Tribal Water Quality Assessment Report

(October 2005 to September 2006)

Deliverable as Specified in Clean Water Act Section 106

Grant # BG-96005701-0

Prepared By:

Confederated Tribes of
Coos, Lower Umpqua, and Siuslaw Indians
Department of Natural Resources
1245 Fulton Avenue
Coos Bay, Oregon

December 27, 2006

Background

The Environmental Division is a branch under the Department of Natural Resources with a mission statement is to research, monitor, assess, manage, use, conserve, protect, and restore the natural resources of the Confederated Tribes' Ancestral Territory, consistent with Tribal values. The Water Quality Program (WQP) was developed to monitor water quality conditions of tribal waters and monitor the quality of waters pertaining to tribal lands. The WQP assess the ecological health of the Ancestral Watersheds and develops plans, best management practices, standards, and ordinances to protect these Tribal waters for their multiple ecological, cultural, economic, and intrinsic values. In 2002, the US 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 the first ever water quality monitoring program. Water quality data collection targeted five core parameters: water temperature, turbidity, salinity, pH, and dissolved oxygen. Data collection was conducted at spring high-high and low-low tides, requiring sampling to be conducted at all hours of the day and night. Data collection was expanded in 2006 with the implementation of an EPA approved QAPP 2.0. The WQP installed YSI continuous data loggers at estuarine sites to improve and increase tidal data collection. The WQP also expanded to include chlorophyll and bacteria parameters into the WQP. The WQP is funded by EPA through Section 106 of the Clean Water Act.

Purpose

EPA's *Guidance on Awards of Grants to Indian Tribes under Section 106 of the Clean Water Act* requires that tribes collect, assess, and report annually on water quality monitoring data collected using Clean Water Act Section 106 funding. The following annual Water Quality Assessment Report covers all tribal water quality data collected in the 2005-2006 water year (October 2005-September 2006). In addition to this report all water quality data collected by the WQP will be submitted with this report to EPA.

Atlas of Tribal Waters

The following table is an estimate of our 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

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:

- Dissolved Oxygen
- pH
- Total phosphorus
- Total nitrogen
- Water temperature
- Turbidity
- Macroinvertebrates
- E. Coli or fecal coliform
- Basic habitat information

The WQP currently collects data on the following five of the nine EPA recommended parameters.

- Dissolved Oxygen
- pH
- Water Temperature
- Turbidity
- E. coli and Enterococcus

Efforts are under way by the WQP to update our Quality Assurance Project Plan (QAPP) to incorporate all EPA required parameters (Total Phosphorus, Total Nitrogen, Macroinvertebrate, and Basic Habitat Information).

Monitoring Methods and Frequency

Estuarine Continuous Monitoring

One data logger is deployed at each of the three permanent monitoring stations. Sites are accessed at high to mid-outgoing tide in a small skiff equipped with an outboard motor. 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 556 records DO, Salinity, Specific Conductivity, and Temperature both at the surface and at the level of the sonde array. Surface grab samples of water for pH and turbidity are taken for bench top analysis.

The WQP staff complete data logger retrieval and deployment approximately every two weeks weather permitting.

Stream Discrete Monitoring

Water temperature, dissolved oxygen, salinity/conductivity, pH, bacteria (*e. coli* and *Enterococcus*), and turbidity data are collected semi-monthly at the Tribes' freshwater monitoring site. A combination of handheld meters (YSI 556 multi-probe meter, Hach 2100-P Turbidimeter, and Beckman 450 ionic pH meter) 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 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 four 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. The estuarine sites are sampled using the discrete sampling methodology described in the previous Stream Water Quality Monitoring section.

Bacteria Monitoring Research Methods

Water samples for microbiological analysis are collected at all sites semi-monthly 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.

Applied Water Quality Standards

The Tribes are in the process of developing tribal water quality standards applicable to tribal lands. Until these 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 Department of Environmental Quality's website (http://www.deq.state.or.us/wq/wqrules/Div041/OAR340Div041.pdf).

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 Parameter

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 datasets to the Coos Watershed Association (www.cooswatershed.org) and the Siuslaw Watershed Council (www.siuslaw.org) to assist in the development of grant proposals and restoration projects. Data was also provided to Greene Point Consulting to assist in a wetland project on the North Fork Siuslaw River.

Outside Lab Support

No outside lab support was utilized during this reporting period.

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.

August 2006 Continuous Data Summary
North Fork Siuslaw Sonde

Stats	Temp	SpCond	Sal	DO pct	DO mg/l	Depth	pH	Turb
Q3	18.80	39.59	25.30	101.03	8.50	3.02	7.70	4.00
Max	21.20	50.26	32.80	153.10	13.20	4.08	8.40	522.00
Median	17.60	34.62	21.80	85.25	7.20	2.50	7.50	3.00
Min	11.00	15.21	8.90	46.70	4.10	1.00	6.90	1.00
Q1	16.20	28.77	17.80	72.10	6.10	1.98	7.20	3.00
Mean	17.37	33.99	21.45	88.72	7.48	2.49	7.48	4.05
Std Dev	1.99	7.56	5.20	21.38	1.79	0.68	0.33	15.47

Fig.1 Turb and D.O. data summarized in this table reflect the effect of outliers on the mean and the median

Measure of Skewness

The continuous water quality monitoring data collected by our program tend to be skewed, meaning that data sets are not symmetrical around the mean or median, with extreme values extending out longer in one direction. Figures 2-4 illustrate the potential skewness of our data. When extreme values extend the right tail of distribution, as they do in figures 1 & 2, the data are said to be skewed to the right, or positively skewed. Left skewness, when the tail extends to the left as in figure 4, is called negative skew.

