Confederated Tribes of the
Coos, Lower Umpqua, and Siuslaw Indians
Water Quality Data Summary
(October 2007 to September 2008)

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Background

The Environmental Division located within the Tribe's Department of Natural Resources. The mission statement of the Environmental Division is to research, monitor, assess, manage, use, conserve, protect, and restore the natural resources of the Confederated Tribes' Ancestral Territory, consistent with Tribal values. In an effort to accomplish this mission the Tribe's established a Water Quality Program (WQP). The WQP is funded by a grant provided by EPA through Section 106 of the Federal Clean Water Act. The WQP works to assess and document the ecological health of the Tribe's ancestral watersheds, develops management plans and strategies, best management practices, water quality standards, and ordinances in an overall effort to protect tribal water resources. In 2002, the Environmental Protection Agency (EPA) agreed to treat the Tribes "in a manner similar to a state" under the authority of the Clean Water Act. In 2003, the Tribes completed an EPA approved Quality Assurance Project Plan (QAPP 1.8) for the water quality monitoring program. Early in 2004, the Tribes initiated a water quality monitoring program that targeted five core parameters: water temperature, turbidity, salinity, pH, and dissolved oxygen. Data collection was conducted at spring high-high and low-low tides which required data sampling to occur at all hours of the day and night. Data collection was expanded in 2006 with the EPA-approval of QAPP 2.0. QAPP 2.0 described the incorporation of YSI continuous data loggers at selected estuarine monitoring sites and the addition of a new monitoring parameter, water bacteria. In 2007, the approval of QAPP 3.0 expanded the WQP's monitoring efforts with the addition of three new parameters; nutrients, macroinvertebrates and basic habitat.

Purpose

EPA's *Guidance on Awards of Grants to Indian Tribes under Section 106 of the Clean Water Act* requires tribes that receive funding under Section 106 of the Federal Clean Water Act to report annually on collected water quality monitoring data. The following annual Water Quality Assessment Report covers all tribal water quality data collected within the 2007-2008 Water Year (October 2007-September 2008). In addition to this report, all water quality data collected throughout the 2007-2008 Water Year by the WQP has been uploaded into EPA's STORET database.

Atlas of Tribal Waters

The following table is an estimate of tribal waters (as of 1/1/2007) using our most current GIS data.

Atlas of Tribal Waters	
Total Number of Stream Miles	0.03 miles
Total Number of Lake Acres	54.4 acres
Total Number of Wetland Acres	3.34 acres
Total Number of Estuary Frontage	0.69 miles

Water Quality Parameters

EPA's *Guidance on Awards of Grants to Indian Tribes under Section 106 of the Clean Water Act for Fiscal Years 2007 and Beyond [EPA 832-R-06-003]* requires that Tribes include and annually report on the following nine water quality parameters:

1. Dissolved Oxygen
2. pH
3. Total phosphorus
4. Total nitrogen
5. Water temperature
6. Turbidity
7. Macroinvertebrates
8. E. Coli or fecal coliform
9. Basic habitat information

Since the approval of QAPP 3.0 in 2007, the WQP continues to collect water quality data on all nine EPA recommended parameters.

Monitoring Methods and Frequency

Estuarine Continuous Monitoring

One data logger is deployed at each of the three permanent sonde monitoring sites. Sites are accessed at high to mid-outgoing tide in a small skiff. During transport, each sonde is wrapped in a tap water-soaked white towel and placed horizontally in a rubber bin for insulation against jarring. To deploy, the data loggers are lowered by chain into protective cases (constructed from 4"-diameter ABS plumbing pipe). The ABS cases are drilled out to ensure adequate tidal flushing and exposure of the probes to ambient water conditions. The ABS cases are affixed vertically to existing log pilings driven into the channel substrate. A bolt prevents the data logger from descending beyond the ABS pipe and ensures that the logger monitors at the same depth on every deployment.

During retrieval, the sondes are again wrapped in a water-saturated white towel and placed in a rubber bin for transport to the lab. To record post-deployment Dissolved Oxygen in 100% water-saturated air, at least two data points are recorded after the sonde reaches ambient temperature and while it is wrapped in the towel. The other post-deployment calibrations are performed in the lab prior to cleaning to determine if instrument drift has occurred and to evaluate the validity of the data. Sonde cleaning and calibration of the DO, Conductivity, Depth, pH, Turbidity, and Chlorophyll probes are performed as outlined in the YSI manual. For Conductivity and Salinity, YSI calibrator solution (10,000 µS/cm) is used without dilution. For pH calibrations, pH 7 and 10 solutions are used. A two-point calibration is used for Turbidity using 0 NTU and 123 NTU. A one-point (0 NTU) Chlorophyll calibration is performed. The depth sensor is calibrated in air at sea level. The DO membranes are replaced prior to every deployment, calibrated, and allowed to stretch for 16-24 hours. The DO probes are re-calibrated before deployment, if necessary.

As a quality assurance check, field calibrations are recorded during sonde deployment and retrieval. As close to the 30-minute sonde recording time as possible, a hand-held YSI 650 records DO, Salinity, Specific Conductivity, pH and Temperature both at the surface and at the level of the sonde array. Surface grab samples of water for turbidity are taken for bench top analysis.

The WQP staff complete data logger retrieval and deployment tasks approximately every 3 to 4 weeks depending on weather conditions.

Stream Discrete Monitoring

Water temperature, dissolved oxygen, salinity/conductivity, pH, bacteria (*E. coli* and *Enterococcus*), turbidity, macroinvertebrate and basic habitat data are collected during the summer at the Tribes' freshwater monitoring site. A combination of handheld meters (YSI 650 multi-probe meter and Hach 2100-P Turbidimeter) and sample bottles are used to measure and collect discrete samples. The target time of day for sample collection at the Tribes' freshwater site is 2:00 p.m. In addition, a water sample is collected for in house analysis of *E. coli* and *Enterococcus* using IDEXX brand *Colilert -18* and *enterolert* reagent and the IDEXX QuantiTray 2000 analytical system. Calibrated and audited Vemco or HOBO water temperature data loggers are deployed at the site from June thru September and record data at 30 minute intervals.

Estuarine Discrete Monitoring

The WQP currently monitors estuarine water quality at three sites and has established three long-term continuous monitoring stations within two estuaries (Siuslaw and Coos Bay) along the central and south central Oregon coast. These sites were established to collect essential baseline information and to improve the Tribes' understanding of tidal dynamics and watershed inputs occurring within tribal waters. YSI 6600 Extended Deployment System data loggers (sondes) are deployed at each site so that the sensor arrays are held 0.5 to 1.0 meter off the bottom of the tidal channels. The sondes are programmed to record water quality parameter measurements every 30 minutes over 22-

30 day periods. Parameters measured include Depth, Temperature, Salinity, Specific Conductivity, pH, Dissolved Oxygen (DO), Turbidity, and Chlorophyll.

Bacteria Monitoring Research Methods
Water samples for microbiological analysis are collected at all sites for in house analysis of *E. coli* and *Enterococcus* using IDEXX brand *Colilert -18* and *Enterolert* reagent per the IDEXX QuantiTray 2000 analytical system. Water samples of approximately 100ml (with adequate head-space for mixing), are collected using disposable pre-sterilized IDEXX sample bottles. All bacteria and ancillary grab samples are placed in a cooler on ice while in transport to the lab.

Nutrient Sampling
Nutrient sampling was initiated in the 2007 Water Year. Water samples are collected twice a year for determining total dissolved nitrogen and phosphorous. Samples are processed by the University of Washington Oceanography and Technical services. The single points of data are not included in this report but can be submitted upon request.

Applied Water Quality Standards

The Tribes are developing tribal water quality standards. Until these water quality standards are completed and approved by Tribal Council, the WQP compares water quality data collected with the numeric standards within the State of Oregon's water quality standards. These water quality standards can be found on the Oregon State Archive's website (http://arcweb.sos.state.or.us/rules/OARs_300/OAR_340/340_041.html).

The following table shows the numeric water quality standards that were applied to the water quality data collected during this reporting period.

Water Quality Standards Applied to Tribal Water Quality Data

Parameter	Estuarine	Freshwater
Dissolved Oxygen	6.5 mg/L	6.0 mg/L
pH	6.5-8.5	6.5-8.5
Water Temperature	18°C (64º F)	18°C (64º F)
Turbidity	5 NTU Low Flow-50 NTU High Flow*	3 NTU Low Flow-8 NTU High Flow*
Salinity/Conductivity	None	None

**Low flow begins June 1st and ends September 30th; high flow begins October 1st and ends May 30th*

Oregon Water Quality Standards for Each WQP Parameter Monitored

Dissolved Oxygen
(Rule No. 340-041-0016)

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

(5) For estuarine water, the dissolved oxygen concentrations may not be less than 6.5 mg/l (for coastal water bodies);

pH (hydrogen ion concentration)
(Rule No. 340-041-0021)

(1) Unless otherwise specified in OAR 340-041-0101 through 340-041-0350, pH values (Hydrogen ion concentrations) may not fall outside the following ranges:

(b) Estuarine and fresh waters: 6.5-8.5.

Water Temperature
(Rule No. 340-041-0028)

(1) Background. Water temperatures affect the biological cycles of aquatic species and are a critical factor in maintaining and restoring healthy salmonid populations throughout the State. Water temperatures are influenced by solar radiation, stream shade, ambient air temperatures, channel morphology, groundwater inflows, and stream velocity, volume, and flow. Surface water temperatures may also be warmed by anthropogenic activities such as discharging heated water, changing stream width or depth, reducing stream shading, and water withdrawals.

(c)The seven-day-average maximum temperature of a stream identified as having salmon and trout rearing and migration use may not exceed 18°C.

Turbidity
(Rule No. 340-041-0036)

The current Oregon Department of Environmental Quality (ODEQ) turbidity standard specifically states that "[n]o more than a ten percent cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity."

DNR staff interviewed ODEQ staff to determine whether an alternate turbidity standard could be applied in the interpretation of our discrete grab sample turbidity data. ODEQ recommended that DNR apply an ambient background standard of 50 NTU to high flow

and 5 NTU to low flow estuarine turbidity data. ODEQ staff explained that studies of the short term exposure of fish (e.g. salmon and trout) to these seasonal NTU's have been cited by previous studies as impacting fish behavioral response and growth rate – relative to the fish's perception of itself as either predator or prey (e.g. impact to juvenile response time to predator or diminished foraging opportunities). Fresh water analysis of the Tribes' Sixes River data was based on median ambient high flow (8 NTU) and low flow (3NTU) conditions of Oregon's rivers listed in Table 3.6 of ODEQ's Oct. 2005 *DRAFT 'Technical Basis for Revising Turbidity Criteria'*. Within the "Oregon Water Quality Index Report: Water Years 1995 – 2004," ODEQ defines low summer flow as *beginning June 1st and ending September 30th*, and high seasonal flow as beginning *October 1st and ending May 30th*.

Salinity/Conductivity
No standard exists for this parameter. This parameter is primarily used to detect fresh and salt water mixing and can be used as an indicator parameter for other pollutants.

