHA will continue to work with operators of public water supplies in the basin to identify and protect drinking water supplies. The Drinking Water State Revolving Fund is a source of financial assistance.	L				L	L									X	X		X	X			X			Community drinking water providers, OHA

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Continue implementing the drinking water source contaminant monitoring project, collecting groundwater and surface water samples from drinking water sources.	L				L	L									X	X		X	X			X	X		OHA
Develop a monitoring plan and implement additional monitoring and analysis to further refine and understand contamination in groundwater in the Basin. Include chemical contaminant monitoring in high risk areas (high density on-site systems, intensive agricultural activities, and environmental cleanup sites) and basin-wide monitoring of nitrate levels.	L					L	X								X	X				X		X	X		Cranberry and lily bulb growers, OSU Extension, Academia, County Health
Groundwater nutrients - work with USGS to understand contribution to DO limited streams.	L					L									X			X	T			X			USGS, OWRD
Characterize correlations between storm events and impacts to public water systems from specific contaminants including fecal coliform and turbidity.	L				L										X	X			X			X			NWS

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Develop a plan to manage third party data to assure data quality is identified and that the data is used in decision making. Use compliance monitoring of receiving waters to inform TMDL and help determine beneficial use support.	L				X							X		X	T	X			X	X	X	L			Permitted facilities, consulting community
Additional sources of data for the beneficial use, aquatic life, should be incorporated in future assessments.	L														X	X		X	X		X	L			Federal partners, WSC
Develop data management system that expands parameter fields or alternatively develop another companion repository for this information (CEMAP, macroinvertebrate, algae composition, etc.). Maximize the amount of data available to staff for use during decision making.	L														X	X		X	X			L			
Continue ambient monitoring to assess status and trends.	L														L				X			T			
Incorporate meteorological and hydrological conditions as well as sample time of day into ambient data interpretation (OWQI).	L														L			X	T			T			NWS

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Increased monitoring of pharmaceuticals, personal care products and other emerging contaminants in vicinity of high density septic systems and biosolids application sites.	L						X								X	X		X	T			X	L		ODA, permitted facilities
Rotate in toxic and other emerging parameters that are not typically included in ambient sampling suite.	L														L			X	X			T			OWEB, WSC
Continue monitoring program for beaches.	L														L			X	X			T			Surfriders, tribes, SSNERR
Design and implement estuarine ambient monitoring sites. Include bacteria monitoring in upstream reaches that flow into shellfish areas.	L														L	X			T			T			Surfriders, tribes, SSNERR
Lab to perform continuing trend analysis and sharing of results with PS and NPS programs. Consider assessing longer periods in addition to the last ten years (e.g. 25 years).	L														X	X		X	X		X	T			

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Many South Coast Basin streams are not sampled as part of the DEQ ambient network. Efforts should be made to characterize these waterbodies as resources and/or partnerships allow. In many instances no data are available.	L														T	X		X	L		X	T			Federal, state, and local partners, WSC
Continue to implement the toxics monitoring program to determine contaminants of concern in the basin. Where contaminant levels of concern are identified conduct additional monitoring to determine contaminant sources.	L				X	X	X					X		X	T			X	T		X	T	L		Tribes, environmental interests
Continue to provide limited sampling support to the Oregon Health Authority when HABs are identified.	L				X										L			T	T			T			WSC, County Health Departments
Complete assessment of CEMAP surface water toxics data.	L														L	X			X			T	T		
Communication with the Environmental Public Health Tracking & Healthy Waters and Beach Monitoring Programs to dissemination toxic algae and beach data and advisories.	L				X										L	X			X			X			OHA

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Develop and maintain an interactive web tool for data and information sharing (e.g. Explorer platform).	L														X	X		X	X			X		L	
Update DEQ Implementation website to include current examples of implementation plans and current basin contact information.	L															X		X	X					L	
Develop a web presence for the Watershed Approach.	L															X		X	X					L	
Continue to follow the development of MST technology (bacterial DNA analyses). Re-evaluate use when quantification improves.	L										X					L		X	T						EPA, Academia
Continue to work with ODF to develop basin specific rules as needed in response to TMDL load allocations.	L															L			T						ODF, Academia
Biosolids reuse coordination; continue to work with WWTP operators to indentify beneficial reuse opportunities for land application of biosolids.	L	L													X	X			X		X	X			ODA, Permitted facilities