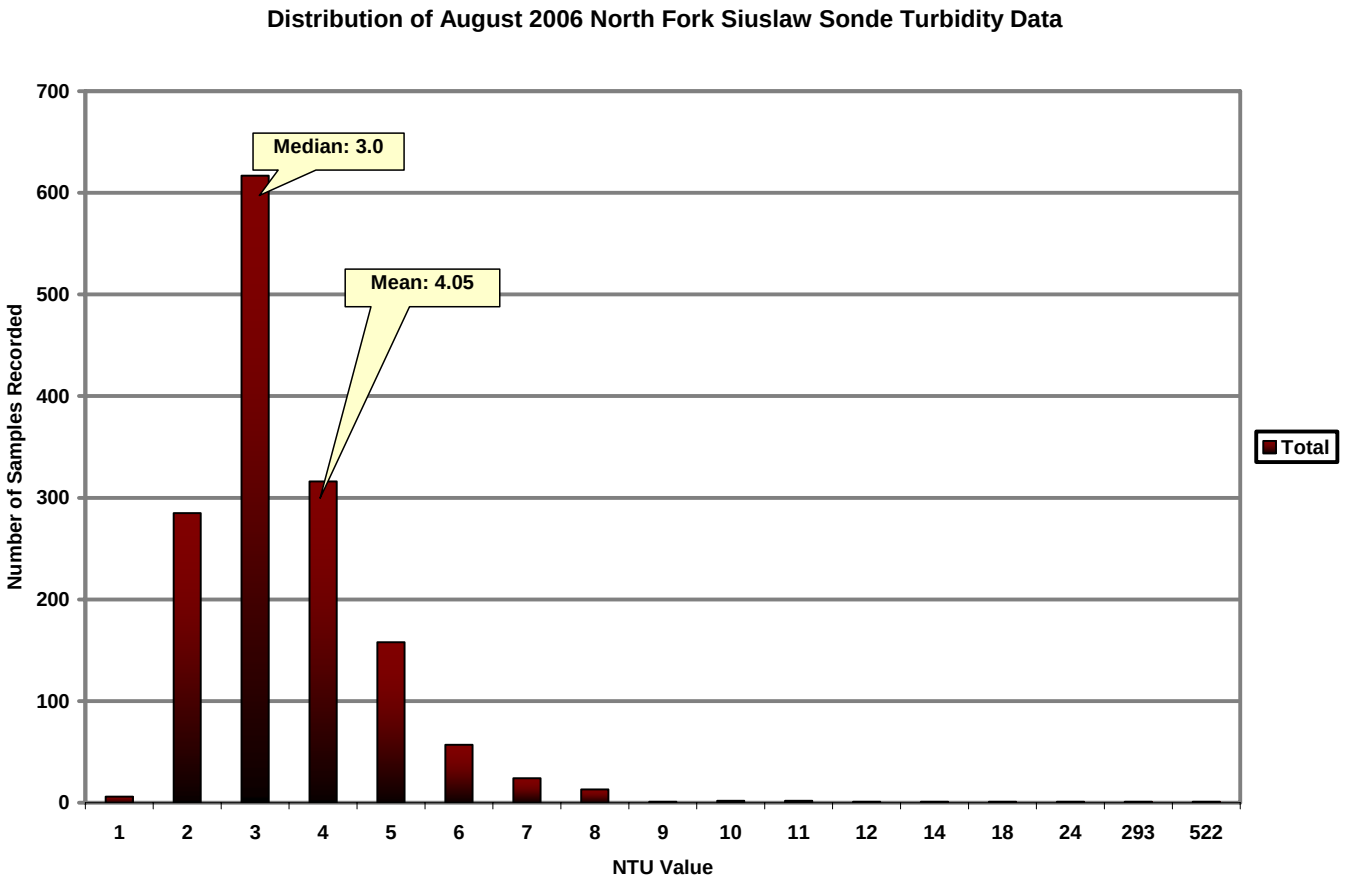


Fig. 2

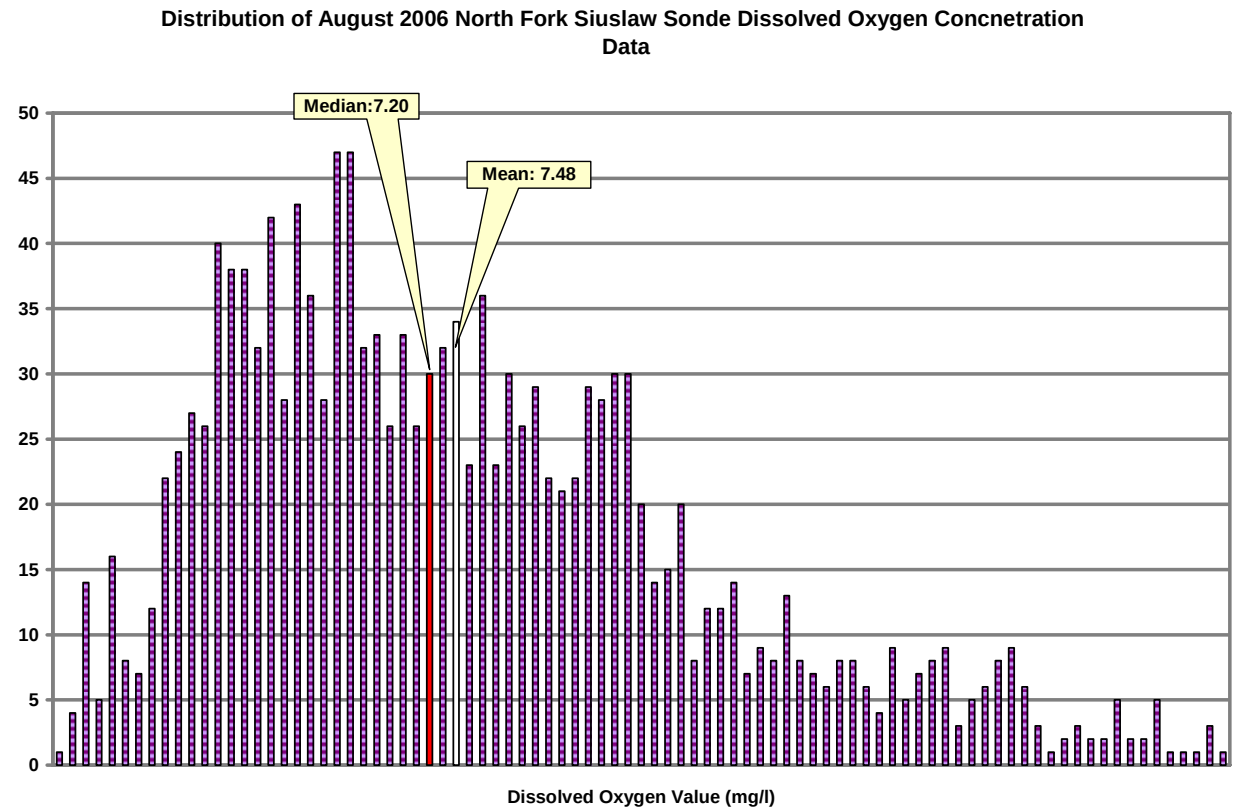

Distribution of August 2006 North Fork Siuslaw Sonde Dissolved Oxygen Concnetration Data
Median:7.20
Mean: 7.48
50
45
40
35
30
25
20
15
10
5
0
Dissolved Oxygen Value (mg/l)

Fig. 3

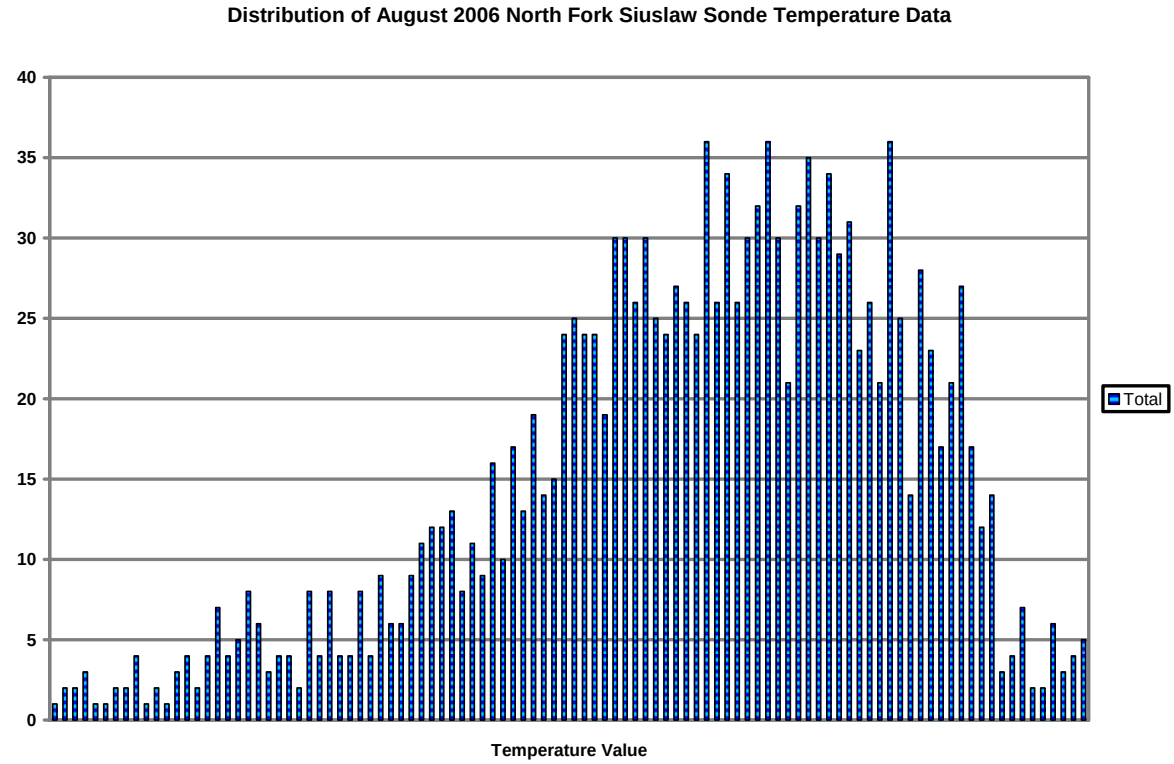

Distribution of August 2006 North Fork Siuslaw Sonde Temperature Data
40
35
30
25
20
15
10
5
0
Total
Temperature Value

Fig. 4

When the data are skewed the mean is not expected to equal the median, but is pulled toward the tail of distribution (Fig. 1 & 2). Thus for positive skewness (Fig. 1 & 2) the mean exceeds more than 50 percent of the data (Fig. 1). The standard deviation is also inflated by data in the tail (Fig.1). Therefore, tables of summary statistics which include only the mean and standard deviation may not describe the majority of the data very well because both will be inflated by outliers. For this reason, summary tables like those presented in this report, which include the median and other percentiles, have greater applicability to potentially skewed data sets. Skewed data also call into question the applicability of hypothesis tests which are based on assumptions that the data have a normal distribution. These tests, called parametric tests, may be of questionable value when applied to skewed data sets and it is best to determine sooner rather than later whether or not these tests apply.

Interquartile Range

The interquartile range (IQR) is a commonly used resistant measure of spread. It measures the range of the central 50 percent of the data, and is not influenced at all by the 25 percent on the other end. The IQR is defined as the 75^{th} percentile minus the 25^{th} percentile. The 75^{th}, 50^{th} (median) and 25^{th} percentiles split the data into four equal-sized quarters. The 75^{th} percentile (also called the upper quartile or Q3) is a value that exceeds no more than 75 percent of the data and is exceeded by no more than 25 percent of the data. The 25^{th} percentile (also called the lower quartile or Q1) is a value that exceeds no more than 25 percent of the data and is exceeded by no more than 75 percent.

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 boxplots.

Boxplots 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 boxplots do not present all of the data, presenting all of the data is more detail than is necessary for the purposes of this report. Boxplots presented in this report provide concise visual summaries of essential data characteristics. The format of the boxplots 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 (Fig. 5). Thus a large amount of information is contained in a very concise illustration.

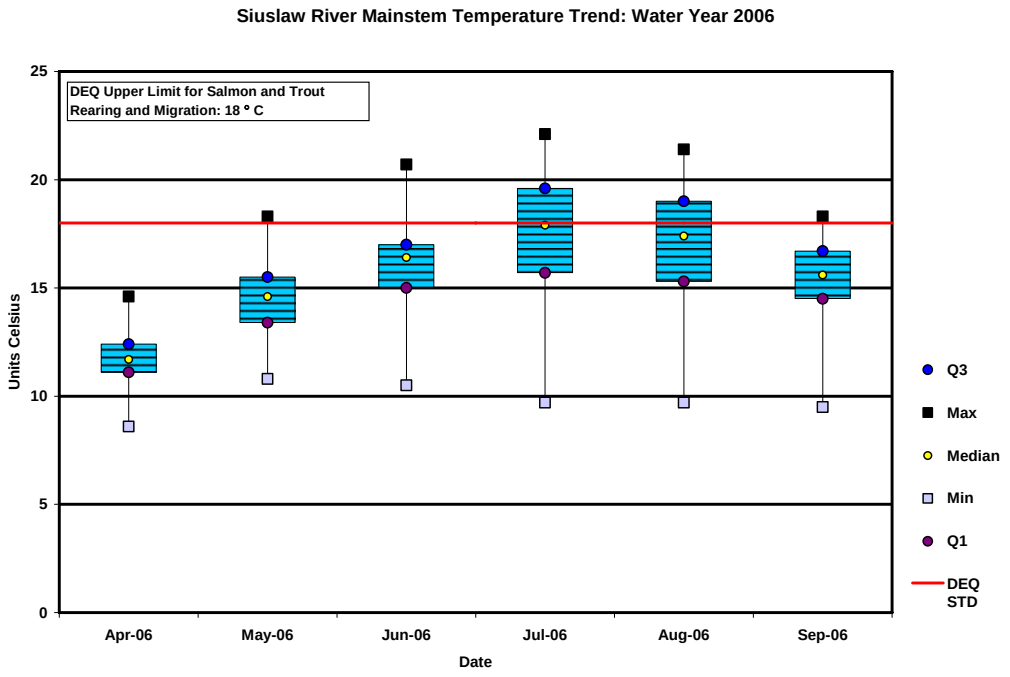


Fig. 5

Boxplots effectively illustrate the characteristics of data for a single variable, and accentuate outliers for further inspection.

Discrete Data

In previous reports we have used overlapping histograms to display our discrete sample data. However, upon reading USGS technical reports, we have learned that overlapping histograms are not recommended for the display of water quality data such as these because histograms provide poor visual discrimination among multiple data sets. It is for this reason that we have chosen to display those discrete water quality monitoring data collected by our program in a line graph format.

Coded Variable Code Definitions

Sampling Station:	Sampling Site Code	Station Code
North Fork Siuslaw Sonde	WQE12	CTCNFWQ
Mainstem Siuslaw Sonde	WQE09	CTCSIWQ
BLM Dock Sonde	WQE10	CTCEDWQ
Kentuck Slough Grab	WQE03	CTCKSWQ
Sixes River Grab	WQS07	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 Dock, KS = Kentuck Slough, 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:** These are other instances in which the data must be examined before absolute rejection. In the second phase we are recommending that each deployment study be evaluated at the site for anomalies prior to submission of data for inclusion in 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.