Coordination and/or Collaboration with Other Organizations

The WQP works with local watershed associations to share technical expertise, strategies, and water quality datasets. During this reporting period, the WQP provided water quality datasets to the Oregon Department of Environmental Quality to assist in the development of a Mid-Coast TMDL (http://www.deq.state.or.us/WQ/TMDLs/midcoast.htm) and to the Oregon Department of Fish and Wildlife staff for a local clam study in the Coos Bay Estuary (http://www.dfw.state.or.us/MRP/shellfish/Seacor/index.asp).

Outside Lab Support

Nutrient samples were processed by University of Washington's Oceanography Technical Services.

Data Summarization and Management

Characteristics of Water Quality Monitoring Data ***– Source: USGS Statistical Methods in Water Resources, Helsel and Hirsch***

Data analyzed by our program have the following characteristics:

- A lower bound of zero. No negative values are possible.
- Presence of 'outliers', observations considerably higher or lower than most of the data, which infrequently but regularly occur.

- Positive skewness. Skewness can be expected when outlying values occur in only one direction.

- Non-normal distribution, due to skewness, presence of outliers, and the lower bound of zero. Symmetry does not guarantee normality. Symmetric data with more observations at both extremes (heavy tails) that occurs for a normal distribution are also non-normal.

- Seasonal patterns. Values tend to be higher or lower in certain seasons of the year.

- Autocorrelation. Consecutive observations tend to be strongly correlated with each other. For the most common kind of autocorrelation in water resources (positive autocorrelation), high values tend to follow high values and low values tend to follow low values.

- Dependence on other uncontrolled variables. Values strongly covary with water discharge, hydraulic conductivity, sediment grain size, or some other variable.

The summarization and graphing methods chosen for the analysis of the WQMP data presented in this report were selected to recognize these common characteristics while facilitating a quick and easy to understand visual and tabular reference for potential trends in water quality captured by our data.

Data Summarization and Analysis Methodology

The following sections describe the methods of data analysis and summarization presented in this report and attempt to explain why they were chosen over other methods.

Outliers

Outliers, observations whose values are quite different than others in the data set, are not deleted from our data set unless they fall outside of instrument specifications. For our purposes, outliers may be the most important points in our data set and are signals for what parameters should be further investigated. Outliers can have one of three causes:

1. **A measurement or recording error – These data are deleted from the data sets during the QA/QC procedures.**

2. **An observation from a population not similar to that of most of the data, such as an elevated spike in turbidity caused by a construction project rather than precipitation.**

3. **A rare event from a single population that is quite skewed.**

Rather than eliminating actual (and possibly very important) data in order to use analysis procedures requiring symmetry or normality, procedures resistant to outliers have been employed in analysis of those data presented in this document. Computing the sample mean alone may be of less value because an outlier observation, either high or low, has a

much greater influence on the overall mean than does a more typical observation. This sensitivity to the magnitudes of a small number of points in the data set defines why the mean is not a "resistant" measure of location (Fig. 1). It is not resistant to changes in the presence of, or changes in the magnitudes of, a few outlying observations. The median, however, is only minimally affected by the magnitude of a single observation, being solely determined by the relative order of observations. This resistance to the effect of a change in value or presence of outlying observations is the main reason we have chosen to include the median in our summarization. In this case, we have chosen to let the data guide which analysis procedures are employed, rather than altering the data in order to implement analysis procedures that may be too restrictive for the informational purposes of this report.

Graphical Data Analysis

Continuous Data

Exploratory analysis of our continuous water quality monitoring data has been applied to these data in the form of box plots. This is an inductive procedure that has been used to summarize, rather than test, these data. The results of the exploratory analysis of these data will provide guidance toward the selection of appropriate deductive hypothesis testing procedures implemented by CTCLUSI for future non-point source pollution assessments and/or reports. According to USGS Book 4. Hydrologic Analysis and Interpretation: Statistical Methods in Water Resources, the use of histograms for data measured on a continuous scale is not the best method for graphical analysis of these data. The process of forcing continuous data into discrete categories may obscure important characteristics of the distribution. Histograms are best applied to data that have natural categories or groupings (e.g., number of individual organisms found at a stream site grouped by species type, or the number of water-supply wells exceeding some critical yield grouped by geological unit). It is for this reason that we have chosen to graphically display our continuous data with box plots.

Box plots provide visual summaries of:

1. **The center of the data (the median)**
2. **The variation or spread (interquartile range – box height)**
3. **The skewness (quartile skew – the relative box halves)**
4. **Presence or absence of unusual values (outliers)**

Although box plots do not present all of the data, presenting all of the data is more detail than is necessary for the purposes of this report. Box plots presented in this report provide concise visual summaries of essential data characteristics. The format of the box plots presented herein is the 'box-and-whisker plot' consisting of a center point (the median) splitting a rectangle defined by the upper and lower quartiles (Q3 and Q1). Whiskers of the box are lines drawn from the ends of the box to the maximum and minimum of the data. Thus a large amount of information is contained in a very concise illustration. Box plots effectively illustrate the characteristics of data for a single variable, and accentuate outliers for further inspection.

Discrete Data
Discrete water quality monitoring data is displayed in line graphs in an attempt to facilitate the quick visual identification of potentially emerging baseline patterns occurring within the 2008 water year and simultaneously comparing these data to 303(d) and other ODEQ standards..

Coded Variable Code Definitions

Sampling Station:	Station Code
North Fork Siuslaw Sonde	CTCNFWQ
Mainstem Siuslaw Sonde	CTCSIWQ
BLM Boat Ramp	CTCEDWQ
Empire Dock Sonde	CTCEMWQ
Sixes River Grab	CTCSRWQ

The station code identifier is composed of a three letter code identifying our organization CTC = CTCLUSI; a two letter code identifying the site NF = North Fork Siuslaw, SI = Mainstem Siuslaw, ED = BLM Boat Ramp, EM = Empire Docks, SR = Sixes River; and a two letter code identifying the type of data WQ = Water Quality.

Sonde Data Review and Editing Protocol

Our WQMP's general philosophy for data acceptance or rejection is based on absolute and discretionary factors.

(1) **Absolute:** In the first phase of data review and editing, values sometimes can be rejected on the basis of absolute factors via software statements with no detailed analysis of the study by the CTCLUSI data logger technician.

(2) **Discretionary:** In the second phase, we evaluate deployment data for site anomalies to help determine whether these data should be migrated into the CTCLUSI water quality data logger database.

Absolute data rejection (1)

The value recorded in the sonde memory is outside the listed range specifications of the instrument.

The following criteria are based on the latest YSI 6-Series Environmental Monitoring Systems Operating Manual sensor specifications in Appendix J and are what the CTCLUSI error checking criteria are based on.

- Temperature: -5 to 45 °C
- Specific Conductivity: 0 to 100 mS/cm
- Salinity: 0 to 70 ppt
- Dissolved Oxygen (% Saturation): 0 to 200 and 200 to 500 % air saturation
- Dissolved Oxygen (mg/L): 0 to 20 and 20 to 50 mg/L

- Shallow Depth: 0 to 9.1m
- pH: 2 to 14 units
- Turbidity: 0 to 1000 NTU

Always reject data that are outside of the range of the probes; the only exceptions to the absolute data rejection for out-of-range values are for the Shallow depth and Turbidity probes. These exceptions are explained under their respective headings in this document.

YSI Turbidity Probes
Contamination can cause the sonde's Turbidity Probe zero calibration to be off by +5 to +8 NTUs. So when the probe really experiences zero turbidity, the values are -5 to -8 NTU. Due to this known small calibration error possibility, small negative turbidity values are kept in the data file and documented as anomalous due to this small calibration error.

Site Location and Description

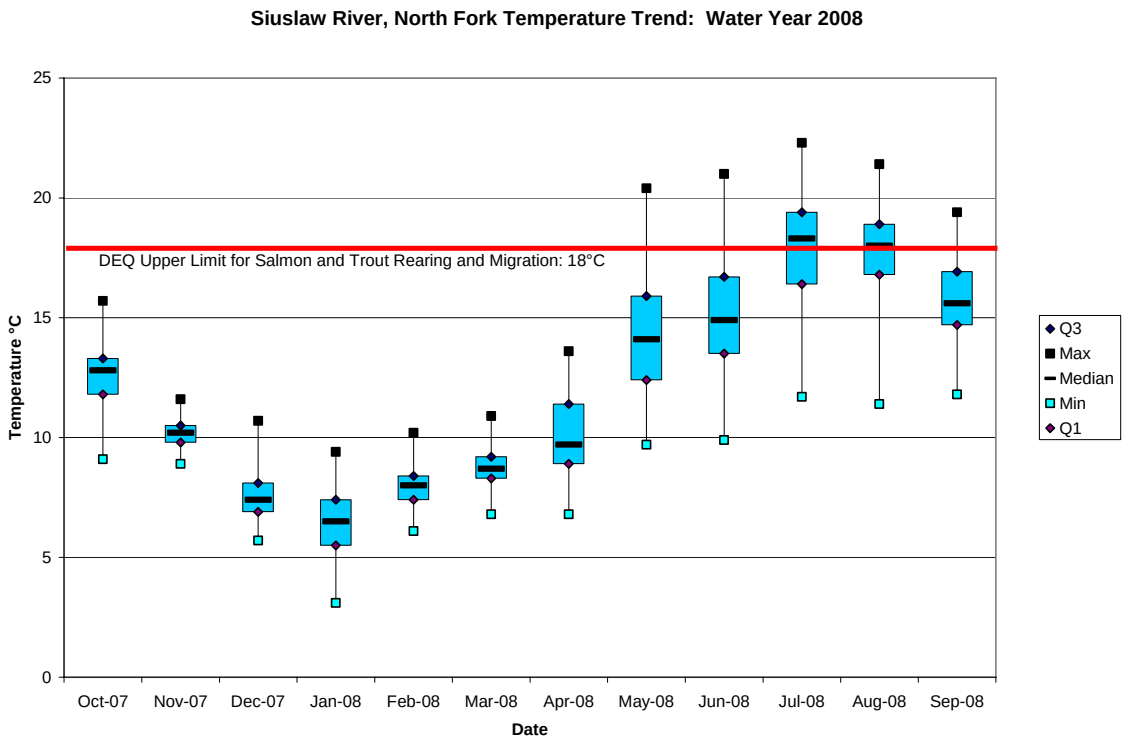
The following sections contain general watershed and water quality information for each of the sites actively monitored by our program. Following each site description are graphs displaying those data pertaining to current ODEQ standards and/or any 303(d) listings for waters running through each monitoring location. This has been done in an attempt to provide a quick identification of impairments potentially recorded in our monitoring data. Tables summarizing water quality data collected at the site follow the graphical analysis.