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Work with WWTP to evaluate the sufficiency of storage capacity and assist operators as possible in expanding capacity as necessary.	L	L													X				X		X				Permitted facilities
Identifying the location and extent of existing and future biosolids applications sites to incorporate these areas into bacterial, pharmaceutical, personal care products, and emerging contaminant monitoring efforts.	L	T													T				T			T	L		Permitted facilities
Local stakeholder outreach for water Reuse Program	L		L																					T	WSC, League of Women's Voters
Water re-use coordination, implement gray water reuse rules, work with stakeholders on recycled water and industrial reuse, work with permittees on improved annual reporting of water reuse activities.	L		L				X																		Permitted facilities, consulting community, installers
Work with groundwater and NPS staff to provide outreach to gray water users to ensure systems are operated and maintained.	L		L			T										T								T	OSU Extension

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Continue to act as an information resource promoting individual landowner education and outreach. Work with citizens who own and manage an onsite septic system to assure they are knowledgeable about their treatment system, repair needs, and the importance of repair area protection.	L			X			L									X		X	T						Realty Associations, WSCS, Local jurisdictions
Develop program success story for inclusion in the annual report of nonpoint source program accomplishments.	L															X		L	T						319 Recipients
Fund sediment abatement and source reduction implementation actions. Support the management of road systems for improved riparian condition, flood plain connection, reduced erosion, and fish passage.	L														X	X		L	T						WSCs, State and Federal Partners, Local jurisdictions, OWEB
Fund bacteria load reduction implementation actions.	L															X		L	T						WSCs, State and Federal Partners, Local jurisdictions, OWEB
Fund macroinvertebrate evaluations.	L														X	X		L	T						WSCs, State and Federal Partners, Local jurisdictions, OWEB

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Fund projects that address stormwater management in urban areas.	L															X		L	T						WSCs, State and Federal Partners, Local jurisdictions, OWEB
Fund temperature implementation actions - riparian restoration, livestock exclusion, off channel watering, quantification of thermal load reductions and identification of threshold conditions needed to realize temperature reductions.	L															X		L	T						WSCs, State and Federal Partners, Local jurisdictions, OWEB
Identify specific high priority projects for consideration and recruit organizations to implement these priority projects.	L															X		L	T						WSCs, State and Federal Partners, Local jurisdictions
Encourage projects and practices that will result in increased channel complexity and function, increased sinuosity.	L									X						X		L	T						WSCs, State and Federal Partners, Local jurisdictions, Drainage Districts
Continue to work with OWEB and other funding sources to promote the implementation of high priority projects through regional review team, grant reviews, and leverage 319 grant matching funding commitments.	L															X		T	L						OWEB, EPA, Other funding sources

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Evaluate the effectiveness of stormwater control measures incorporated into TMDL Implementation Plans for those areas not covered by NPDES Phase II stormwater requirements.	L														X	X		T	L			X			Local jurisdictions
Design and implement a monitoring program(s) to provide a robust data set for fish tissue mercury (methyl mercury) in the basin to update datasets and fill data gaps (streams, lakes, and estuaries).	L														T			T	L			X			OHA
Data collection to confirm that sediment loading is decreasing as a result of TMDL implementation (incorporated into temperature and nutrient TMDLs because of effects on channel form/widening and phosphorus delivery)	L														X	X		T	L			X	X		WSC, ODA, ODF

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Stream segments having insufficient data to meet 303d data requirements (small datasets) but data indicate water quality problems may exists should be monitoring priorities in order to develop datasets of sufficient size to allow the characterization of water quality conditions, at least for priority pollutants.	L														X	X		T	L			X			Federal and state partners, local jurisdictions, WSCs
Support improved agriculture grazing management, floodplain connectivity, and riparian vegetation. Support wetland restoration and actions that reduce bacterial loading.	L															X		L	T						ODA, SWCD, OWRD, DSL, ACOE
Work with tribes to compile, assess, and share water quality data on tribal lands.	L															X		X	L			X			Tribes
Support tribal watershed assessment efforts.	L														X			X	L			X			Tribes
Add the Coos Bay Estuary to the National Estuary Program (NEP) Eligible Projects List and/or seek other funding to support more in depth estuary investigation and planning.	L															T			L						Governor's Office, EPA