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]

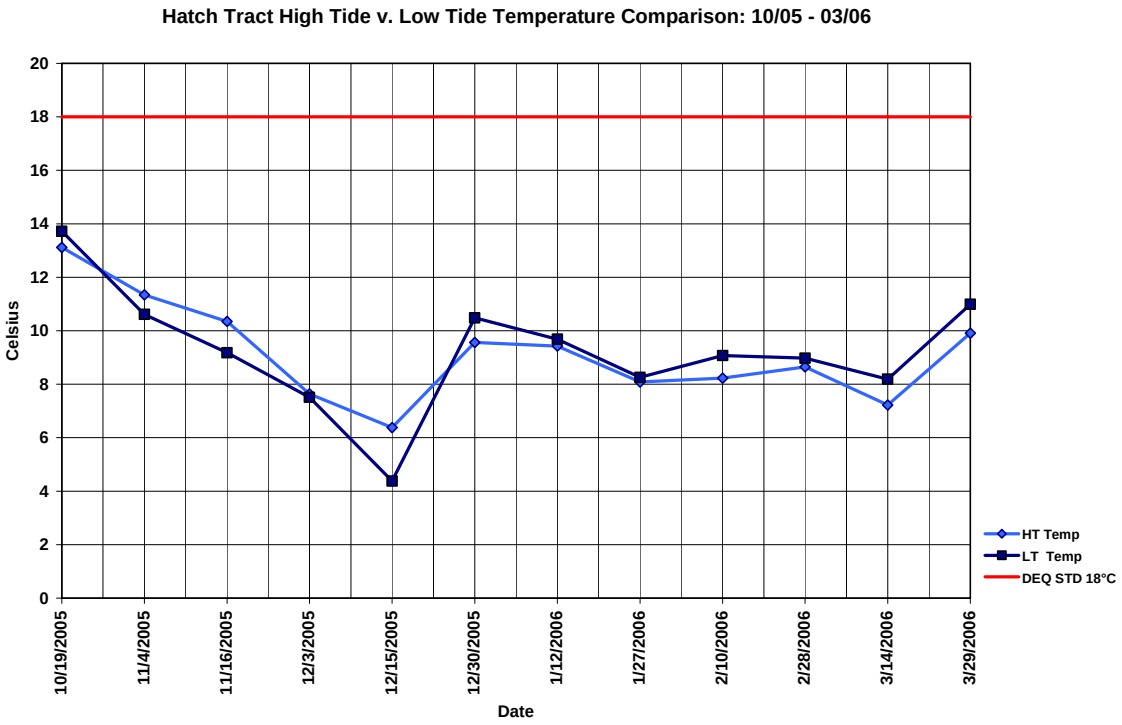
In April 2006, CTCLUSI discontinued discrete monitoring at the Hatch Tract Hwy 126 bridge location and established a permanent continuous monitoring station upriver approximately 600ft from the bridge site.

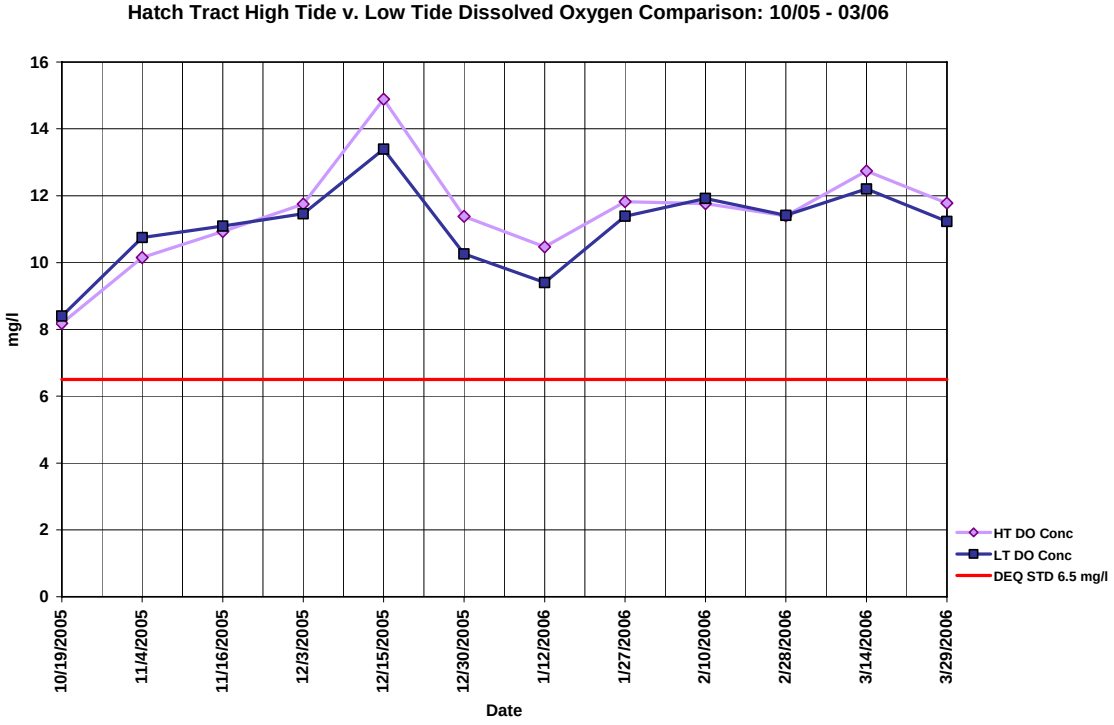
The North Fork Siuslaw sonde station is located in the Lower North Fork Siuslaw watershed approximately 6 river miles from the mouth of the Siuslaw River and within river mile one of the Lower North Fork Siuslaw River. Water quality at this site is both tidally influenced and watershed driven. The Lower 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.

The following graphs and tables display both the discrete and continuous water year 2006 monitoring data collected by our program at these sites. The first set of graphs compare the discrete high tide and low tide data collected at the Hatch Tract bridge site and relate these data to state established water quality standards. The second set of graphs and tables were generated from data collected at the North Fork Siuslaw sonde station.

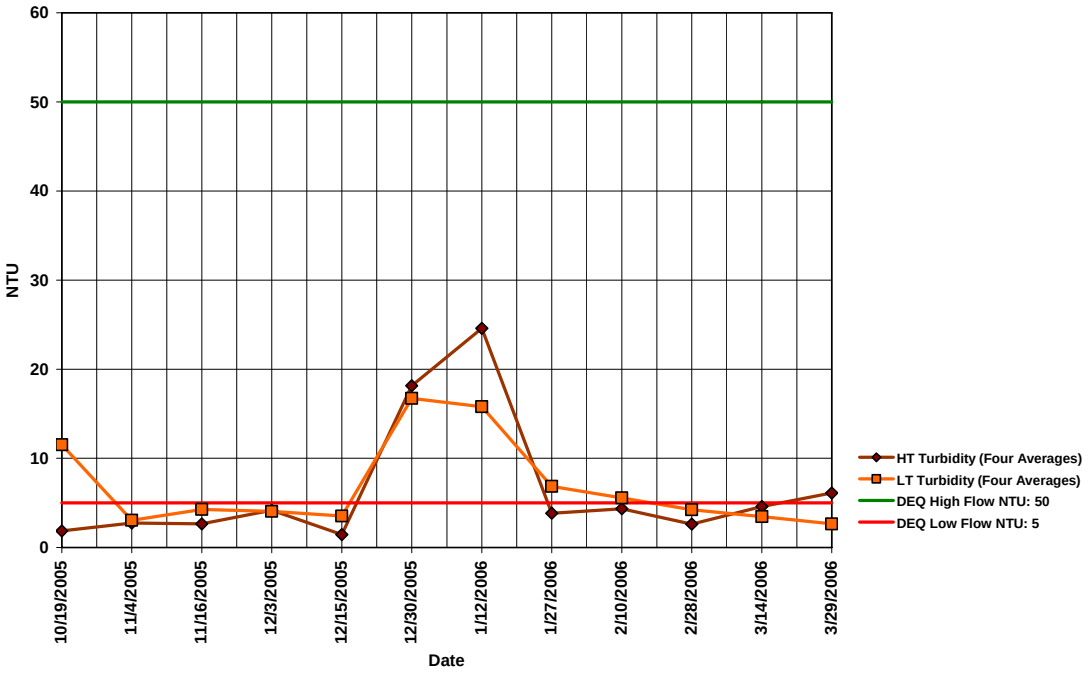
* *Contamination can cause the sonde's Turbidity Probe zero calibration to be off by +5 to +8 NTUs. So when the probe really experiences zero turbidity, the values are -5 to -8 NTU. Due to this known small calibration error possibility, small negative turbidity values are kept in the data file and documented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