1) North Fork Siuslaw River (WQE12) [43.978039, 124.080850 – Siuslaw Watershed]

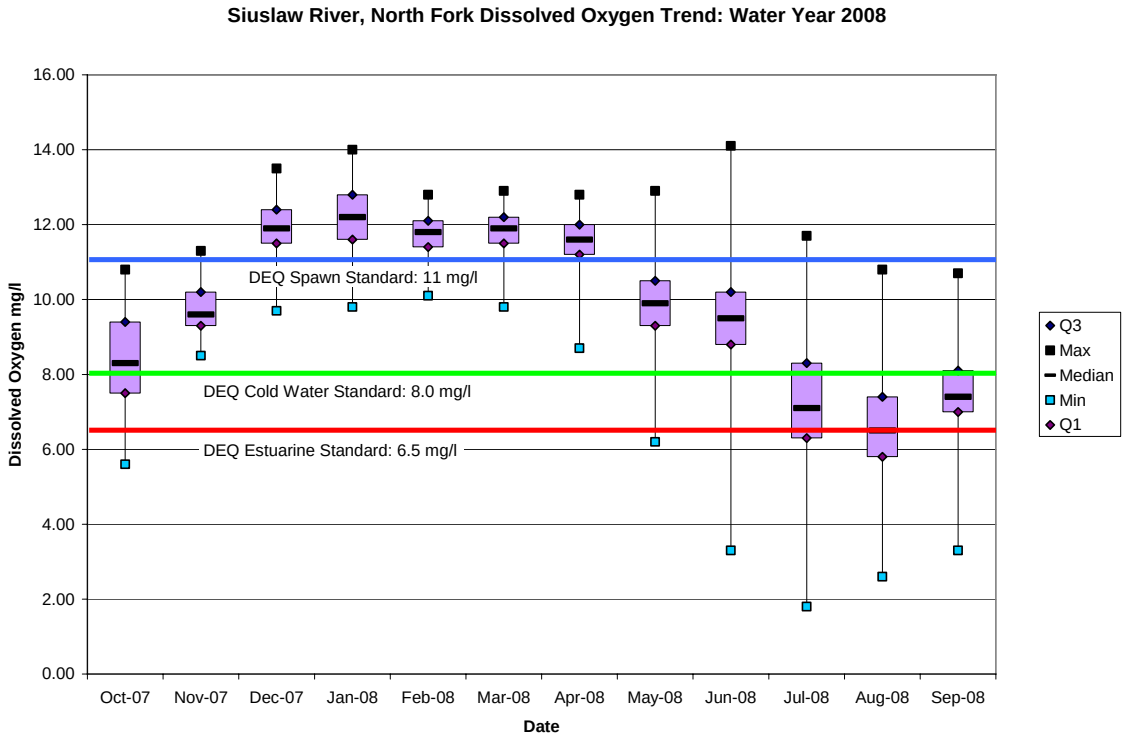
The North Fork Siuslaw sonde station is located in the Lower North Fork Siuslaw watershed approximately 6 river miles from the mouth of the Siuslaw River and within river mile one of the Lower North Fork Siuslaw River. Water quality at this site is both tidally influenced and watershed driven. The Lower North Fork Siuslaw River is also considered part of the Siuslaw Estuary. The North Fork Siuslaw River is 303(d) listed for sedimentation and temperature beginning at river mile 0.4 to 27.3. The sedimentation listing is based on the criteria of the formation of appreciable bottom sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life and the impact to the beneficial use of resident fish and aquatic life. The temperature listing is based on the salmon and trout rearing and migration beneficial use criteria temperature not to exceed an 18°C 7-day average maximum. The North Fork Siuslaw has also been listed as water quality limited for habitat modification. Of the parameters listed, temperature is the only one cited by ODEQ as impacting the beneficial use of salmon and trout rearing and migration year round and as a result ODEQ has identified this reach as requiring a temperature TMDL.

North Fork Siuslaw Continuous/Sonde Data Analysis

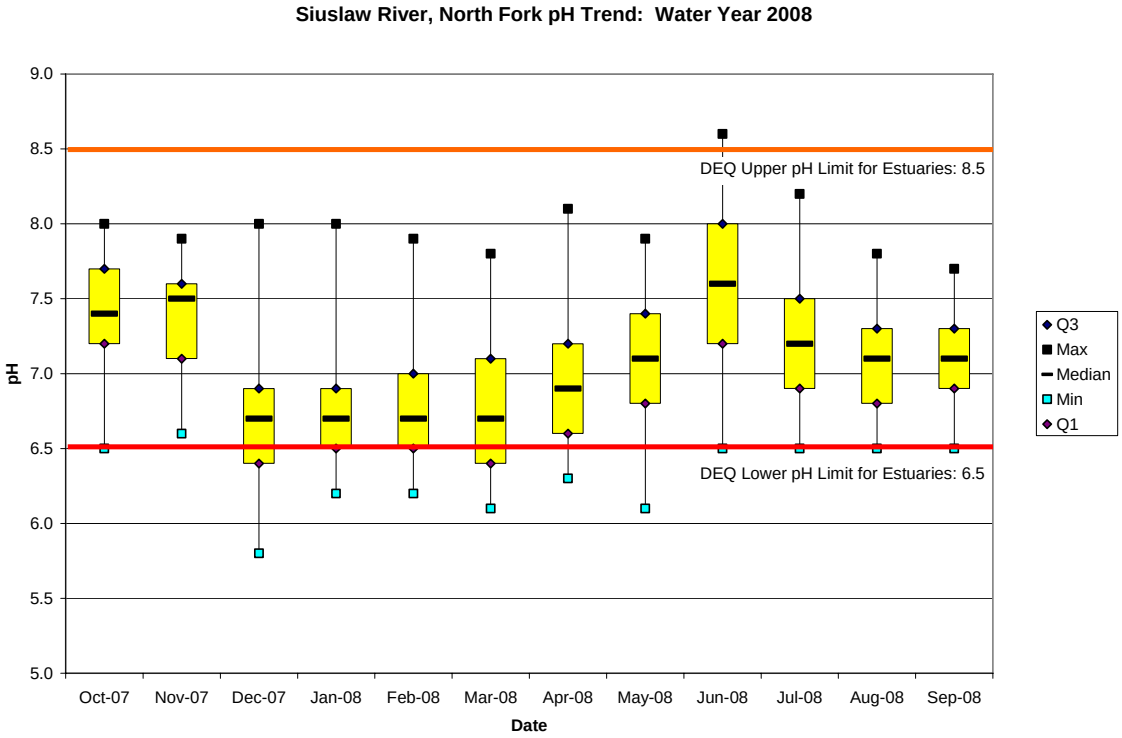
The following box and whisker plots display sonde temperature, dissolved oxygen, and pH data collected at this site. The graphs have been produced with the appropriate ODEQ standards and/or 303(d) listing in an attempt to facilitate rapid visual understanding of the trends occurring at the site. Those data presented in the temperature box plot (Box plot 1) indicate that the majority of continuous temperature data collected at CTCLUSI's North Fork sonde station throughout July and August exceeded the salmon and trout rearing and migration beneficial use criteria of 18°C 7-day average maximum temperature and therefore support the 303(d) listing for temperature within the North Fork Siuslaw River.
In addition to supporting the 303(d) listing for the site, dissolved oxygen data collected at the site indicate an additional impairment to water quality is occurring at the site. Although the Mainstem Siuslaw River is 303(d) listed from river mile 5.7 to 105.9 as impacting the designated beneficial use of anadromous fish for dissolved oxygen June 1st – September 14th (based on the criteria of cold water no less than 8.0 mg/l or 90% of saturation) and impacting the designated beneficial use of salmonids fish spawning for dissolved oxygen September 15th to May 31st (based on the spawning criteria not less than 11.0 mg/l or 95% saturation), the North Fork Siuslaw is not. However, our initial analysis of the continuous data collected by our program at this site indicate that impairments to dissolved oxygen similar to those listed for the Mainstem Siuslaw River are occurring within the North Fork Siuslaw River (Box plot 2). A trend of low pH (Box plot 3) was noted in November through April although the monthly median never fell below the DEQ minimum of 6.5 for estuaries.



Box plot 1.



Box plot 2.



Box plot 3.

Monthly North Fork Siuslaw River Temperature C°: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	13.30	10.50	8.10	7.40	8.40	9.20	11.40	15.90	16.70	19.40	18.90	16.93
Max	15.70	11.60	10.70	9.40	10.20	10.90	13.60	20.40	21.00	22.30	21.40	19.40
Median	12.80	10.20	7.40	6.50	8.00	8.70	9.70	14.10	14.90	18.30	18.00	15.60
Min	9.10	8.90	5.70	3.10	6.10	6.80	6.80	9.70	9.90	11.70	11.40	11.80
Q1	11.80	9.80	6.90	5.50	7.40	8.30	8.90	12.40	13.50	16.40	16.80	14.70
Mean	12.57	10.16	7.61	6.45	7.94	8.69	10.03	14.20	15.16	17.76	17.77	15.79
Std Dev	1.08	0.48	0.97	1.41	0.76	0.72	1.44	2.26	2.12	2.23	1.63	1.55
N	1488	942	1218	1488	1392	1488	1440	1488	1440	1488	1488	1440

Monthly North Fork Siuslaw River Dissolved Oxygen Concentration mg/l: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	9.40	10.20	12.40	12.80	12.10	12.20	12.00	10.50	10.20	8.30	7.40	8.10
Max	10.80	11.30	13.50	14.00	12.80	12.90	12.80	12.90	14.10	11.70	10.80	10.70
Median	8.30	9.60	11.90	12.20	11.80	11.90	11.60	9.90	9.50	7.10	6.50	7.40
Min	5.60	8.50	9.70	9.80	10.10	9.80	8.70	6.20	3.30	1.80	2.60	3.30
Q1	7.50	9.30	11.50	11.60	11.40	11.50	11.20	9.30	8.80	6.30	5.80	7.00
Mean	8.43	9.78	11.85	12.21	11.74	11.83	11.58	9.89	9.56	7.21	6.57	7.55
Std Dev	1.14	0.60	0.78	0.77	0.48	0.53	0.58	0.91	1.20	1.66	1.21	0.96
N	1488	942	1218	1488	1392	1488	1440	1488	1440	1488	1488	1440

Monthly North Fork Siuslaw River pH: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	7.70	7.60	6.90	6.90	7.00	7.10	7.20	7.40	8.00	7.50	7.30	7.30
Max	8.00	7.90	8.00	8.00	7.90	7.80	8.10	7.90	8.60	8.20	7.80	7.70
Median	7.40	7.50	6.70	6.70	6.70	6.70	6.90	7.10	7.60	7.20	7.10	7.10
Min	6.50	6.60	5.80	6.20	6.20	6.10	6.30	6.10	6.50	6.50	6.50	6.50
Q1	7.20	7.10	6.40	6.50	6.50	6.40	6.60	6.80	7.20	6.90	6.80	6.90
Mean	7.40	7.36	6.75	6.78	6.80	6.77	6.94	7.09	7.60	7.23	7.07	7.09
Std Dev	0.34	0.36	0.42	0.38	0.40	0.44	0.41	0.42	0.46	0.37	0.30	0.25
N	1488	942	1218	1488	1392	1488	1440	1488	1440	1488	1488	1440