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Facilitate regional planning, prioritization, and implementation of NPS projects to address TMDL identified WQ impairments.	L				X	X	X								X			T	L			X		X	All eligible recipients
NPS staff facilitate regional coordination between DMAs, DEQ, Federal Partners, and other TMDL implementation stakeholders.	L															X		T	L		X			X	All DMAs
NRCS coordination, work with NRCS on watershed projects and WQ goals.	L															T		T	L						NRCS, SWCD, ODA
Support land acquisition that addresses pollutant delivery mechanisms and facilitates the restoration of key wetlands.	L									X						X		T	L						OWEB, SWCD, ODA, Drainage Districts
Continue to work with ODA to incorporate TMDL load allocations into AgWQMPs.	L															L		X	T			X			ODA, SWCDs
Track and review yearly DMA reports as required: are actions being implemented, are they affective, is TA needed or other assistance.	L															T		T	L					X	All DMAs
Work with land quality (Invasive - riparian, aquatic weeds, aquatic species).	L															X		X	L		X				PSU, OSMB, DEQ LQ, Ports

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Support tribal efforts to develop water quality standards.	L										X								T						Local tribes
Work specifically to improve DEQ's relationship with area tribes to better understand and reflect each other's objectives and goals in coordinated efforts and to allow more effective sharing of resources and information.	L																		T						Local tribes
Develop assessment benchmarks for parameters with narrative criteria. Developing approaches to identify beneficial use impairments resulting from excessive sedimentation, turbidity, and nutrient loading are SCB priority actions.	L										L								X						ODFW, Federal and state partners, Academia
Continue to work with the SB737 and standards programs to review SB737 data to determine compliance with WQ standards in addition to SB737 action levels (City of Coos Bay PCBs).	L										L				X				X			X	T		

Identified Actions & Primary Programs	Priority/Timeline	Biosolids	Water Reuse	CWSRF	Drinking Water	Groundwater	On-site	UIC	401 hydro	401 dredge/fill	Standards/Assess	Industrial Permits	Pretreatment	Stormwater	Monitoring	Non-point Source	OCE	319	TMDLs	Municipal	Permitting	Data Management	Toxics	OCO	External Partners
Consider developing guidance on how and when to apply the spawning criteria to a waterbody when spawning is triggered by rainfall and may not correspond to an assigned date.	L										L				X				T			X			ODFW, EPA, USFWS, NMFS
Regional representatives actively participate in the identification of standards needs and in the development of Internal Management Directives (IMD) assuring needs are aligned and IMD guidance is applied accurately in the context of the basin.	L	X	X	X	X	X	X				L	X	X	X	X	X		X	X	X	X		X		
Continue work to revise/update the water quality standard for turbidity based on the best available science regarding the effects of turbidity on beneficial uses, in particular aquatic life.	L										L					X			X			X			Fishery interests, Academia

Acronyms and Abbreviations

Acronym or Abbreviation	Definition
1200-C	Stormwater; NPDES construction more than 1 acre
1300J	Oily stormwater runoff; oil/water separator
1400B	Canneries; food and animal processing, extracts
1500A and B	Tanks cleanup and treatment of groundwater
1900B	Geothermal Exploration
1900J	Noncontact geothermal
500J	Boiler blow down
700PM	Suction dredges, not required to provide specific worksite locations but general information
ANC	Acid Neutralizing Capacity
BACT	Bacteria
BLM	Bureau of Land Management
BOD	Biochemical Oxygen Demand
CEMAP	Coastal Environmental Monitoring and Assessment Program
Chl a	Chlorophyll a
Ck	Creek
C:N	Carbon: Nitrogen ratio
Cr	Creek
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
DEQ	Department of Environmental Quality
DO	Dissolved Oxygen
Dom Da	Wastewater Treatment System (other than lagoons)
Dom e	Non Discharging Lagoons
Dom f	Septage Alkaline Stabilization facilities
EF	East Fork
EMAP	Environmental Monitoring and Assessment Program
EPA	Environmental Protection Agency
ERL	Effects Range-Low
ERM	Effects Range-Medium
ESU	Evolutionary Significant Unit
FWS	Fall, Winter, and Spring
GEN 2300-A	Pesticide General Permit
GEN01	Industrial Wastewater; NPDES Cooling Water
GEN02	Industrial Wastewater; NPDES Filter Backwash
GEN03	Industrial Wastewater; NPDES Fish Hatcheries
GEN04	Industrial Wastewater; NPDES Log Ponds
GEN07PM	Suction Dredges
GEN08	Confined Animal Feeding Operations (ODA)
GEN09	Industrial Wastewater; NPDES Seafood Processing
GEN10	Gravel Mining
GEN12A	Stormwater; NPDES Sand and Gravel Mining
GEN12C	Stormwater; NPDES construction more than 1 acre