Discrete Monitoring Data Analysis – Hatch Tract Bridge

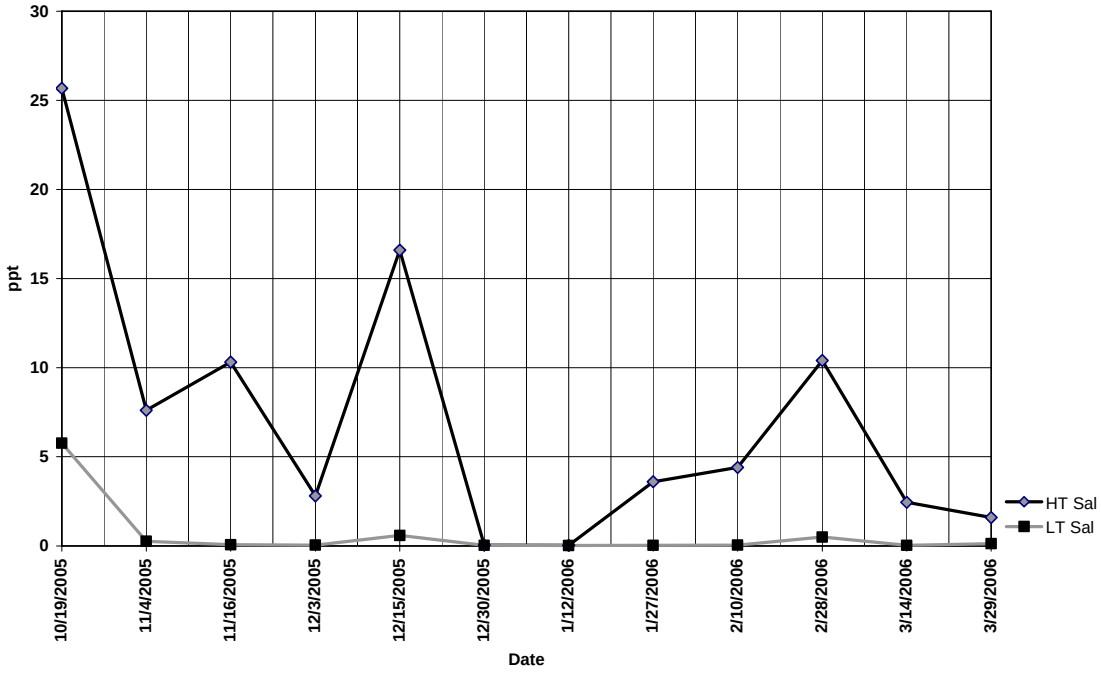




Hatch Tract High Tide v. Low Tide Turbidity Grab Sample Comparison: 10/05-03/06



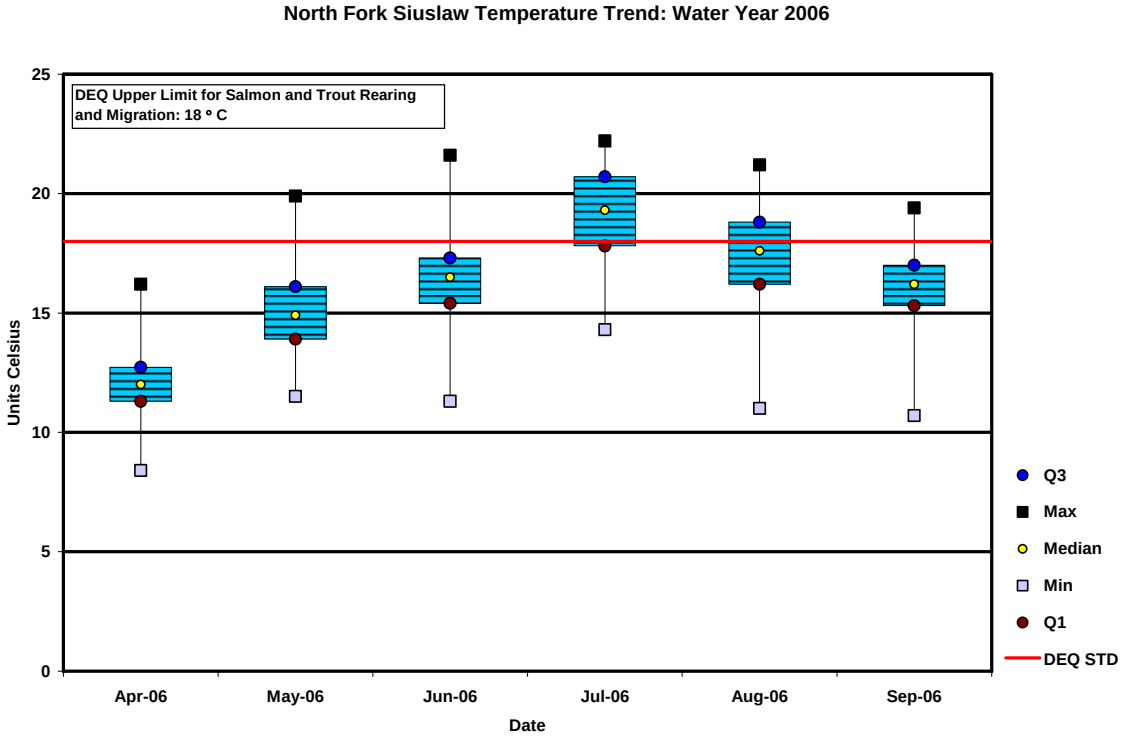
Hatch Tract High Tide v. Low Tide Salinity Comparison: 10/05-04/06



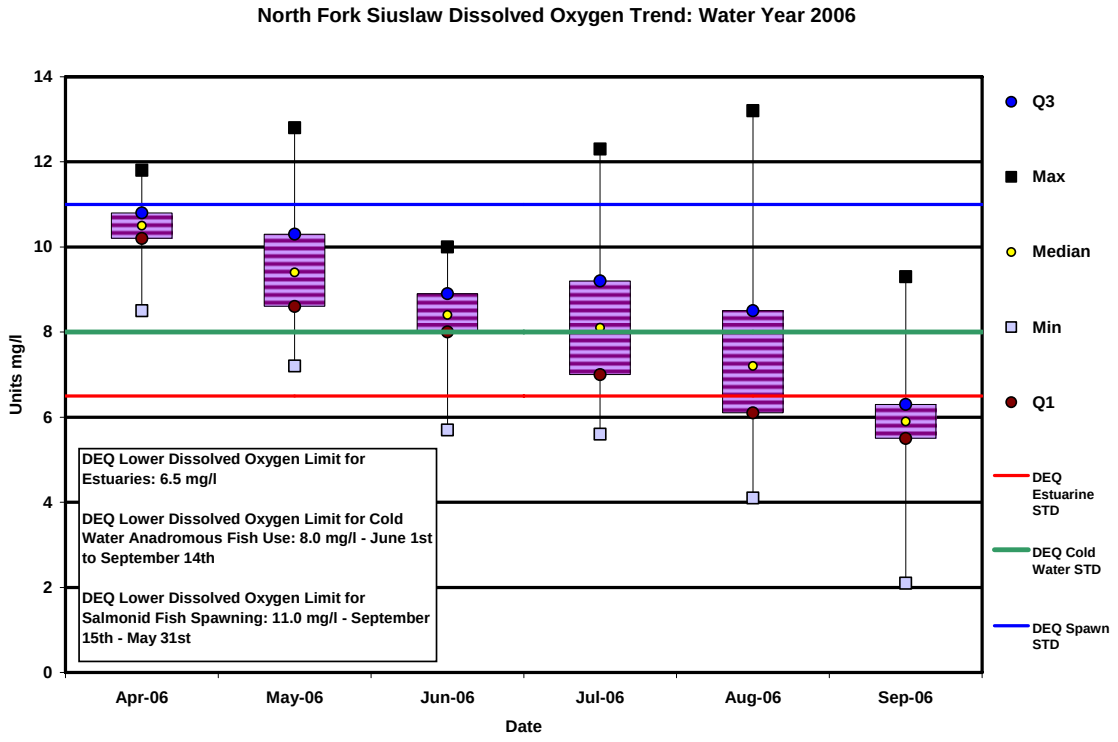
North Fork Siuslaw Continuous/Sonde Data Analysis

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 boxplot (Boxplot 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.

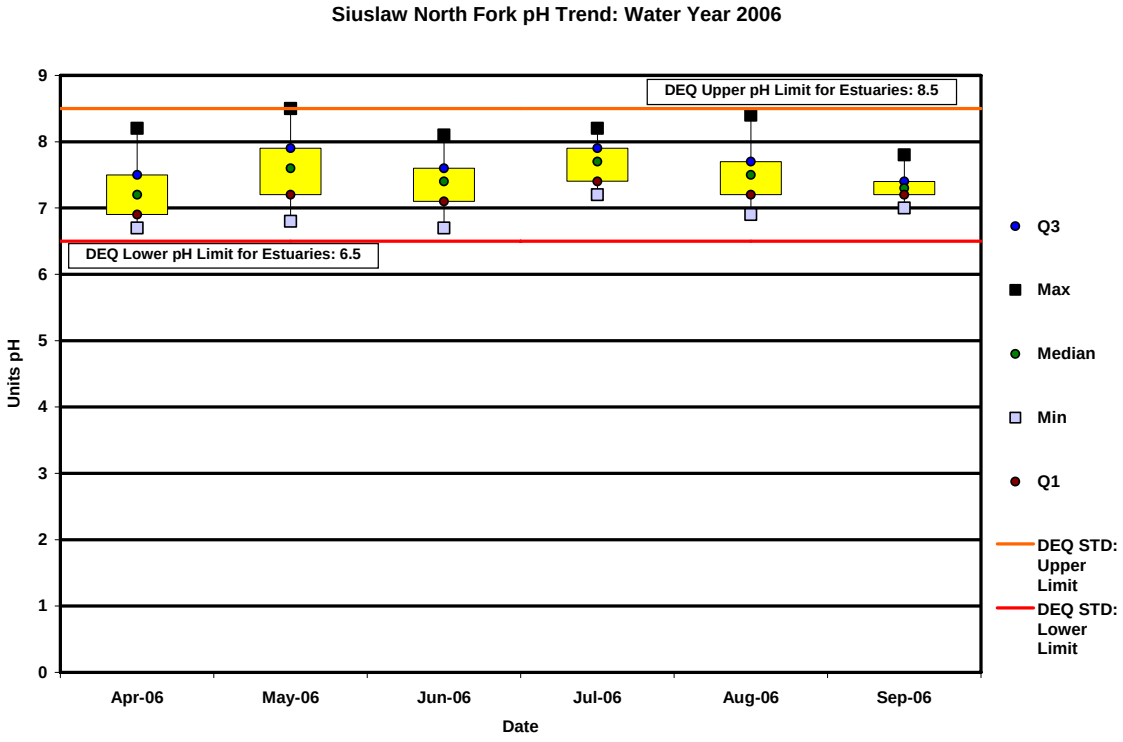
In addition to supporting the 303(d) listing for the site, dissolved oxygen data collected at the site indicate an additional impairment to water quality is occurring at the site. Although the Mainstem Siuslaw River is 303(d) listed from river mile 5.7 to 105.9 as impacting the designated beneficial 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 (Boxplot 2). Because there is an ODEQ standard for pH in estuaries, we generated a boxplot (Boxplot 3) displaying pH data collected at the site. No impairments to water quality associated with pH appear to be occurring at the site.



Boxplot 1.



Boxplot 2.



Boxplot 3.

Monthly North Fork Temperature °C: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	12.7	16.1	17.3	20.7	18.8	17.0
Max	16.2	19.9	21.6	22.2	21.2	19.4
Median	12.0	14.9	16.5	19.3	17.6	16.2
Min	8.4	11.5	11.3	14.3	11.0	10.7
Q1	11.3	13.9	15.4	17.8	16.2	15.3
Mean	12.0	15.0	16.4	19.2	17.4	16.1
Std Dev	1.27	1.57	1.75	1.79	1.99	1.42

Monthly North Fork Dissolved Oxygen Concentration mg/l: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	10.8	10.3	8.9	9.2	8.5	6.3
Max	11.8	12.8	10.0	12.3	13.2	9.3
Median	10.5	9.4	8.4	8.1	7.2	5.9
Min	8.5	7.2	5.7	5.6	4.1	2.1
Q1	10.2	8.6	8.0	7.0	6.1	5.5
Mean	10.5	9.5	8.4	8.2	7.5	5.9
Std Dev	0.51	1.12	0.78	1.57	1.79	0.86

Monthly North Fork pH: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	7.5	7.9	7.6	7.9	7.7	7.4
Max	8.2	8.5	8.1	8.2	8.4	7.8
Median	7.2	7.6	7.4	7.7	7.5	7.3
Min	6.7	6.8	6.7	7.2	6.9	7.0
Q1	6.9	7.2	7.1	7.4	7.2	7.2
Mean	7.3	7.6	7.4	7.7	7.5	7.3
Std Dev	0.38	0.42	0.34	0.31	0.33	0.17

Monthly North Fork Salinity ppt: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	5.6	16.9	16.2	23.7	25.3	26.1
Max	27.9	28.2	31.5	29.4	32.8	32.7
Median	1.6	10.1	9.4	20.2	21.8	23.2
Min	0.0	0.2	0.1	9.3	8.9	11.0
Q1	0.2	4.6	3.6	16.1	17.8	19.2
Mean	4.1	11.1	10.8	19.7	21.5	22.6
Std Dev	5.69	7.87	8.36	5.06	5.20	4.88

Monthly North Fork Turbidity NTU: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	4.0	4.0	4.0	4.0	4.0	4.0
Max	330.0	14.0	218.0	8.0	522.0	743.0
Median	3.0	3.0	3.0	3.0	3.0	3.0
Min	0.0	0.0	0.0	2.0	1.0	0.0
Q1	2.0	2.0	2.0	3.0	3.0	2.0
Mean	3.8	2.9	3.0	3.6	4.0	3.9
Std Dev	9.57	1.83	6.24	1.12	15.47	19.76

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 2006. 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 2006 at this site have exceeded either of these criteria.