Monthly North Fork Siuslaw River Salinity ppt: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	19.00	18.08	0.98	0.20	1.30	2.63	3.40	13.63	16.80	22.03	23.10	24.00
Max	30.60	27.90	21.70	26.10	26.00	25.90	22.90	27.00	30.50	31.30	31.00	30.90
Median	13.40	12.50	0.10	0.10	0.10	0.20	0.50	7.35	10.95	17.60	19.00	20.50
Min	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	2.40	2.90	7.70
Q1	5.70	4.50	0.10	0.00	0.00	0.10	0.10	1.90	5.30	12.90	14.30	15.90
Mean	12.66	11.65	1.89	1.58	2.07	2.50	2.47	8.55	11.58	17.47	18.49	19.86
Std Dev	7.81	8.02	4.28	4.38	4.53	4.76	3.90	7.25	7.67	6.35	6.06	5.37
N	1488	942	1218	1488	1392	1488	1440	1488	1440	1488	1488	1440

Monthly North Fork Siuslaw River Turbidity NTU: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	6.00	4.00	9.00	7.00	6.00	6.00	5.00	5.00	5.00	4.00	5.00	4.00
Max	338.00	45.00	996.00	998.00	443.00	956.00	580.00	658.00	971.00	773.00	391.00	20.00
Median	3.00	2.00	6.00	5.00	3.00	4.00	3.00	3.00	3.00	3.00	4.00	2.00
Min	0.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	-1.00
Q1	2.00	1.00	4.00	3.00	2.00	2.00	3.00	2.00	2.00	2.00	2.00	1.00
Mean	5.39	4.09	9.03	9.82	7.78	8.08	5.67	9.10	9.77	9.42	24.00	2.48
Std Dev	16.61	6.29	38.90	52.81	25.40	35.69	25.50	44.31	46.72	38.55	57.89	1.95
N	1488	941	1217	1480	1386	1488	1439	1487	1386	1480	1485	1440

North Fork Siuslaw Bacteria Data

CTCLUSI began collecting water samples for microbiological analysis of *E.coli* and *Enterococcus* in May 2006. Because the data set for this parameter is relatively small, no statistical analysis has been applied to these data. The following tables list all bacteria data collected by our program for water year 2008. Our program currently compares single grab samples to ODEQ and EPA established numeric criteria for Freshwaters and Estuarine Waters of either 1) no single sample exceeding 406 *E.coli* organisms per 100 milliliters (406 MPN) or 2) The federal Environmental Protection Agency (EPA) recommendation of the safe standard for Enterococcus to be no more than 158 colony

forming units (158 MPN) per 100 milliliters of marine water. No samples collected by our program during water year 2008 at this site have exceeded either of these criteria.

North Fork *E. coli* Data: Water Year 2008

Sample Date	Sample ID	Analyte	MPN/100mL
11/1/2007	NF 1	E. coli.	20.2
11/20/2007	NF 1	E. coli.	62
12/17/2007	NF 1	E. coli.	354.5
3/27/2008	NF 1	E. coli.	20.2
5/1/2008	NF 1	E. coli.	20.2
6/4/2008	NF 1	E. coli.	133.6
7/8/2008	NF 1	E. coli.	10
8/13/2008	NF 1	E. coli.	< 10.0
9/9/2008	NF 1	E. coli.	< 10.0

North Fork *Enterococcus* Data: Water Year 2008

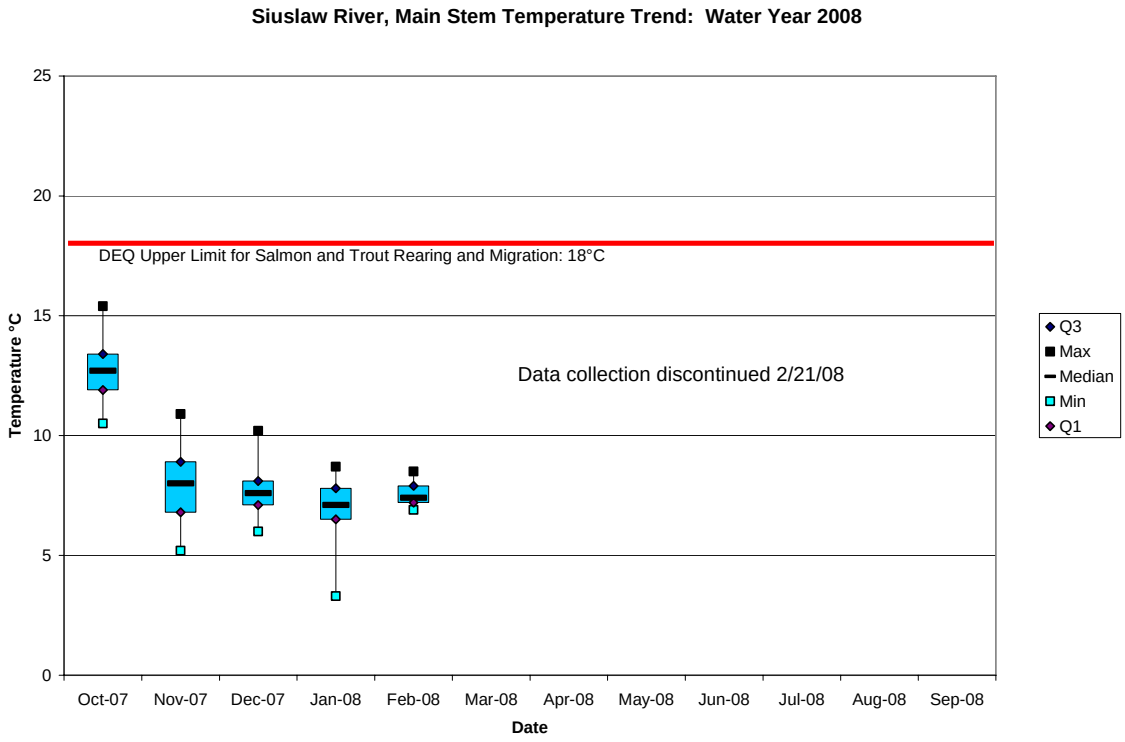
Sample Date	Sample ID	Analyte	MPN/100mL
11/1/2007	NF 1	Enterococci	< 10.0
11/20/2007	NF 1	Enterococci	10
12/17/2007	NF 1	Enterococci	110
3/27/2008	NF 1	Enterococci	< 10.0
5/1/2008	NF 1	Enterococci	< 10.0
6/4/2008	NF 1	Enterococci	10
7/8/2008	NF 1	Enterococci	< 10.0
8/13/2008	NF 1	Enterococci	< 10.0
9/9/2008	NF 1	Enterococci	10

2) <u>Siuslaw River Mainstem</u> [43.974167, 124.071111–Siuslaw Watershed]

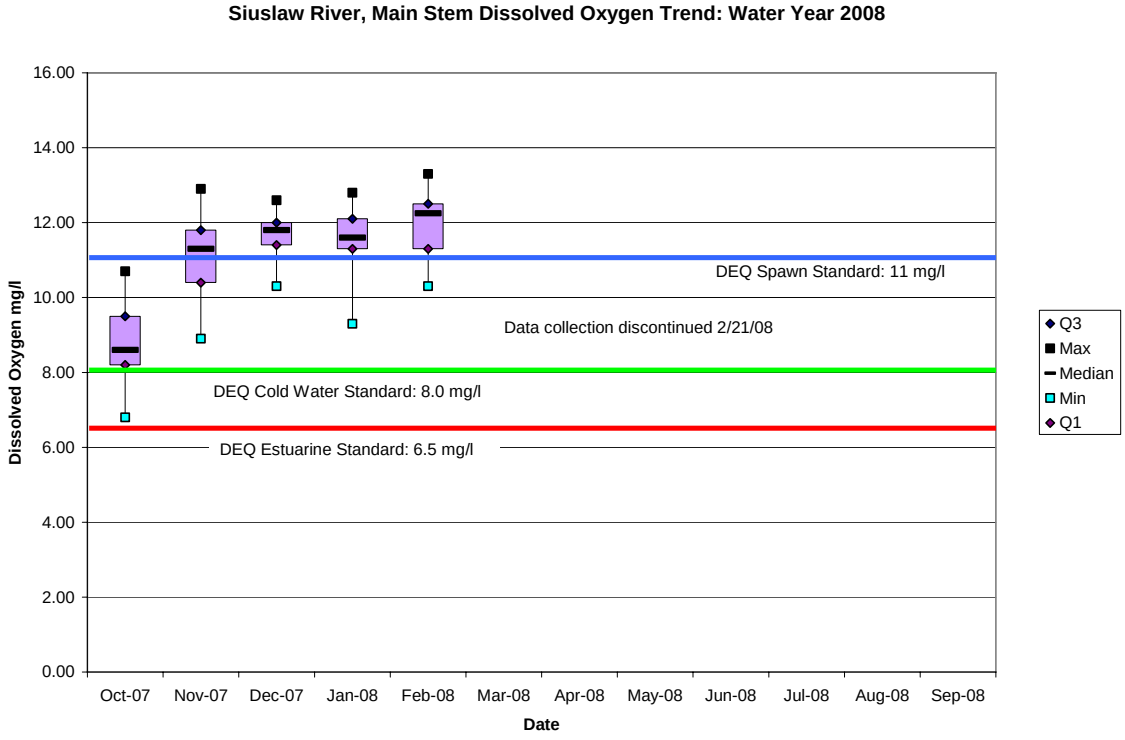
The Siuslaw River sonde station is located in the Siuslaw River Mainstem approximately 7 river miles from the mouth of the Siuslaw River. Water quality at this site is both tidally influenced and watershed driven. This sonde station is also located within the Siuslaw Estuary. The Siuslaw River is 303(d) listed from river mile 5.7 to 105.9 as impacting the designated beneficial use of anadromous fish for dissolved oxygen June 1st – September 14th. This listing is based on the criteria of cold water no less than 8.0 mg/l or 90% of saturation. This reach of the Siuslaw River is also 303(d) listed as impacting the designated beneficial use of salmonids fish spawning for dissolved oxygen September 15th to May 31st. This listing is based on the spawning criteria not less than 11.0 mg/l or 95% saturation. The Siuslaw River is 303(d) listed as impacting the year round (non-spawning) beneficial use for salmon and trout rearing and migration for temperature from river mile 0 to 106. This listing is based on the salmon and trout rearing and migration temperature criteria not greater than an 18.0 ° C 7-day average maximum. In addition to the adverse impacts to water quality associated with low dissolved oxygen and high water temperature, water quality in the Siuslaw River Mainstem and Estuary is also 303(d) listed as impacting the year round beneficial use of shellfish for fecal coliform from river mile 5.7 to 105.9. This listing is based on the criteria for the fecal coliform median of 14 organisms per 100ml or no more than 10% of samples greater than 43 organisms per 100 ml. Of the parameters listed, ODEQ cites the need for fecal coliform and temperature TMDLs within the Siuslaw River Mainstem and Estuary.