Acronym or Abbreviation	Definition
GEN12Z	Stormwater; NPDES specific SIC codes
GEN14A	Wineries and Fresh Pack Food Processors
GEN17A	Industrial Wastewater; NPDES wash water
GEN17B	Industrial Wastewater; WPCF wash water
GIS	Geographic Information System
HWY	Highway
HUC	Hydrologic Unit Code
IQR	Interquartile range (25^{th}-75^{th} Percentile Range)
IW	Industrial Wastewater
LASAR	Laboratory Analytical Storage and Retrieval
Lat	Latitude
Long	Longitude
MAO	Mutual Agreement and Order
MF	Middle Fork
Mg/l	Milligrams per liter
N	Nitrogen
NARS	National Aquatic Resource Survey
NF	North Fork
NLCD	National Land Cover Database
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NS&T	NOAA's National Status and Trends Program
NWCA	National Wetland Condition Assessment
ODA	Oregon Department of Agriculture
DEQ	Oregon Department of Environmental Quality
ODSL	Oregon Department of State Lands
ODFW	Oregon Department of Fish and Wildlife
OS	Onsite
OSU	Oregon State University
OWQI	Oregon Water Quality Index
OWRD	Oregon Water Resources Department
P	Phosphorous
Q1	Lower Quartile in a Box and Whisker Plot
Q2	Median Quartile in a Box and Whisker Plot
Q3	Upper Quartile in a Box and Whisker Plot
R	River
RM	River Mile
SOD	Sediment Oxygen Demand
SF	South Fork
SIC	Standard Industrial Classification System
Sl	Slough
SQGs	NOAA's Sediment Quality Guidelines
STP	Sewer Treatment Plant
T	Temperature
TD	True Detects
TMDL	Total Maximum Daily Load

Acronym or Abbreviation	Definition
TOC	Total Organic Carbon
Trib.	Tributary
TS	Total Solids
USEPA	United States Environmental Quality Administration
USGS	United States Geological Survey
WA	Watershed Approach
WAB	Water Availability Basin
WLA	Waste Load Allocation
WPCF	Water Pollution Control Facility (no discharge to surface water)
WQ	Water Quality
OWRD	Oregon Water Resources Department
WWTP	Wastewater Treatment Plant

References

Bell, M.C. 1986. Fisheries handbook of engineering requirements and biological criteria. U.S. Army Corps of Engineers, Office of the Chief of Engineers, Fish Passage Development and Evaluation Program, Portland, Oregon.

Boyd, M., and Kasper, B. 2003. Analytical methods for dynamic open channel heat and mass transfer: Methodology for heat source model Version 7.0.

Brett, J.R., 1952. Temperature Tolerance in Young Pacific Salmon, Genus Oncorhynchus. J. Fish. Res. Bd. Can., 9(6):265-323.

Burris, F., 2008. Partnership for Monitoring and Assessment of NPS Bacterial Contamination of South Coast Beaches (EPA #C900451 and DEQ #018-06). Watershed Management Extension Agent. Oregon State University Extension Service and Sea Grant, Gold Beach, OR

Clearwater BioStudies, Inc., 2003. Geomorphic and Riparian Assessment of the Lower South Fork Coquille River – *review draft*. Under contract with Coquille Watershed Association.

Department of Environmental Quality, 1988. Oregon Statewide Assessment of Nonpoint Sources of Water Pollution.

Department of Environmental Quality, 1988b. Garrison Lake Total Maximum Daily Load

Department of Environmental Quality, 1995. Temperature 1992-1994 Water Quality Standards Review. DEQ Standards and Assessment Section.

Department of Environmental Quality, 1995b. Dissolved Oxygen 1992-1994 Water Quality Standards Review. DEQ Standards and Assessment Section.