North Fork Siuslaw *E. coli* Data: Water Year 2006

Sample Date	Sample ID	Analyte	MPN/100mL Undiluted Sample
5/18/06	NFLT	E. coli.	40.9
6/16/06	NFLT	E. coli.	41.3
7/28/06	NFLT	E. coli.	20.2
8/11/06	NFLT	E. coli.	20.2
8/24/06	NFHT	E. coli.	< 10.0
9/7/06	NFHT	E. coli.	10
9/27/06	NFLT	E. coli.	10

North Fork Siuslaw *Enterococcus* Data: Water Year 2006

Sample Date	Sample ID	Analyte	MPN/100mL Undiluted Sample
5/18/06	NFLT	Enterococci	< 10.0
7/28/06	NFLT	Enterococci	10
8/11/06	NFLT	Enterococci	< 10.0
8/24/06	NFHT	Enterococci	< 10.0
9/7/06	NFHT	Enterococci	< 10.0
9/27/06	NFLT	Enterococci	< 10.0

NFLT = North Fork Low Tide
NFHT = North Fork High Tide

2) <u>Siuslaw River Mainstem (WQE09)</u> [43.974167, 124.071111–Siuslaw Watershed]

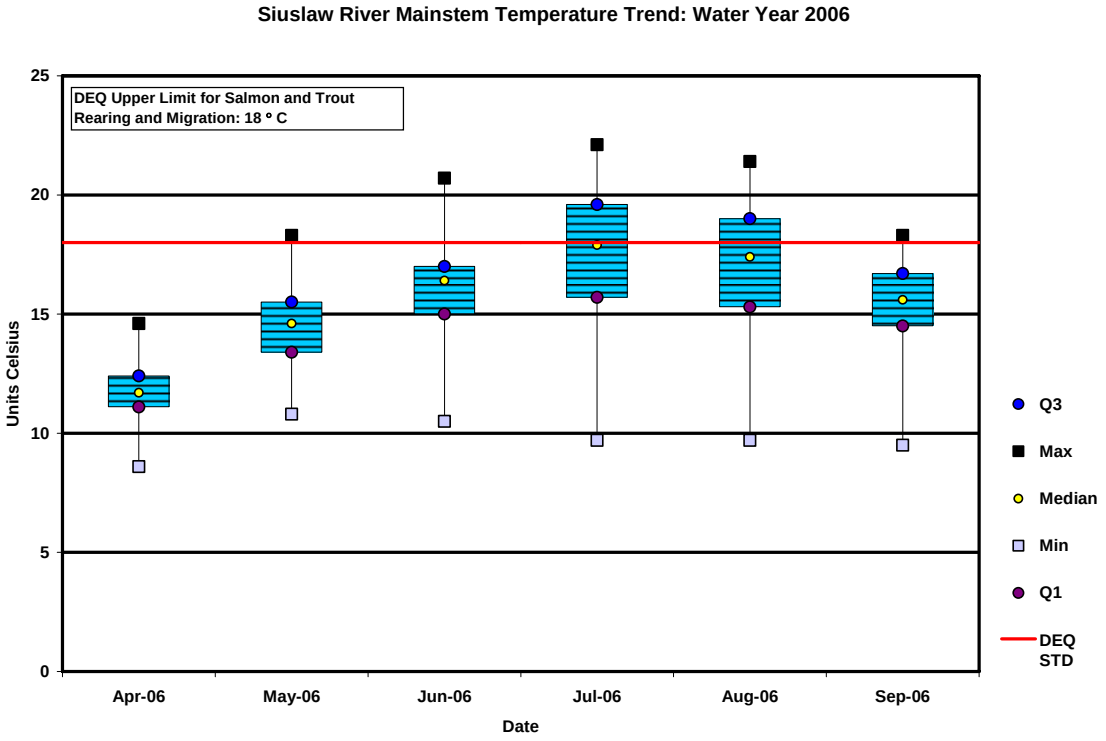
The Siuslaw River sonde station is located in the Siuslaw River Mainstem approximately 7 river miles from the mouth of the Siuslaw River. Water quality at this site is both tidally influenced and watershed driven. This sonde station is also located within the Siuslaw Estuary. The Siuslaw River is 303(d) 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.

* *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.*

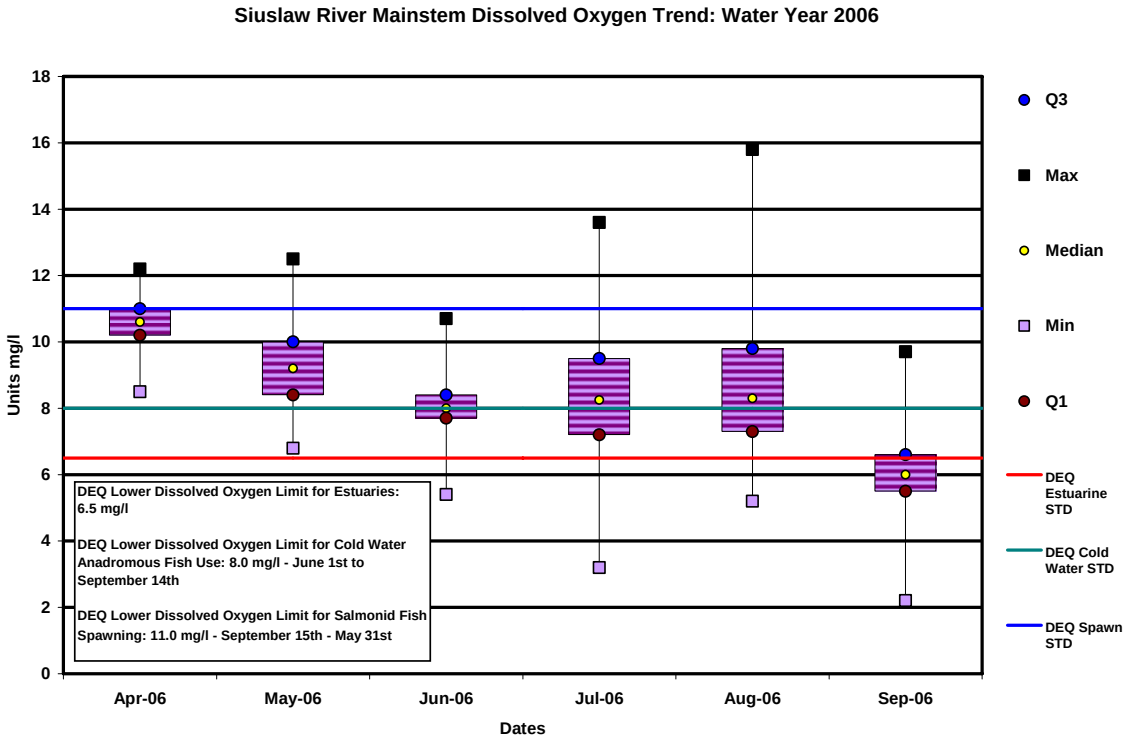
Siuslaw River Mainstem Continuous/Sonde Data Analysis

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. Those data presented in the temperature boxplot (Boxplot 4) indicate that the majority of continuous temperature data collected at CTCLUSI's Siuslaw River Mainstem 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 Siuslaw River Estuary and Mainstem.

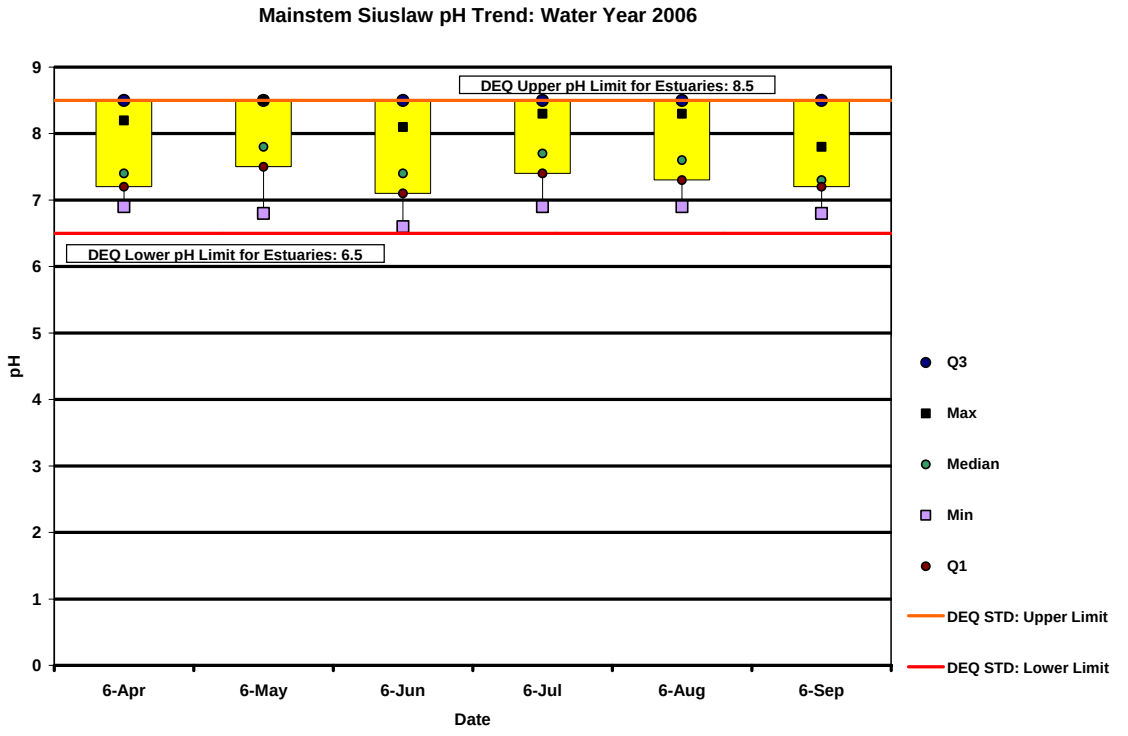
In addition to supporting the 303(d) listing for temperature at the site, dissolved oxygen data collected at the site support the additional 303(d) listing for dissolved oxygen at this site. Our initial analysis of continuous data collected by our program at this site supports the seasonal impairments to water quality associated with dissolved oxygen listed for the Mainstem Siuslaw River (Boxplot 5). Because there is an ODEQ standard for pH in estuaries, we generated a boxplot (Boxplot 6) displaying pH data collected at the site. No impairments to water quality associated with pH appear to be occurring at the site.