Siuslaw River Mainstem Continuous/Sonde Data Analysis

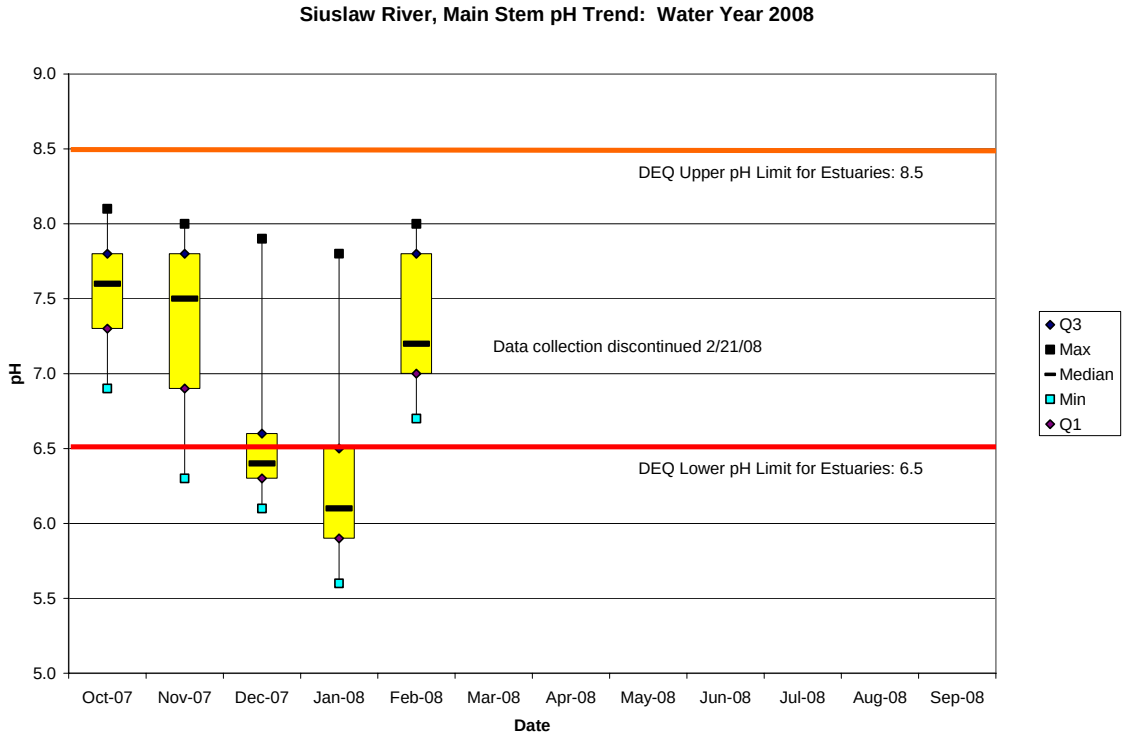
The following box and whisker plots display sonde temperature, dissolved oxygen, and pH data collected at this site. The graphs have been produced with the appropriate ODEQ standards and/or 303(d) listing in an attempt to facilitate rapid visual understanding of the trends occurring at the site. Data collection for this site was discontinued and the sonde dismantled on 2/21/08. This site has previously been noted as impaired in the summer months for DO and temperature but no supporting data was collected for water year 2008. A low winter pH trend similar to the North Fork was noted in the Mainstem (Box plot 6) with very low numbers observed in January. The exceptionally low pH numbers in January corresponded with a low battery error in the sonde and the data may be ultimately rejected after closer scrutiny.



Box plot 4



Box plot 5



Box plot 6

Monthly Mainstem Siuslaw River Temperature C°: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	13.40	8.90	8.10	7.80	7.90							
Max	15.40	10.90	10.20	8.70	8.50							
Median	12.70	8.00	7.60	7.10	7.40							
Min	10.50	5.20	6.00	3.30	6.90							
Q1	11.90	6.80	7.10	6.50	7.20							
Mean	12.66	7.96	7.86	7.16	7.53							
Std Dev	1.00	1.46	1.06	0.87	0.41							
N	1488	543	961	1073	286							

Monthly Mainstem Siuslaw River Dissolved Oxygen Concentration mg/l: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	9.50	11.80	12.00	12.10	12.50							
Max	10.70	12.90	12.60	12.80	13.30							
Median	8.60	11.30	11.80	11.60	12.25							
Min	6.80	8.90	10.30	9.30	10.30							
Q1	8.20	10.40	11.40	11.30	11.30							
Mean	8.82	11.12	11.72	11.64	11.94							
Std Dev	0.88	1.00	0.42	0.62	0.71							
N	1488	543	961	1073	286							

Monthly Mainstem Siuslaw River pH: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	7.80	7.80	6.60	6.50	7.80							
Max	8.10	8.00	7.90	7.80	8.00							
Median	7.60	7.50	6.40	6.10	7.20							
Min	6.90	6.30	6.10	5.60	6.70							
Q1	7.30	6.90	6.30	5.90	7.00							
Mean	7.57	7.38	6.59	6.27	7.35							
Std Dev	0.31	0.44	0.43	0.51	0.41							
N	1488	543	961	1073	286							

Monthly Mainstem Siuslaw River Salinity ppt: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	22.70	19.20	0.10	0.20	14.10							
Max	31.80	29.90	24.20	29.80	26.80							
Median	16.90	9.00	0.00	0.00	2.35							
Min	0.10	0.00	0.00	0.00	0.00							
Q1	10.80	0.80	0.00	0.00	0.10							
Mean	16.01	10.77	1.62	2.73	6.97							
Std Dev	8.44	9.52	4.24	6.40	8.41							
N	1488	543	961	1073	286							

Monthly Mainstem Siuslaw River Turbidity NTU: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	4.00	9.00	14.00	9.00	4.00							
Max	32.00	36.00	150.00	24.00	9.00							
Median	2.00	6.00	8.00	5.00	3.00							
Min	0.00	0.00	0.00	1.00	1.00							
Q1	2.00	3.00	5.00	4.00	2.00							
Mean	3.56	6.54	13.25	6.69	3.22							
Std Dev	3.26	4.51	17.97	3.73	1.31							
N	1488	543	961	1073	286							

Siuslaw Mainstem Bacteria Data

CTCLUSI began collecting water samples for microbiological analysis of *E.coli* and *Enterococcus* in May 2006. Because the data set for this parameter is relatively small, no statistical analysis has been applied to these data. The following tables list all bacteria data collected by our program for water year 2008. Our program currently compares single grab samples to ODEQ and EPA established numeric criteria for Freshwaters and Estuarine Waters of either 1) no single sample exceeding 406 *E. coli* organisms per 100 milliliters (406 MPN) or 2) The federal Environmental Protection Agency (EPA) recommendation of the safe standard for Enterococcus to be no more than 158 colony

forming units (158 MPN) per 100 milliliters of marine water. A single water sample collected on 12/17/07 exceeded both the *E. coli* and *Enterococci* criteria.

Siuslaw Mainstem *E. coli* Data: Water Year 2008

Sample Date	Sample ID	Analyte	MPN/100mL
11/1/2007	MS 1	E. coli.	20.2
11/20/2007	MS 1	E. coli.	52.1
12/17/2007	MS 1	E. coli.	1075.8
1/29/2008	MS 1	E. coli.	52.1
3/10/2008	MS	E. coli.	30.6

Siuslaw Mainstem Enterococcus Data: Water Year 2008

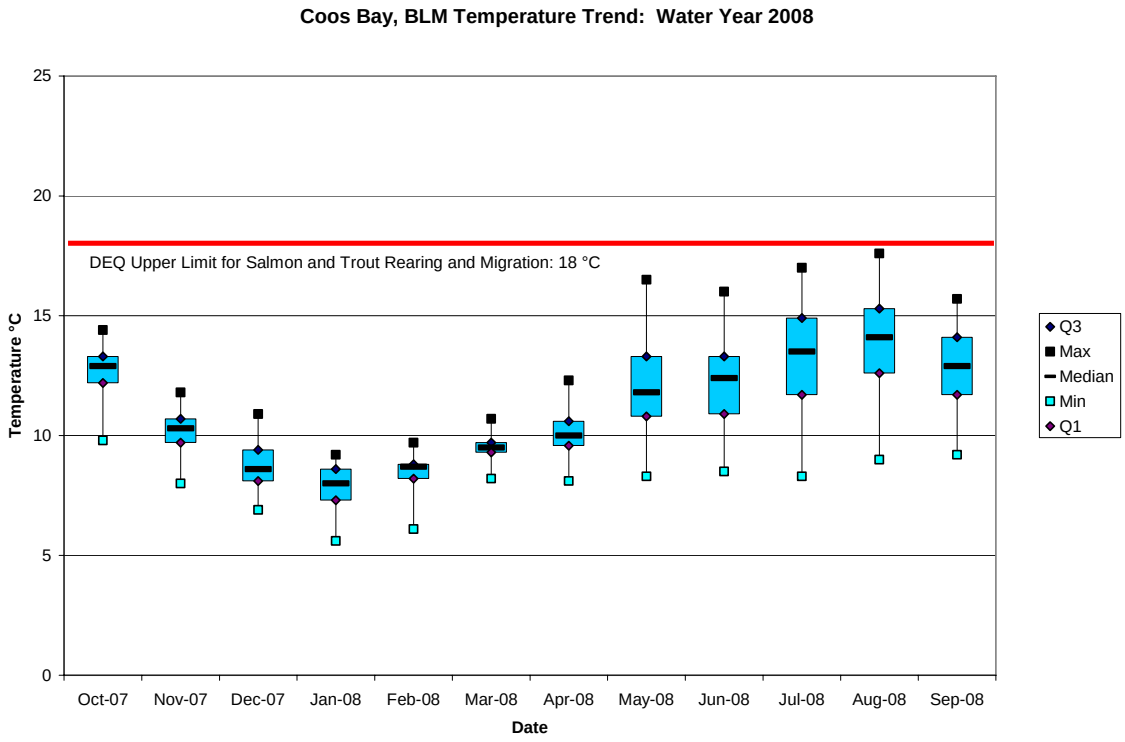
Sample Date	Sample ID	Analyte	MPN/100mL
11/1/2007	MS 1	Enterococci	< 10.0
11/20/2007	MS 1	Enterococci	20.1
12/17/2007	MS 1	Enterococci	291.7
1/29/2008	MS 1	Enterococci	10
3/10/2008	MS	Enterococci	< 10.0

3) <u>BLM Boat Ramp</u> [43.398019, 124.286034 – Coos Watershed]