Department of Environmental Quality, 1996. Total Maximum Daily Load Coquille River and Estuary.

Department of Environmental Quality, 2000. The Periphyton Control Model and its Application to the Grande Ronde River, Oregon.

Department of Environmental Quality, 2000b. South Fork Coquille Water Quality Management Plan.

Department of Environmental Quality, 2001. Upper South Fork Coquille Total Maximum Daily Load (TMDL) and Water quality Management Plan (WQMP).

Department of Environmental Quality, 2003. Source Water Assessment Summary Brochure(s), City of Powers, PWS # 4100672, City of Bandon PWS # 4100074, City of Coquille PWS # 4100213, City of Myrtle Point PWS # 4100511.

Department of Environmental Quality, 2005. Draft Technical Basis for Revising Turbidity Criteria

Department of Environmental Quality, 2005b. Assessment Methodology for Oregon's 2004 Integrated Report on Water Quality Status. DEQ Water Quality Division

Department of Environmental Quality, 2005c. Water Quality Trading Internal Management Directive

Department of Environmental Quality, 2006. Oregon Coastal Beach Monitoring DEQ03-LAB-0042-QAPP September 6, 2006, Version 2.0.

Department of Environmental Quality, 2007. Total Maximum Daily Load and Water Quality Management Plan. Tenmile Lakes Watershed

Department of Environmental Quality, 2010. Turbidity Technical Review, Summary of Sources, Effects, and Issues Related to Revising the Statewide Water Quality Standard for Turbidity.

Department of Environmental Quality, 2010b. The 2007 Survey of Oregon Lakes

Department of Environmental Quality, 2011. Assessment Methodology for Oregon's 2010 Integrated Report on Water Quality Status. DEQ Water Quality Division

Department of Environmental Quality, 2011b. Oregon DEQ Harmful Algal Bloom Strategy

Department of Environmental Quality, 2011c. South Fork Coquille River – August 2011 Dissolved Oxygen Study – Preliminary Data Review

Department of Environmental Quality, 2012. Oregon 2010 Integrated Report, Water Quality Division

Department of Environmental Quality, 2012b. Oregon Water Quality Index Summary Report

Department of Environmental Quality, 2012b. Reasonable Potential Analysis Process for Toxic Pollutants Version 3.1

Department of Environmental Quality, 2013. Memorandum – Implementation Instructions for Dissolved Metals Water Quality Criteria in Reasonable Potential Analysis and Water Quality-based Effluent Limits Calculations.

Department of Environmental Quality, 2014. Turbidity Technical Review.

Ebersole, J. L., W. J. Liss, and C. A. Frissell, 2001. Relationship between stream temperature, thermal refugia and rainbow trout Oncorhynchus mykiss abundance in arid-land streams in the northwestern United States. Ecology of Freshwater Fish 10:1-10.

Environmental Protection Agency, 1986. Ambient Water Quality Criteria for Bacteria 1986. EPA 440/5-84-002. U.S. Environmental Protection Agency, Office of Research and Development, Microbiology and Toxicology Division and Office of Water Regulations and Standards, Criteria and Standards Division, Washington, DC.

Environmental Protection Agency, 1993. Guidance Specifying Management Measures for Sources of nonpoint Pollution in Coastal Waters. EPA 840-B-92-002

Environmental Protection Agency, 1996. Recommendations for Screening Values for Tributyltin in Sediments at Superfund Sites in Puget Sound, Washington.

Environmental Protection Agency, 2000. Nutrient Criteria, Technical Guidance Manual, Rivers and Streams

Environmental Protection Agency, 2002. National Beach Guidance and Required Performance Criteria for Grants. EPA 823/B-02-004. U.S. Environmental Protection Agency, Office of Water, Washington, DC

Environmental Protection Agency, 2003. EPA Region 10 guidance for Pacific Northwest state and tribal temperature water quality standards. EPA 910 B-03-002

Environmental Protection Agency, 2007. National Management Measures to Control Nonpoint Source Pollution from Hydromodification. Assessment and Watershed Protection Division, Office of Water. EPA841-B-07-002

Environmental Protection Agency, 2010. National Lakes Assessment: Technical Appendix. U.S. Environmental Protection Agency, Washington, DC. EPA 841-R009-001a.