Boxplot 4



Boxplot 5



Boxplot 6

Monthly Siuslaw Mainstem Temperature °C: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	12.4	15.5	17.0	19.6	19.0	16.7
Max	14.6	18.3	20.7	22.1	21.4	18.3
Median	11.7	14.6	16.4	17.9	17.4	15.6
Min	8.6	10.8	10.5	9.7	9.7	9.5
Q1	11.1	13.4	15.0	15.7	15.3	14.5
Mean	11.8	14.5	16.0	17.5	16.9	15.3
Std Dev	1.15	1.64	2.01	2.71	2.75	1.73

Monthly Siuslaw Mainstem Dissolved Oxygen Concentration mg/l: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	11.0	10.0	8.4	9.5	9.8	6.6
Max	12.2	12.5	10.7	13.6	15.8	9.7
Median	10.6	9.2	8.0	8.25	8.3	6.0
Min	8.5	6.8	5.4	3.2	5.2	2.2
Q1	10.2	8.4	7.7	7.2	7.3	5.5
Mean	10.6	9.3	8.0	8.5	8.7	5.9
Std Dev	0.67	1.05	0.67	1.61	1.94	1.22

Monthly Siuslaw Mainstem pH: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	7.9	8.0	7.7	7.9	7.8	7.4
Max	8.2	8.5	8.1	8.3	8.3	7.8
Median	7.4	7.8	7.4	7.7	7.6	7.3
Min	6.9	6.8	6.6	6.9	6.9	6.8
Q1	7.2	7.5	7.1	7.4	7.3	7.2
Mean	7.5	7.7	7.4	7.6	7.6	7.3
Std Dev	0.37	0.36	0.35	0.31	0.33	0.20

Monthly Siuslaw Mainstem Salinity ppt: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	12.3	21.5	21.5	24.9	27.7	27.5
Max	30.6	30.8	32.8	33.1	34.2	33.9
Median	3.8	14.2	13.3	19.6	23.0	24.3
Min	0.0	0.1	0.1	6.9	11.6	16.1
Q1	0.3	7.1	6.5	14.7	18.6	20.6
Mean	7.4	14.4	14.1	19.8	23.2	24.3
Std Dev	8.31	8.38	8.69	6.65	5.78	4.44

Monthly Siuslaw Mainstem Turbidity NTU: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	4.0	3.0	3.0	35.5	6.0	4.0
Max	15.0	512.0	13.0	1000.0	39.0	498.0
Median	3.0	2.0	2.0	3.0	6.0	3.0
Min	0.0	*-2.0	0.0	0.0	1.0	*-2.0
Q1	2.0	0.0	2.0	2.0	3.0	2.0
Mean	2.9	2.0	2.2	99.8	4.9	3.8
Std Dev	1.68	13.38	1.10	213.24	2.26	16.21

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 2006. 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 2006 at this site have exceeded either of these criteria.

Siuslaw Mainstem *E.coli* Data: Water Year 2006

Sample Date	Sample ID	Analyte	MPN/100mL
5/18/06	MSLT	E. coli.	< 10.0
6/16/06	MSLT	E. coli.	10
6/28/06	MSLT	E. coli.	< 10.0
7/28/06	MSLT	E. coli.	10
8/11/06	MSLT	E. coli.	10
8/24/06	MSHT	E. coli.	< 10.0
9/7/06	MSHT	E. coli.	< 10.0
9/27/06	MSLT	E. coli.	20.2

Siuslaw Mainstem *Enterococcus* Data: Water Year 2006

Sample Date	Sample ID	Analyte	MPN/100mL
5/18/06	MSLT	Enterococci	< 10.0
7/28/06	MSLT	Enterococci	< 10.0
8/11/06	MSLT	Enterococci	< 10.0
8/24/06	MSHT	Enterococci	< 10.0
9/7/06	MSHT	Enterococci	< 10.0
9/27/06	MSLT	Enterococci	< 10.0

MSLT = Siuslaw Mainstem Low Tide
MSHT = Siuslaw Mainstem High Tide

3) <u>BLM Boat Ramp (WQE10)</u> [43.398019, 124.286034 – Coos Watershed]

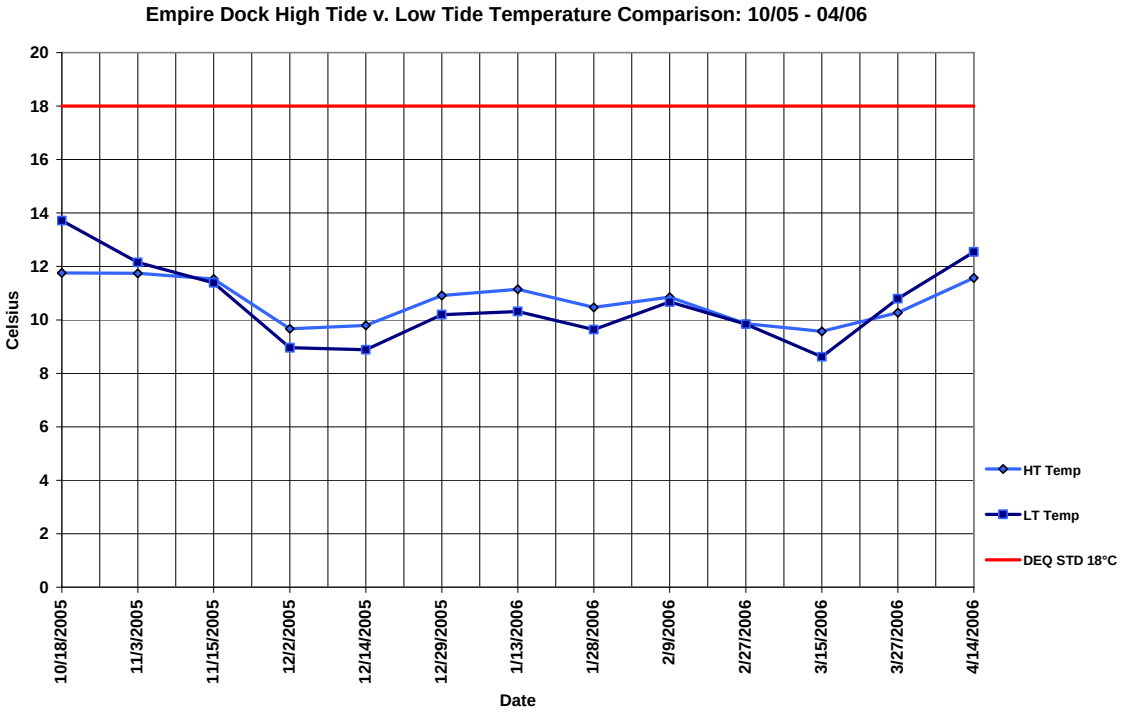
In April 2006, CTCLUSI discontinued discrete monitoring at the Empire Dock and established a permanent continuous monitoring station across the bay from the site adjacent to the local BLM managed boat ramp. The continuous monitoring station is located in the same area of the bay as the Empire Dock site and monitors the same body of water as that previously monitored at Empire Dock in lower Coos Bay.

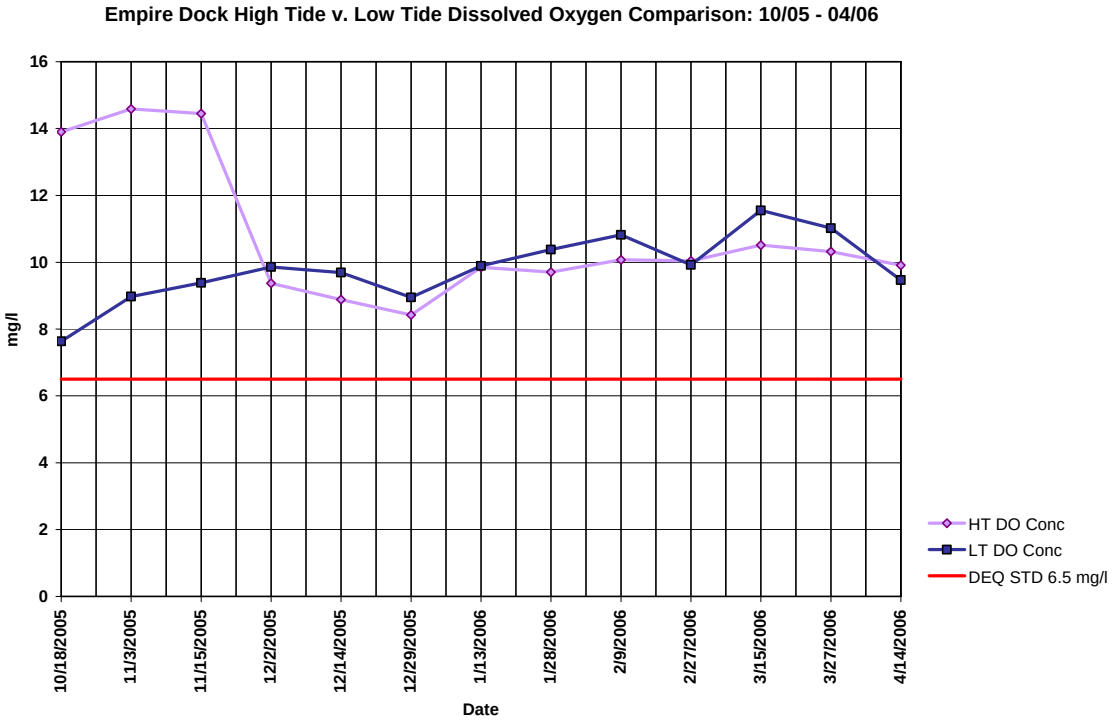
The BLM Sonde station is located approximately 6 river miles from the mouth of the Lower Coos Bay Estuary. This is a marine dominated site. The Coos Estuary and its watershed are located in the lowlands of the southwestern Oregon Coast Range. It is the largest Oregon estuary completely contained within 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.

The following graphs and tables display both the discrete and continuous water year 2006 monitoring data collected by our program. The first set of graphs compare the discrete high tide and low tide data collected at the Empire Dock site and relate these data to state established water quality standards. The second set of graphs and tables were generated from data collected at the BLM sonde station. Data collected at both the Empire Dock and BLM Boat Ramp site do not indicate impairments to water quality have been or are occurring at either site.