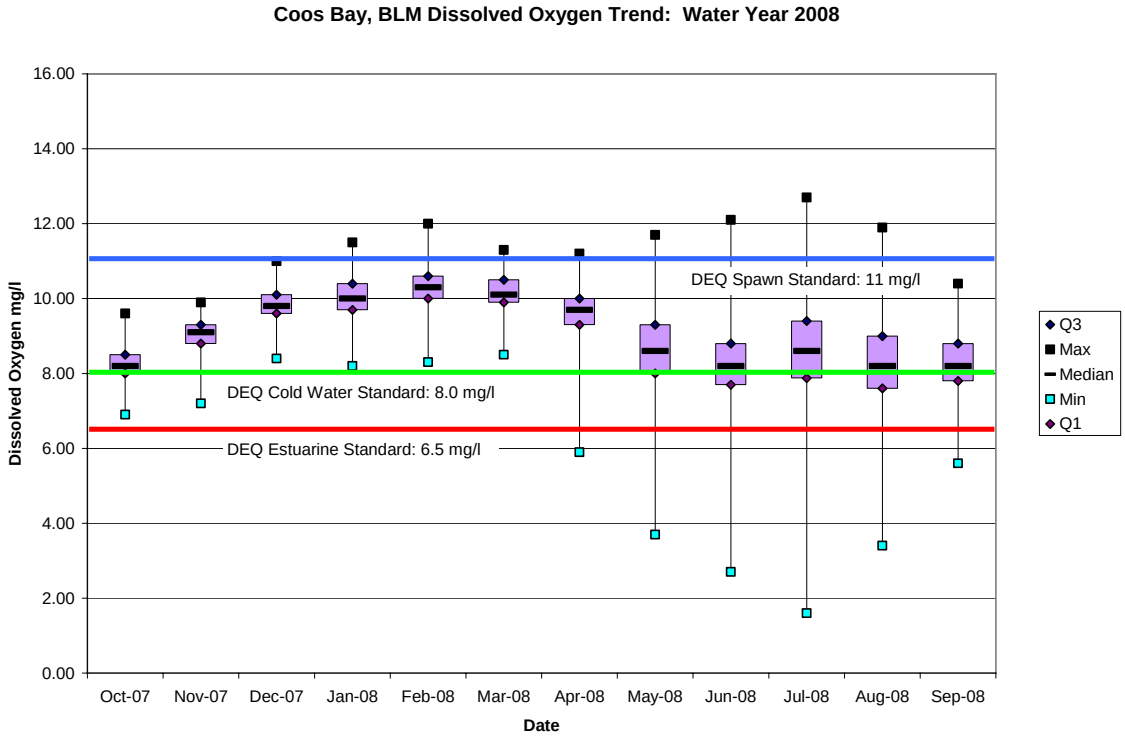
The BLM Sonde station is located approximately 6 river miles from the mouth of the Lower Coos Bay Estuary. This is a marine dominated site. The Coos Estuary and its watershed are located in the lowlands of the southwestern Oregon Coast Range. It is the largest Oregon estuary completely contained within state boundaries and is the fifth largest estuary in the Pacific Northwest (South Slough National Estuarine Research Reserve (SSNERR) Management Plan, 13). The Coos River and its estuary are considered to be a "drowned river mouth" system. ODEQ lists 303(d) impairments to water quality in the upper bay and jetty inlet/ South Slough area of Coos Bay. The lower jetty inlet/ South Slough (river mile 0 to 5.3) and upper bay (river mile 7.8 to 12.3) are currently listed for fecal coliform year round. Additional listings of potential concern for the upper bay are heavy metals (tributyltin, copper, lead, chromium, lead, and nickel) and temperature (Oct 1 to May 31st). Although surface waters immediately adjacent to the BLM Boat Ramp sonde station are not 303(d) listed, the monitoring of potential impacts to water quality from non point sources located upbay and downbay of this site are within tribal interest due to the historic association with tribal subsistence resources within the bay such as shellfish harvesting and fishing.

BLM Boat Ramp Continuous/Sonde Data Analysis

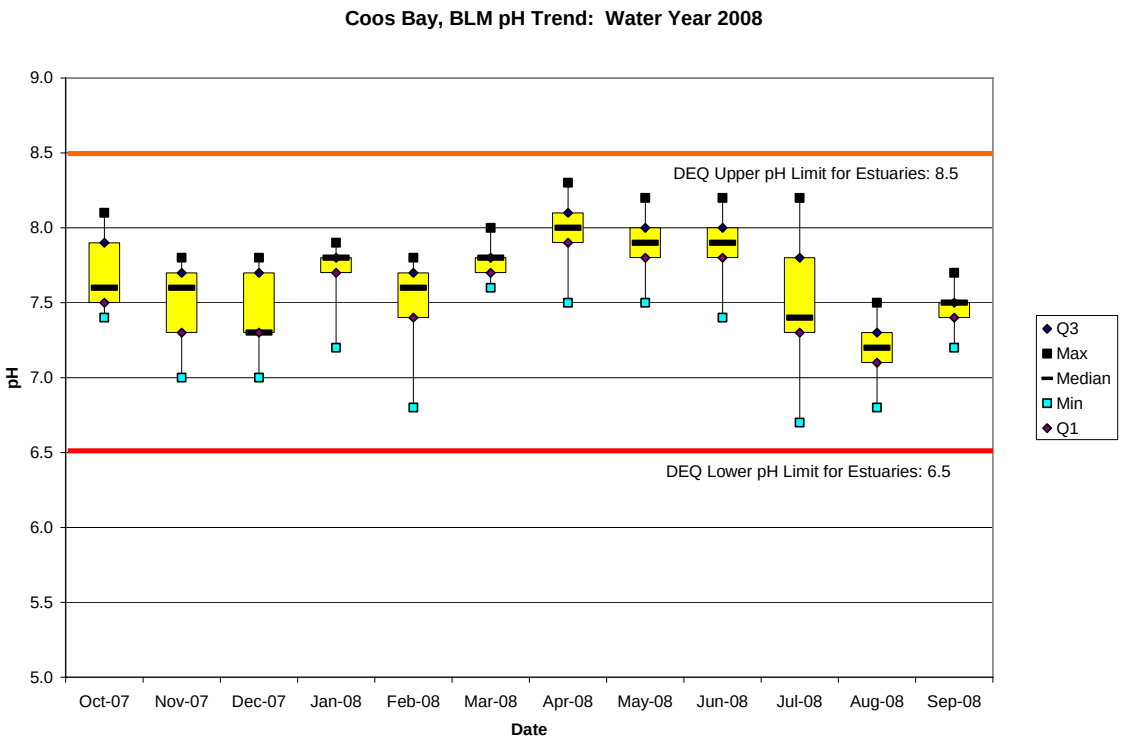
The following box and whisker plots display sonde temperature, dissolved oxygen, and pH data collected at this site. The graphs have been produced with the appropriate ODEQ standards and/or 303(d) listing in an attempt to facilitate rapid visual understanding of the trends occurring at the site. Data collected at the BLM Boat Ramp site do not indicate impairments to water quality have been or are occurring at the site.



Box plot 7



Box plot 8



Box plot 9

Monthly Coos Bay BLM Temperature C°: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	13.30	10.70	9.40	8.60	8.80	9.70	10.60	13.30	13.30	14.90	15.30	14.10
Max	14.40	11.80	10.90	9.20	9.70	10.70	12.30	16.50	16.00	17.00	17.60	15.70
Median	12.90	10.30	8.60	8.00	8.70	9.50	10.00	11.80	12.40	13.50	14.10	12.90
Min	9.80	8.00	6.90	5.60	6.10	8.20	8.10	8.30	8.50	8.30	9.00	9.20
Q1	12.20	9.70	8.10	7.30	8.20	9.30	9.58	10.80	10.90	11.70	12.60	11.70
Mean	12.63	10.22	8.80	7.91	8.44	9.53	10.10	11.97	12.15	13.24	13.86	12.82
Std Dev	0.97	0.76	0.90	0.85	0.66	0.38	0.77	1.74	1.55	2.03	1.92	1.44
N	1488	1440	1488	1487	1391	1487	1440	1488	1440	1488	555	941

Monthly Coos Bay BLM Dissolved Oxygen Concentration mg/l: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	8.50	9.30	10.10	10.40	10.60	10.50	10.00	9.30	8.80	9.40	9.00	8.80
Max	9.60	9.90	11.00	11.50	12.00	11.30	11.20	11.70	12.10	12.70	11.90	10.40
Median	8.20	9.10	9.80	10.00	10.30	10.10	9.70	8.60	8.20	8.60	8.20	8.20
Min	6.90	7.20	8.40	8.20	8.30	8.50	5.90	3.70	2.70	1.60	3.40	5.60
Q1	8.00	8.80	9.60	9.70	10.00	9.90	9.30	8.00	7.70	7.88	7.60	7.80
Mean	8.24	8.99	9.83	10.01	10.33	10.17	9.63	8.63	8.23	8.64	8.36	8.31
Std Dev	0.41	0.43	0.39	0.54	0.51	0.46	0.64	0.98	1.00	1.14	1.23	0.71
N	1488	1440	1488	1487	1391	1487	1440	1488	1440	1488	555	941

Monthly Coos Bay BLM pH: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	7.90	7.70	7.70	7.80	7.70	7.80	8.10	8.00	8.00	7.80	7.30	7.50
Max	8.10	7.80	7.80	7.90	7.80	8.00	8.30	8.20	8.20	8.20	7.50	7.70
Median	7.60	7.60	7.30	7.80	7.60	7.80	8.00	7.90	7.90	7.40	7.20	7.50
Min	7.40	7.00	7.00	7.20	6.80	7.60	7.50	7.50	7.40	6.70	6.80	7.20
Q1	7.50	7.30	7.30	7.70	7.40	7.70	7.90	7.80	7.80	7.30	7.10	7.40
Mean	7.67	7.51	7.44	7.70	7.53	7.78	8.02	7.90	7.89	7.52	7.20	7.48
Std Dev	0.19	0.19	0.21	0.15	0.21	0.09	0.13	0.12	0.11	0.30	0.12	0.07
N	1488	1440	1488	1487	1391	1487	1440	1488	1440	1488	555	941

Monthly Coos Bay BLM Salinity ppt: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	32.20	31.33	28.00	27.15	27.80	28.60	27.93	30.50	32.10	33.00	32.10	33.00
Max	33.60	33.70	33.40	33.10	33.10	33.20	32.90	33.60	33.80	33.90	33.10	33.60
Median	31.30	29.60	23.70	22.50	23.90	25.70	24.75	28.40	30.50	32.40	31.60	32.70
Min	20.50	9.10	6.60	6.30	3.70	13.70	15.80	19.50	25.80	28.40	30.40	31.70
Q1	29.60	26.60	18.70	16.45	17.95	21.30	22.60	26.40	29.10	31.60	31.30	32.30
Mean	30.43	28.17	23.22	21.71	22.74	24.94	25.26	28.23	30.47	32.26	31.71	32.66
Std Dev	2.43	4.71	5.87	6.71	6.78	4.90	3.56	3.02	1.92	0.96	0.59	0.44
N	1488	1440	1488	1487	1391	1487	1440	1488	1440	1488	555	941

Monthly Coos Bay BLM Turbidity NTU: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3	4.00	4.00	5.00	5.00	5.00	2.00	4.00	3.00	3.00	5.00	6.00	2.00
Max	1063.00	15.00	29.00	44.00	58.00	10.00	286.00	1055.00	308.00	618.00	19.00	9.00
Median	3.00	2.00	3.00	4.00	3.00	2.00	3.00	2.00	2.00	3.00	4.00	1.00
Min	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	-1.00
Q1	2.00	1.00	2.00	3.00	2.00	1.00	2.00	2.00	1.00	2.00	3.00	1.00
Mean	8.02	2.76	4.06	4.68	4.06	1.76	3.74	3.57	2.54	4.33	4.68	1.34
Std Dev	52.61	1.93	2.74	3.82	4.10	1.26	10.12	27.32	8.52	16.11	2.86	1.03
N	1486	1440	1488	1487	1391	1487	1438	1488	1440	1486	555	941

BLM Boat Ramp Bacteria Data

CTCLUSI began collecting water samples for microbiological analysis of *E.coli* and *Enterococcus* in Coos Bay in May 2006. Because the data set for this parameter is relatively small, no statistical analysis has been applied to these data. The following tables list all bacteria data collected by our program for this site during water year 2008. Our program currently compares single grab samples to ODEQ and EPA established numeric criteria for Freshwaters and Estuarine Waters of either 1) no single sample exceeding 406 *E. coli* organisms per 100 milliliters (406 MPN) or 2) The federal Environmental Protection Agency (EPA) recommendation of the safe standard for Enterococcus to be no more than 158 colony forming units (158 MPN) per 100 milliliters of marine water. A single water sample collected on 11/19/07 exceeded the Enterococci criteria.