Environmental Protection Agency, 2012. Primer for Identifying Cold-Water Refuges to Protect and Restore Thermal Diversity in Riverine Landscapes.

Environmental Protection Agency, 2012b. National Coastal Condition Report IV. EPA-842-R-10-003

Food and Drug Administration. 1993. Guidance Document for Arsenic in Shellfish. U.S. Department of Health and Human Services, Public Health Service, Office of Seafood (HFS-416), 200 C Street, SW, Washington, DC 20204.

Follansbee, B., 2002, North Fork Coquille River Riparian Shade Assessment. Under contract with Coquille Watershed Association.

Follansbee, B., 2003, Middle Fork Coquille River Riparian Shade Assessment. Under contract with Coquille Watershed Association.

Follansbee, B., 2006, Lower Mainstem Coquille River and Tributaries Riparian Shade Assessment. Under contract with Coquille Watershed Association.

Hokanson, K. E. F., Kleiner, C. F., and Thorslund, T. W., 1977. Effects of constant temperatures and diel temperature fluctuations on specific growth and mortality rates and yield of juvenile rainbow trout, *Salmo gairdneri*. *J. Fish. Res. Bd. Can*., 34:639-648

Joyce, Bessie. 2002. Irrigation Management Fact Sheet. Coos Soil and Water Conservation District. Coquille, OR. www.coosswcd.org/Files/Irrigation%20Management.pdf

Kimbrough, K. L., W. E. Johnson, G. G. Lauenstein, J. D. Christensen and D. A. Apeti. 2008. An Assessment of Two Decades of Contaminant Monitoring in the Nation's Coastal Zone. Silver Spring, MD. NOAA Technical Memorandum NOS NCCOS 74. 105 pp.

Long, E.R., and L. G. Morgan, 1990. The potential for biological effects of sediment-sorbed contaminants tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52. National Oceanic and Atmospheric Administration. Seattle, Washington.

Jones, K.L, Wallick, J.R., O'Connor, J.E., Keith, M.K., Mangano, J.F., and Risley, J.C., 2011, Preliminary assessment of channel stability and bed-material transport along Hunter Creek, southwestern Oregon: U.S. Geological Survey Open-File Report 2011–1160, 41 p.

Jones, K.L., O'Connor, J.E., Keith, M.K., Mangano, J.F., and Wallick, J.R., 2012, Preliminary assessment of channel stability and bed-material transport in the Coquille River basin, southwestern Oregon: U.S. Geological Survey Open-File Report 2012–1064, 84 p.

Long, E. R., D. D. MacDonald, S. L. Smith, and F. D. Calder, 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. *Environmental Management* 19(1): 81-97.

Long, E. R., and C. J. Wilson, 1997. On the identification of toxic hot spots using measures of the sediment quality triad. *Marine Pollution Bulletin* 34 (6): 373-374.

Lower Columbia River Estuary Partnership, 2007. Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead (proposed plan).

National Oceanic and Atmospheric Association, Center for Coastal Monitoring and Assessment, National Status and Trends, 1999. Sediment Quality Guidelines developed for the National Status and Trends Program

Oregon Climate Service, George Taylor, 2000. Per. Comm.

Oregon Department of Agriculture, 2012. Noxious Weed Policy and Classification System 2012.

Oregon Department of Fish and Wildlife, 1997. Instream Water Rights, Backgrounder. www.dfw.state.or.us/fish/water/docs/BKGWaterRights.pdf

Oregon Department of Fish and Wildlife & Oregon Water Resources Department, 2002. Streamflow Restoration Priority Areas. www.oregon.gov/owrd/docs/opsw_priorities_summary.pdf.

Oregon Department of Fish and Wildlife, 2005. Oregon Coastal Coho Assessment (OCCA) and Conservation Plan for the State of Oregon. Parts 1, 2, 3A and 3B.

Oregon Department of Fish and Wildlife, 2007. Oregon Coastal Coho Conservation Plan for the State of Oregon.

Oregon Department of State Lands, 2013. A Guide to the Removal-Fill Permit Process

Oregon Health Authority, 2010. Oregon Beach Monitoring Program Summer 2010 Evaluation of Beach Sites. OHA, Public Health Division, Salem, OR

Oregon Health Authority, 2012. Oregon Harmful Algae Blooms Surveillance (HABS) Program, Public Health Advisory Guidelines, Harmful Algae Blooms in Freshwater Bodies
Oregon Health Authority, 2013. Oregon Health Authority Standard Operating Guidance, Target Analytes for Oregon's Fish Advisory Program, December 30, 2013.