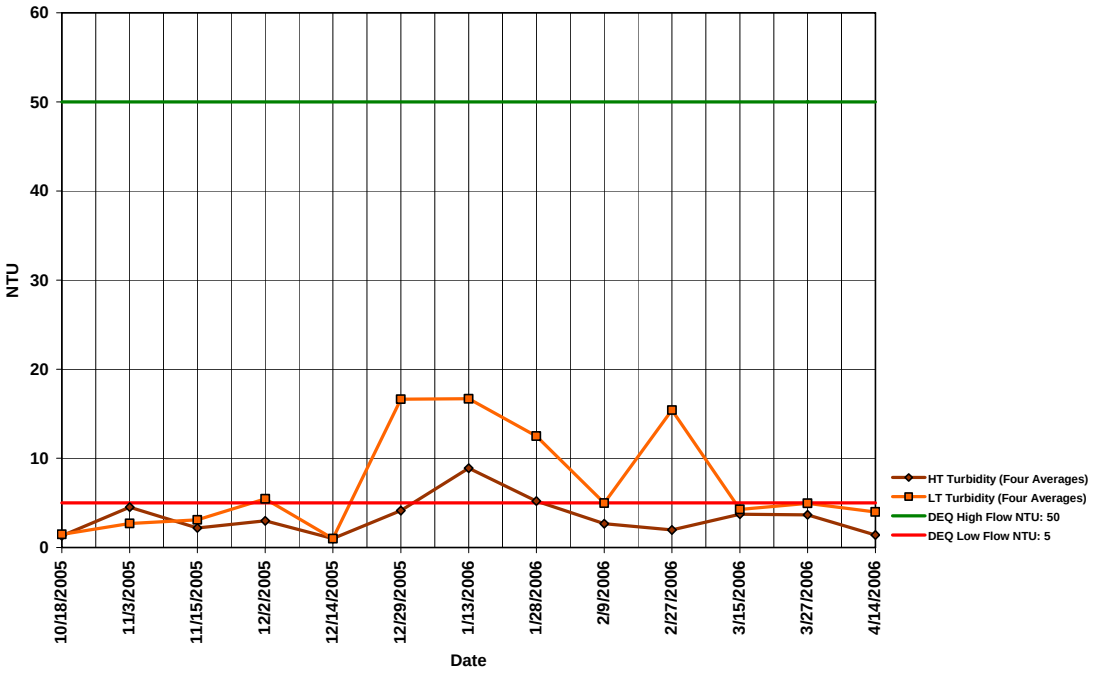
* *Contamination can cause the sonde's Turbidity Probe zero calibration to be off by +5 to +8 NTUs. So when the probe really experiences zero turbidity, the values are -5 to -8 NTU. Due to this known small calibration error possibility, small negative turbidity values are kept in the data file and documented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

Discrete Monitoring Data Analysis – Empire Dock

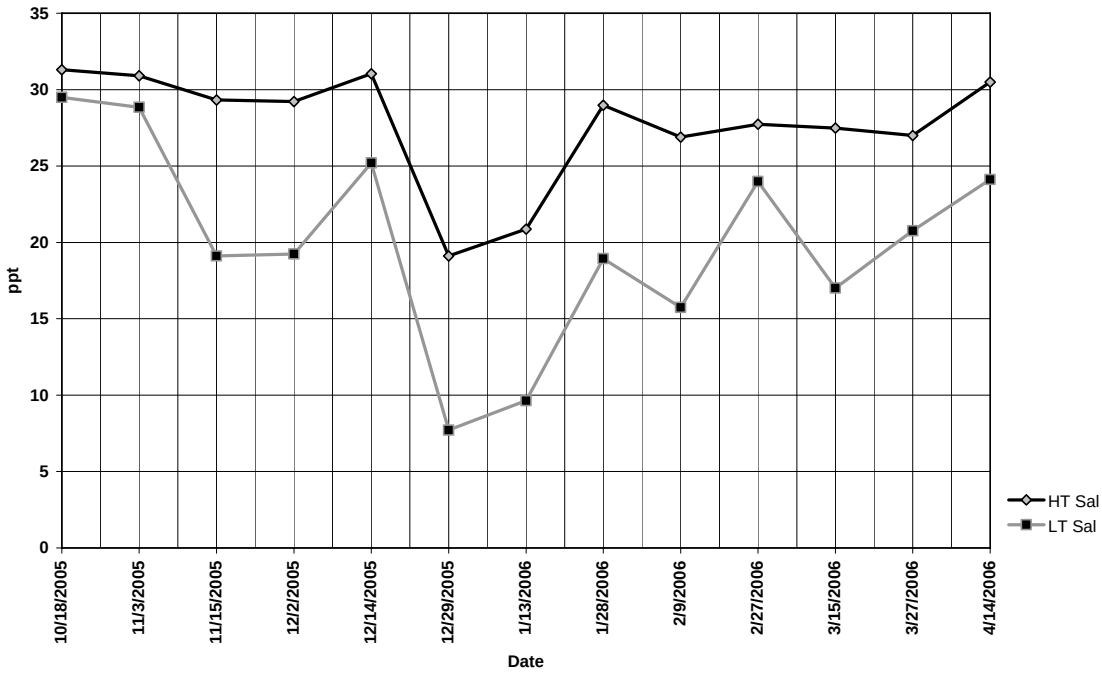




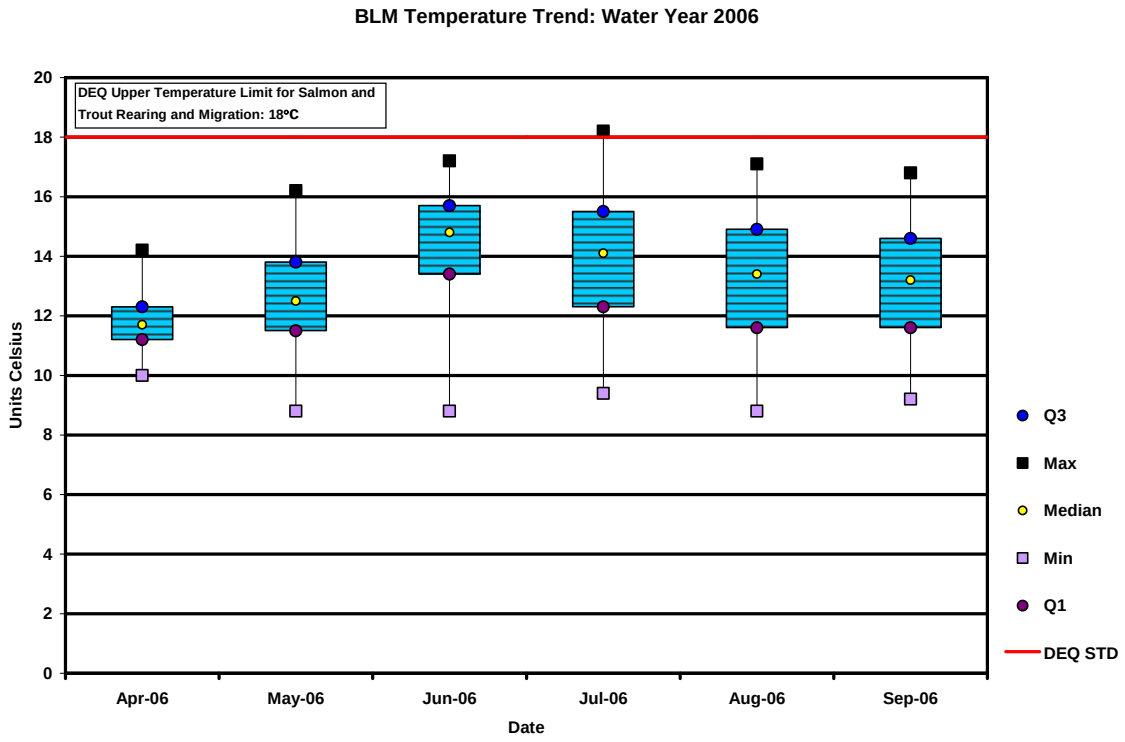
Empire Dock High Tide v. Low Tide Turbidity Grab Sample Comparison: 10/05-04/06