Coos Bay BLM *E. coli* Data: Water Year 2008

Sample Date	Sample ID	Analyte	MPN/100mL
10/30/2007	BLM 1	E. coli.	20.2
11/19/2007	BLM 1	E. coli.	196.7
12/20/2007	BLM 1	E. coli.	10
1/28/2008	BLM 1	E. coli.	10
3/10/2008	BLM	E. coli.	< 10.0
4/3/2008	BLM 1	E. coli.	< 10.0
5/5/2008	BLM 1	E. coli.	10
6/4/2008	BLM 1	E. coli.	< 10.0
7/9/2008	BLM 1	E. coli.	10
8/12/2008	BLM 1	E. coli.	< 10.0
9/11/2008	BLM	E. coli.	< 10.0

Coos Bay BLM *Enterococcus* Data: Water Year 2008

Sample Date	Sample ID	Analyte	MPN/100mL
10/30/2007	BLM 1	Enterococci	< 10.0
11/19/2007	BLM 1	Enterococci	184.9
12/20/2007	BLM 1	Enterococci	< 10.0
1/28/2008	BLM 1	Enterococci	< 10.0
3/10/2008	BLM	Enterococci	< 10.0
4/3/2008	BLM 1	Enterococci	< 10.0
5/1/2008	BLM 1	Enterococci	< 10.0
6/4/2008	BLM 1	Enterococci	< 10.0
7/9/2008	BLM 1	Enterococci	< 10.0
8/12/2008	BLM 1	Enterococci	< 10.0
9/11/2008	BLM	Enterococci	< 10.0

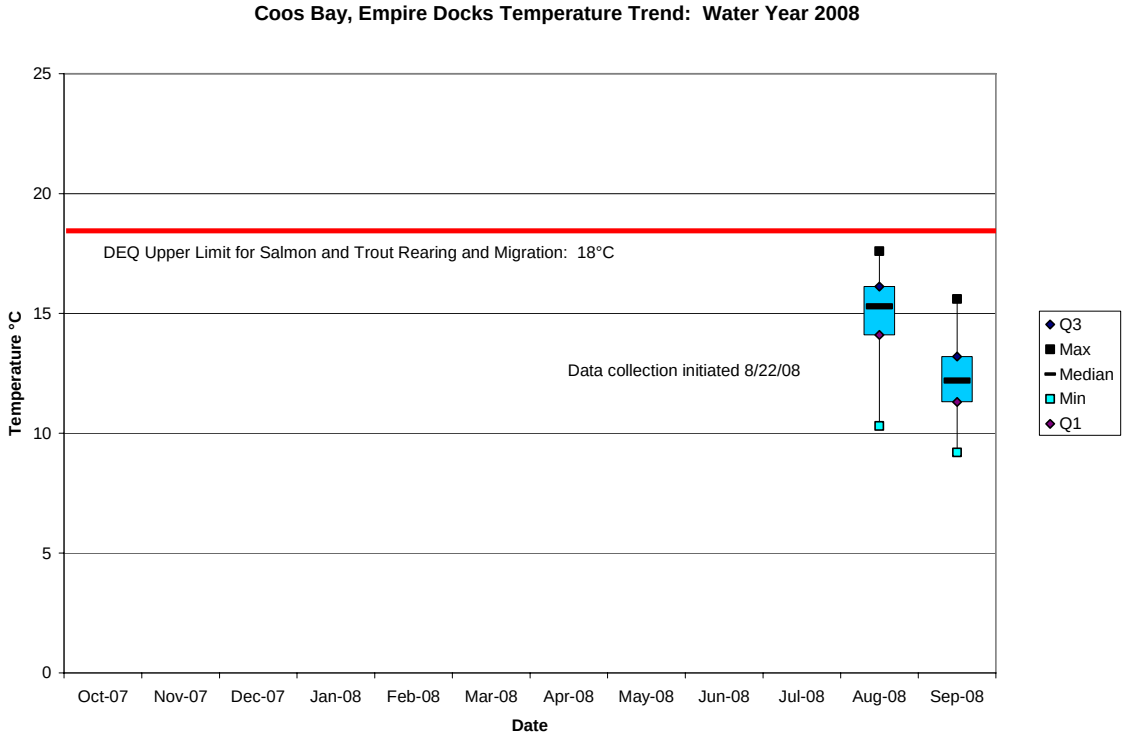
4) <u>Empire Docks</u> [43.394219, 124.280394 – Coos Watershed]

The Empire Docks sonde station is a new site installed on 8/22/08. The Empire Docks Sonde station is located approximately 5 Miles from the mouth of the Lower Coos Bay

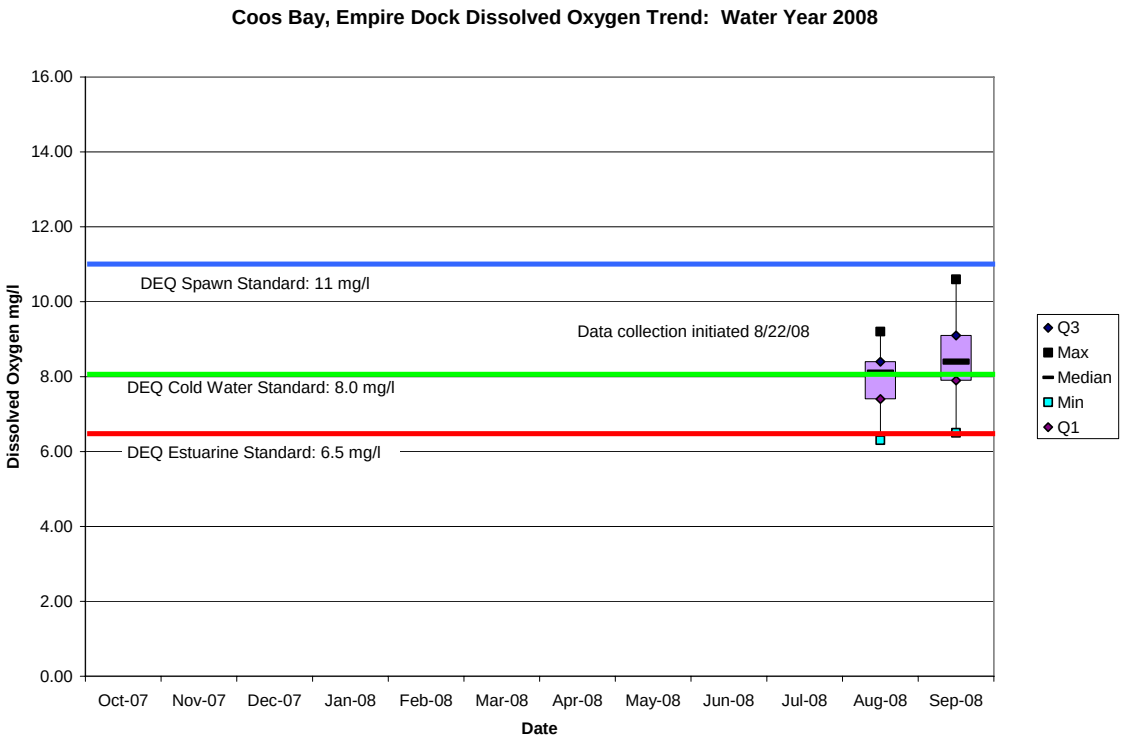
Estuary. This is a marine dominated site. The Coos Estuary and its watershed are located in the lowlands of the southwestern Oregon Coast Range. It is the largest Oregon estuary completely contained within state boundaries and is the fifth largest estuary in the Pacific Northwest (South Slough National Estuarine Research Reserve (SSNERR) Management Plan, 13). The Coos River and its estuary are considered to be a "drowned river mouth" system. ODEQ lists 303(d) impairments to water quality in the upper bay and jetty inlet/ South Slough area of Coos Bay. The lower jetty inlet/ South Slough (river mile 0 to 5.3) and upper bay (river mile 7.8 to 12.3) are currently listed for fecal coliform year round. Additional listings of potential concern for the upper bay are heavy metals (tributyltin, copper, lead, chromium, lead, and nickel) and temperature (Oct 1 to May 31st). Although surface waters immediately adjacent to the BLM Boat Ramp sonde station are not 303(d) listed, the monitoring of potential impacts to water quality from non point sources located upbay and downbay of this site are within tribal interest due to the historic association with tribal subsistence resources within the bay such as shellfish harvesting and fishing.

Empire Docks Continuous/Sonde Data Analysis

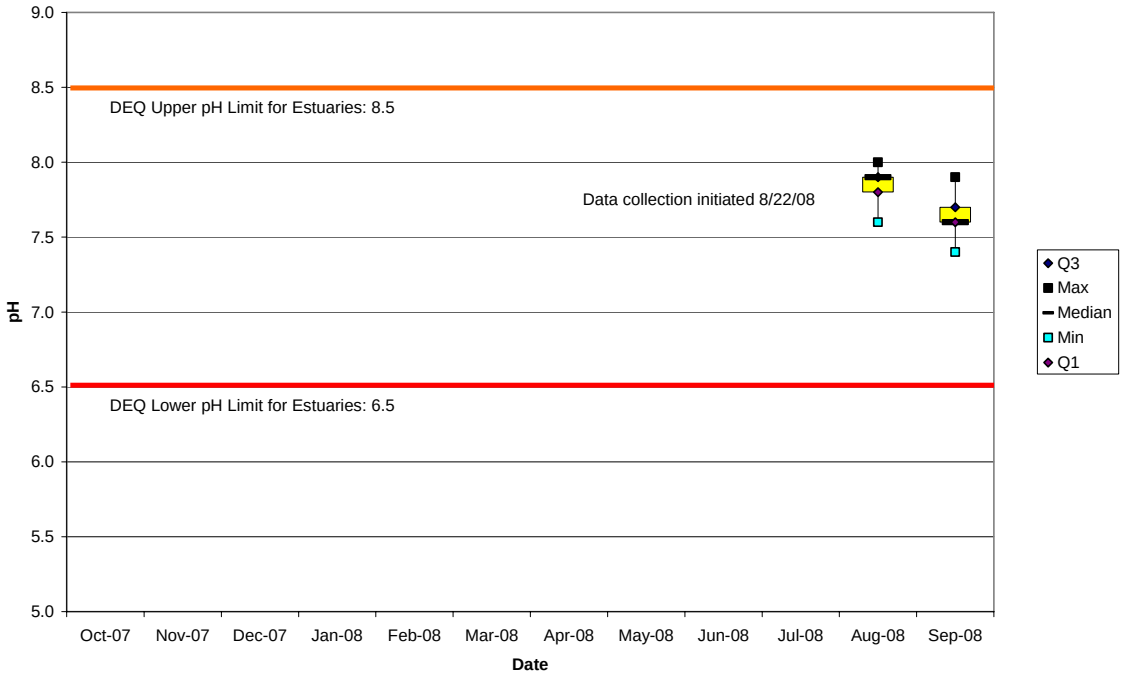
The following box and whisker plots display sonde temperature, dissolved oxygen, and pH data collected at this site. The graphs have been produced with the appropriate ODEQ standards and/or 303(d) listing in an attempt to facilitate rapid visual understanding of the trends occurring at the site. The initial data collected at the Empire Docks site do not indicate impairments to water quality have been or are occurring at the site.