Oregon Water Resources Department. 2002. Determining Surface Water Availability in Oregon, Open File Report SW 02-002. Salem, OR.OWRD. Water Right Information Search Database. http://www.oregon.gov/owrd/pages/wr/wris.aspx.

Oregon Water Resources Department, 2012. Integrated Water Resources Strategy

Overton, W.S., D. White, D.L. Stevens, 1990. Design report for EMAP, Environmental Assessment and Monitoring Program. U.S. EPA, Washington D.C. EPA/600/3-91/053.
Picard, C, B. Bornhold, J. Harper. 2003. 2nd International Symposium on Contaminated Sediments

Pearson T. H., Rosenberg R., 1978. Macrobenthic succession in relation to organic enrichment and pollution of the marine environment. Oceanography and Marine Biology: an Annual Review 1978;16:229-311.

Redfield, A.C., Ketchum, B.H., and Richards, F.A., 1963. The influence of organisms on the composition of seawater. *In* Hill, M.N. (Ed.), *The Sea* (Vol. 2): New York (Wiley), 26–77.

Rumrill, S. and Grupe, B., 2008. Partnership for Monitoring and Assessment of NPS Bacterial Contamination of South Coast Beaches. South Slough National Estuarine Research Reserve, Charleston, OR

Stoddard, J.L., D.P. Larsen, C.P. Hawkins, R.K. Johnson, and R.H. Norris. 2006. Setting Expectations for the Ecological Condition of Streams: The Concept of Reference Condition. Ecological Applications, 16(4), pp. 1267–1276

Stone and Bress, 2007. Addressing Public Health Risks for Cyanobacteria in Recreational Freshwaters: The Oregon and Vermont Framework. Integrated Environmental Assessment and Management – Volume 3, Number 1 pp 137-143.

Sweet C.W. and Prestbo E., 1999. Wet Deposition of Mercury in the U.S. and Canada. Presented at the Air and Waste Management Association "Mercury in the Environment Specialty Conference", September 15-17, 1999, Minneapolis, MN.

Sweet C.W., Prestbo E., and Brunette, R., 2003. Wet Deposition of Mercury in the U.S. and Canada, 1996-2000: Results from the NADP Mercury Deposition Network (MDN). Unpublished Draft Document.

Sweet, James W., 1985. An Analysis of Phytoplankton of Oregon Lakes. Aquatic Analysts, Portland, OR.

Tenmile Lakes Basin Partnership, Tenmile Lakes Integrated Aquatic Plant Management Plan,

UNESCO/WHO/UNEP, 1992, 1996. Water Quality Assessments - A Guide to Use of Biota, Sediments and Water in Environmental Monitoring - Second Edition

United States Department of Agriculture (USDA), 1962. USDA Report on Water and Related Land Resources, South Coast Drainage Basin, Oregon

United States Geological Service, 2006. National Land Cover Database (NLCD) UNESCO/WHO/UNEP, 1992, 1996. Water Quality Assessments - A Guide to Use of Biota, Sediments and Water in Environmental Monitoring - Second Edition

Wallick, J.R., Anderson, S.W., Cannon, Charles, and O'Connor, J.E., 2009, Channel change and bed-material transport in the lower Chetco River, Oregon: U.S. Geological Survey Open-File Report 2009–1163, 83 p.

Van Sickle, J. J.L. Stoddard, S.G. Paulsen and A.R. Olsen, 2006. Using relative risk to compare the effects of aquatic stressors at a regional scale. Environmental Management 38:1020-1030

Appendices

Appendix A: Section 303D and 305B Information

Appendix B: South Coast Basin Land Use Detail

Appendix C: Water Availability and Water Rights

Appendix D: General NPDES Permits by Sub-basin

Appendix E: CEMAP Sampling Site Detail

Appendix F: Biomonitoring Sampling Site Detail and Condition

Appendix G: Water Quality Data Graphics and Detail

Appendix H: Tenmile Lakes HABS Summary

Appendix I: Surface and Groundwater Public Water Systems