Boxplot 10



Box plot 11



Box plot 12

Monthly Coos Bay Empire Docks Temperature C°: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3											16.13	13.20
Max											17.60	15.60
Median											15.30	12.20
Min											10.30	9.20
Q1											14.10	11.30
Mean											14.93	12.24
Std Dev											1.71	1.29
N											460	1440

Monthly Coos Bay Empire Docks Dissolved Oxygen Concentration mg/l: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3											8.40	9.10
Max											9.20	10.60
Median											8.10	8.40
Min											6.30	6.50
Q1											7.40	7.90
Mean											7.91	8.49
Std Dev											0.64	0.76
N											460	1440

Monthly Coos Bay Empire Docks pH: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3											7.90	7.70
Max											8.00	7.90
Median											7.90	7.60
Min											7.60	7.40
Q1											7.80	7.60
Mean											7.84	7.64
Std Dev											0.10	0.08
N											460	1440

Monthly Coos Bay Empire Docks Salinity ppt: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3											32.50	33.90
Max											33.30	34.40
Median											32.20	33.50
Min											31.10	31.70
Q1											32.00	33.00
Mean											32.21	33.38
Std Dev											0.45	0.61
N											460	1440

Monthly Coos Bay Empire Docks Turbidity NTU: Water Year 2008

Statistics	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
Q3											4.00	3.00
Max											8.00	109.00
Median											3.00	2.00
Min											1.00	-1.00
Q1											2.00	1.00
Mean											2.96	2.14
Std Dev											1.07	3.18
N											460	1439

Empire Docks Bacteria Data

CTCLUSI began collecting water samples for microbiological analysis of *E.coli* and *Enterococcus* at this site in September 2008. Because the data set for this parameter is a single point, no statistical analysis can be applied. The following tables list all bacteria data collected by our program for this site during water year 2008. Our program currently compares single grab samples to ODEQ and EPA established numeric criteria for Freshwaters and Estuarine Waters of either 1) no single sample exceeding 406 *E. coli* organisms per 100 milliliters (406 MPN) or 2) The federal Environmental Protection Agency (EPA) recommendation of the safe standard for Enterococcus to be no more than 158 colony forming units (158 MPN) per 100 milliliters of marine water. No samples collected as this site during water year 2008 have exceeded either of these criteria.

Empire Docks *E. coli* Data: Water Year 2008

Sample Date	Sample ID	Analyte	MPN/100mL
9/11/2008	EMP 1	E. coli.	< 10.0

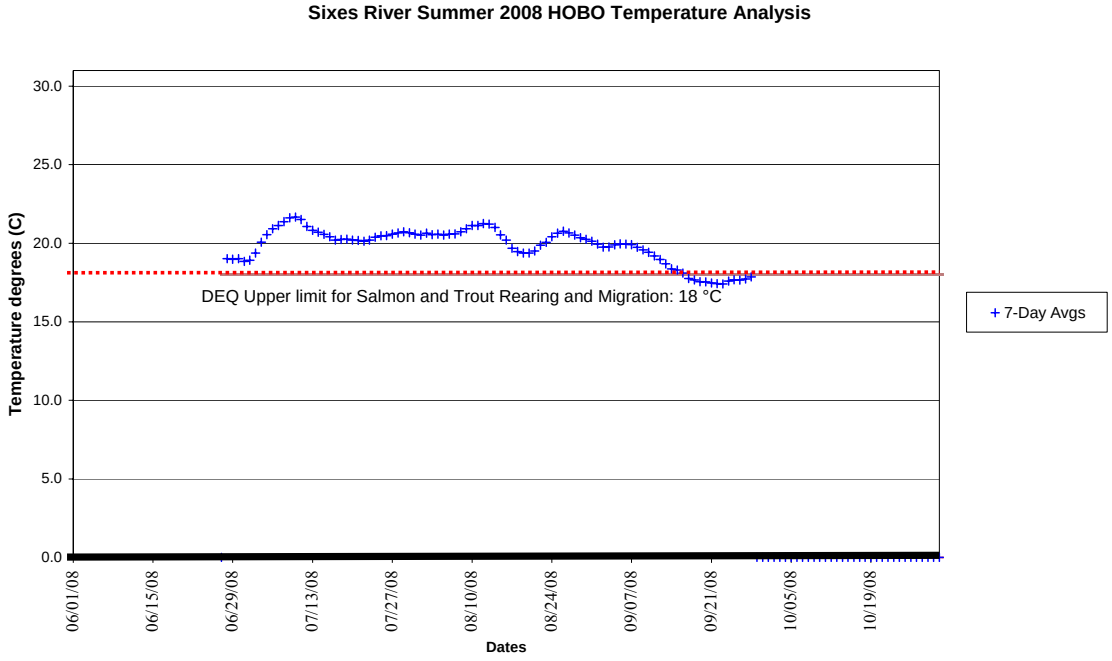
Empire Docks Enterococcus Data: Water Year 2008

Sample Date	Sample ID	Analyte	MPN/100mL
9/11/2008	EMP 1	Enterococci	< 10.0

5) <u>Sixes River</u> [42.810972, 124.445361 – Sixes Watershed]

The Sixes River stream monitoring site is located approximately 7 river miles from the mouth of the river. This is a freshwater site and as such water quality at the site is likely watershed and/or storm event driven. This is a discrete monitoring site (see Stream Discrete Monitoring under Monitoring Methods and Frequency). The Sixes River headwaters in the Klamath Mountains and flows into the Pacific Ocean north of Cape Blanco near Sixes, Oregon, draining approximately 85,645 acres of land. This basin is one of the largest occurring in the southern Oregon coast. The land uses in the watershed are dominated by forestry, ranching, and rural residences. The water quality of the Sixes River and many of its tributaries is 303(d) listed by ODEQ as impaired by elevated temperature in the summer.

CTCLUSI deploys an automated HOBO temperature datalogger at this site during the summer months. The HOBOs are used for long – term deployment and record the temperature at the site at 30 minute intervals. HOBO data collected by our program in the summer of 2008 were viewed and summarized using an ODEQ developed MS Excel macro called HYDROSTATSimple203.xls.



The above chart generated from the automated HOBO temperature datalogger shows summer temperatures above the 18 °C DEQ upper limit for salmon and trout rearing and migration. This agrees with the ODEQ 303(d) listing as impaired by elevated temperature in the summer.

Sixes River Basic Habitat and Macroinvertebrates

CTCLUSI began collecting macroinvertebrate samples and basic habitat data in 2007. Macroinvertebrate samples are taken at the beginning of the low flow season (mid June – mid July) and again at the end of the low flow season (mid July-mid Sept). The macroinvertebrate sampling site is a riffle 37.6 meters in length, 8.7 meters wide, 20 cm deep with a surface velocity of 1.47 m/sec. The bottom substrate is approximately 75% cobble, 20% gravel and 5% sand with about 2% sticks and other plant material and no large woody debris. A brownish diatomaceous and filamentous alga covers the bottom substrate. The site is partially shaded with trees and shrubs with the shoreline dominated by grasses. The surrounding area is predominately forested with scattered residences.

Sixes River Macroinvertebrate Samples: Water Year 2008

Sample Date	Sample ID	D-net composites	Notes
10/3/07	Sixes	4	End low flow season
6/24/08	Sixes	4	Beginning low flow season

Preliminary sorting and examination of the macroinvertebrates samples reveals an abundance of stoneflies, mayflies and caddisflies including some sensitive species. The presence of sensitive species is indicative of low impacts caused by human disturbance. The final sorting and identification of species in the preserved macroinvertebrate samples is in process.

Sixes River Bacteria Data

The WQP began collecting water samples for microbiological analysis of *E. coli* and *Enterococcus* at this site in April 2006. Because the data set for this parameter is small, no statistical analysis has been applied to these data. The following tables list all bacteria data collected by our program for this site during water year 2008. Our program currently compares single grab samples to ODEQ and EPA established numeric criteria for Freshwaters and Estuarine Waters of either 1) no single sample exceeding 406 *E. coli* organisms per 100 milliliters (406 MPN) or 2) The federal Environmental Protection Agency (EPA) recommendation of the safe standard for Enterococcus to be no more than 158 colony forming units (158 MPN) per 100 milliliters of marine water. No samples collected as this site during water year 2008 have exceeded either of these criteria.

Sixes River *E. coli* Data: Water Year 2008

Sample Date	Sample ID	Analyte	MPN/100mL
5/13/2008	Sixes 1	E. coli.	30.6
6/24/2008	Sixes 1	E. coli.	< 10.0

Sixes River Enterococcus Data: Water Year 2008

Sample Date	Sample ID	Analyte	MPN/100mL
5/13/2008	Sixes 1	Enterococci	< 10.0
6/24/2008	Sixes 1	Enterococci	< 10.0

Issues of Tribal Concerns

Tribal water quality issues of concern continue to be the impairments listed on EPA's Clean Water Act 303 (d) Lists. These impairments are more than likely attributed to multiple non-point sources contributions and land use practices within the watersheds. While there is no indication that the CTCLUSI are contributing to these impairments, CTCLUSI holdings in the lower portions of these watersheds are bearing the brunt of these impairments. Being traditionally centered in the estuarine and lower freshwater portions of the watershed, the CTCLUSI and our traditional natural/cultural resources including subsistence foods such as shellfish are particularly at risk from impairments originating in upper portions of the watershed. Point source contributions that may be attributed to these impairments have not been assessed by the WQP. An inventory of known point sources would be valuable information in addressing tribal water quality issues. Detailed information on the types of impairments found at each monitoring site can be found under the Site Description and Location section of this report.

Conclusion

The work summarized in this report represents the continuing successful partnership between the EPA and the CTCLUSI DNR. The WQP continues to evolve to meet new program requirements found within EPA's *Final Guidance on Awards of Grants to Indian Tribes under Section 106 of the Clean Water Act for Fiscal Years 2007 and Beyond*. With the continued support of EPA, the WQP will continue to assess, protect, and improve water quality within the Tribe's Ancestral Watersheds.