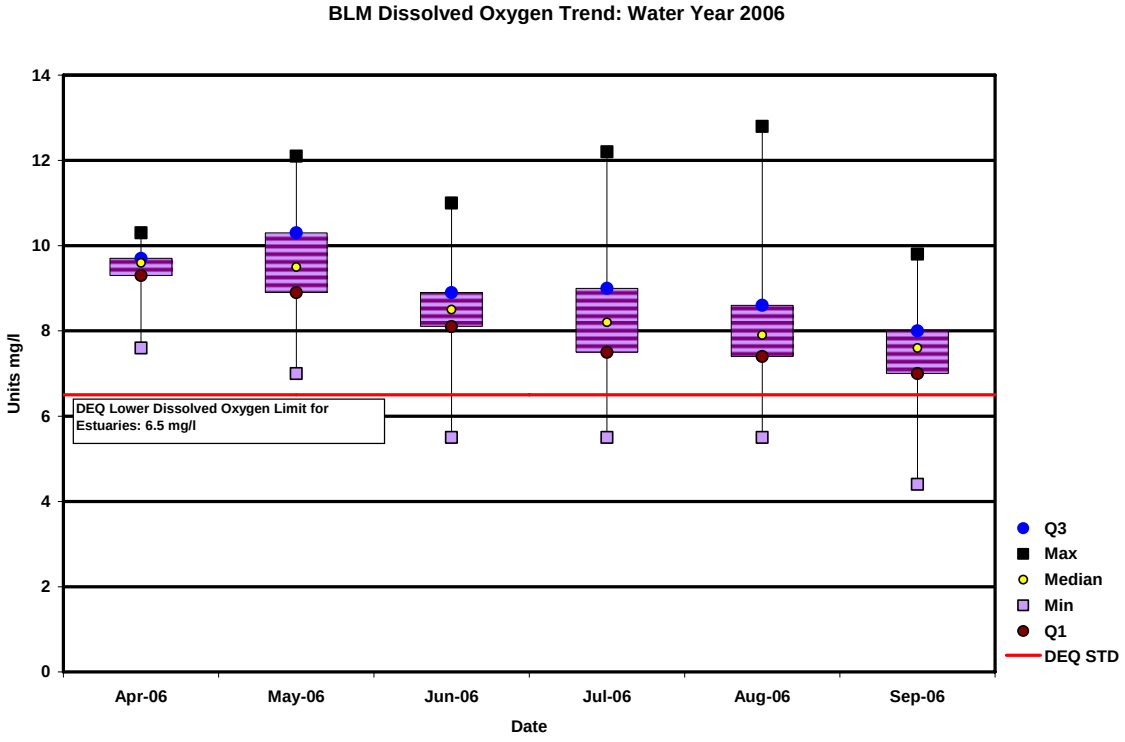


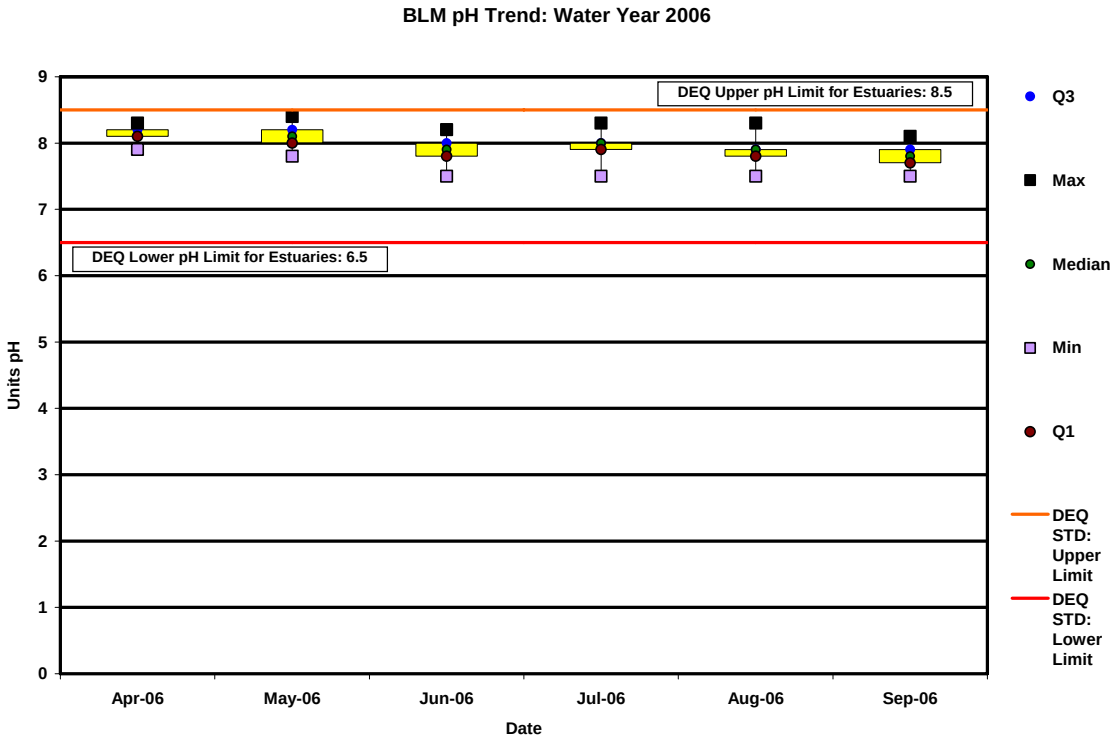
Empire Dock High Tide v. Low Tide Salinity Comparison: 10/05 - 04/06



BLM Continuous/Sonde Data Analysis






BLM pH Trend: Water Year 2006
DEQ Upper pH Limit for Estuaries: 8.5
DEQ Lower pH Limit for Estuaries: 6.5
Units pH
9
8
7
6
5
4
3
2
1
0
Apr-06
May-06
Jun-06
Jul-06
Aug-06
Sep-06
Date
Q3
Max
Median
Min
Q1
DEQ STD: Upper Limit
DEQ STD: Lower Limit

Monthly BLM Temperature °C: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	12.3	13.8	15.7	15.5	14.9	14.6
Max	14.2	16.2	17.2	18.2	17.1	16.8
Median	11.7	12.5	14.8	14.1	13.4	13.2
Min	10.0	8.8	8.8	9.4	8.8	9.2
Q1	11.2	11.5	13.4	12.3	11.6	11.6
Mean	11.8	12.6	14.3	13.9	13.2	13.1
Std Dev	0.76	1.59	1.94	2.01	1.96	1.79

Monthly BLM Dissolved Oxygen Concentration mg/l: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	9.7	10.3	8.9	9.0	8.6	8.0
Max	10.3	12.1	11.0	12.2	12.8	9.8
Median	9.6	9.5	8.5	8.2	7.9	7.6
Min	7.6	7.0	5.5	5.5	5.5	4.4
Q1	9.3	8.9	8.1	7.5	7.4	7.0
Mean	9.5	9.6	8.5	8.3	8.1	7.5
Std Dev	0.43	0.94	0.61	1.05	1.05	0.81

Monthly BLM pH: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	8.2	8.2	8.0	8.0	7.9	7.9
Max	8.3	8.4	8.2	8.3	8.3	8.1
Median	8.1	8.1	7.9	8.0	7.9	7.8
Min	7.9	7.8	7.5	7.5	7.5	7.5
Q1	8.1	8.0	7.8	7.9	7.8	7.7
Mean	8.12	8.11	7.89	7.96	7.86	7.78
Std Dev	0.06	0.12	0.10	0.10	0.17	0.11

Monthly BLM Salinity ppt: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	28.9	31.4	31.4	32.7	33.8	33.7
Max	32.9	33.6	33.8	33.7	34.3	34.2
Median	25.4	29.6	29.7	32.0	33.4	33.4
Min	15.3	22.7	15.7	12.4	31.2	32.3
Q1	22.8	28.2	28.1	31.2	32.9	33.1
Mean	25.6	29.7	29.7	31.8	33.3	33.4
Std Dev	4.05	2.13	2.06	1.67	0.66	0.41

Monthly BLM Turbidity NTU: 2006

Statistics	6-Apr	6-May	6-Jun	6-Jul	6-Aug	6-Sep
Q3	4.0	5.0	5.0	17.6	3.0	2.0
Max	17.0	989.0	935.0	1000.0	572.0	42.0
Median	3.0	3.0	3.0	2.0	2.0	1.0
Min	1.0	1.0	*-1.0	*-1.0	0.0	0.0
Q1	2.0	3.0	2.0	1.0	2.0	1.0
Mean	3.7	4.6	17.8	160.1	3.3	1.8
Std Dev	2.14	25.70	77.37	313.73	14.95	2.07

BLM Boat Ramp 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 this site during water year 2006. 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 2006 at this site have exceeded either of these criteria.

BLM *E.coli* Data: Water Year 2006

Sample Date	Sample ID	Analyte	MPN/100mL Undiluted Sample
6/14/06	BLM	E. coli.	10
6/27/06	BLM	E. coli.	< 10.0
7/27/06	BLM	E. coli.	< 10.0
8/10/06	BLM	E. coli.	10
8/23/06	BLM LT	E. coli.	< 10.0
9/28/06	BLMHT	E. coli.	< 10.0

BLM *Enterococcus* Data: Water Year 2006

Sample Date	Sample ID	Analyte	MPN/100mL Undiluted Sample
7/27/06	BLM	Enterococci	< 10.0
8/10/06	BLM	Enterococci	< 10.0
9/6/06	BLMHT	Enterococci	< 10.0
9/28/06	BLMHT	Enterococci	< 10.0

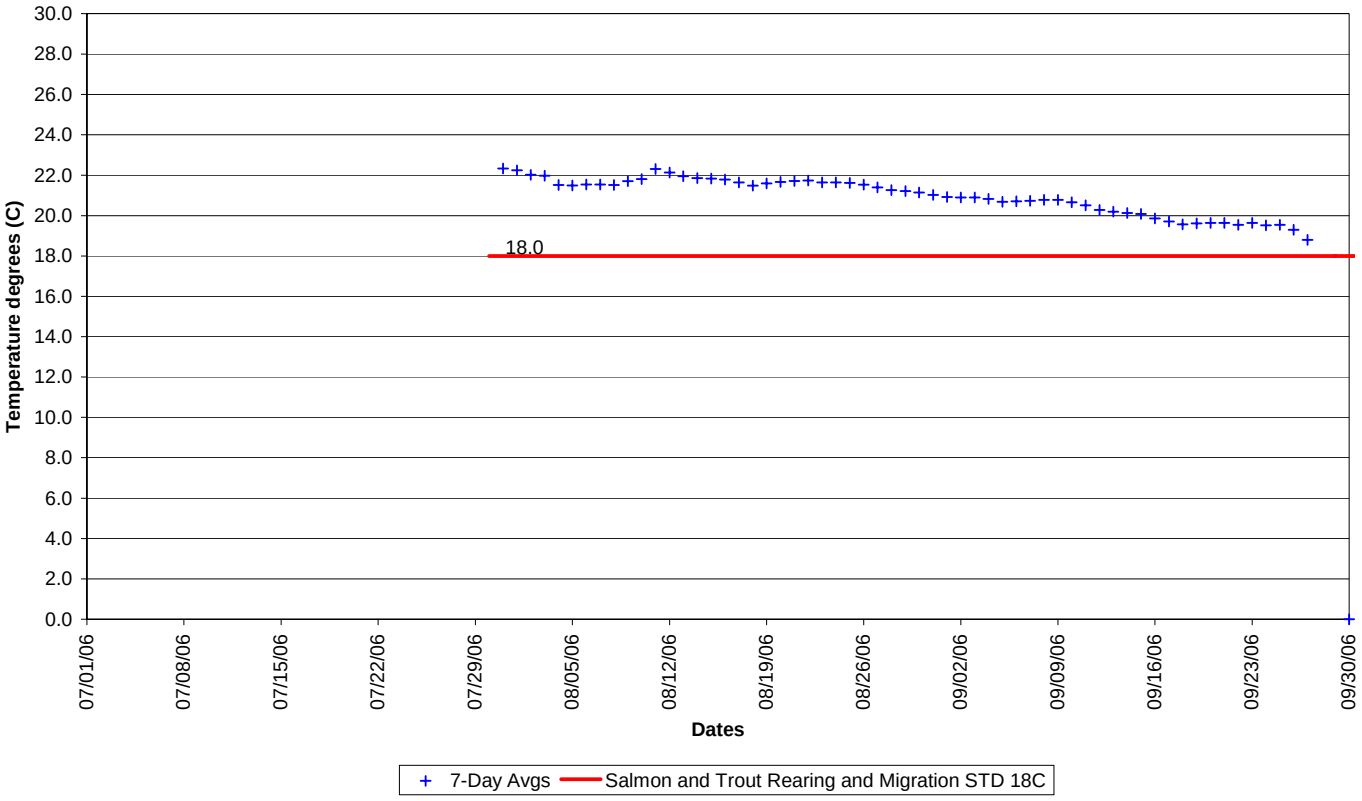
BLM LT = BLM Low Tide
BLM HT = BLM High Tide

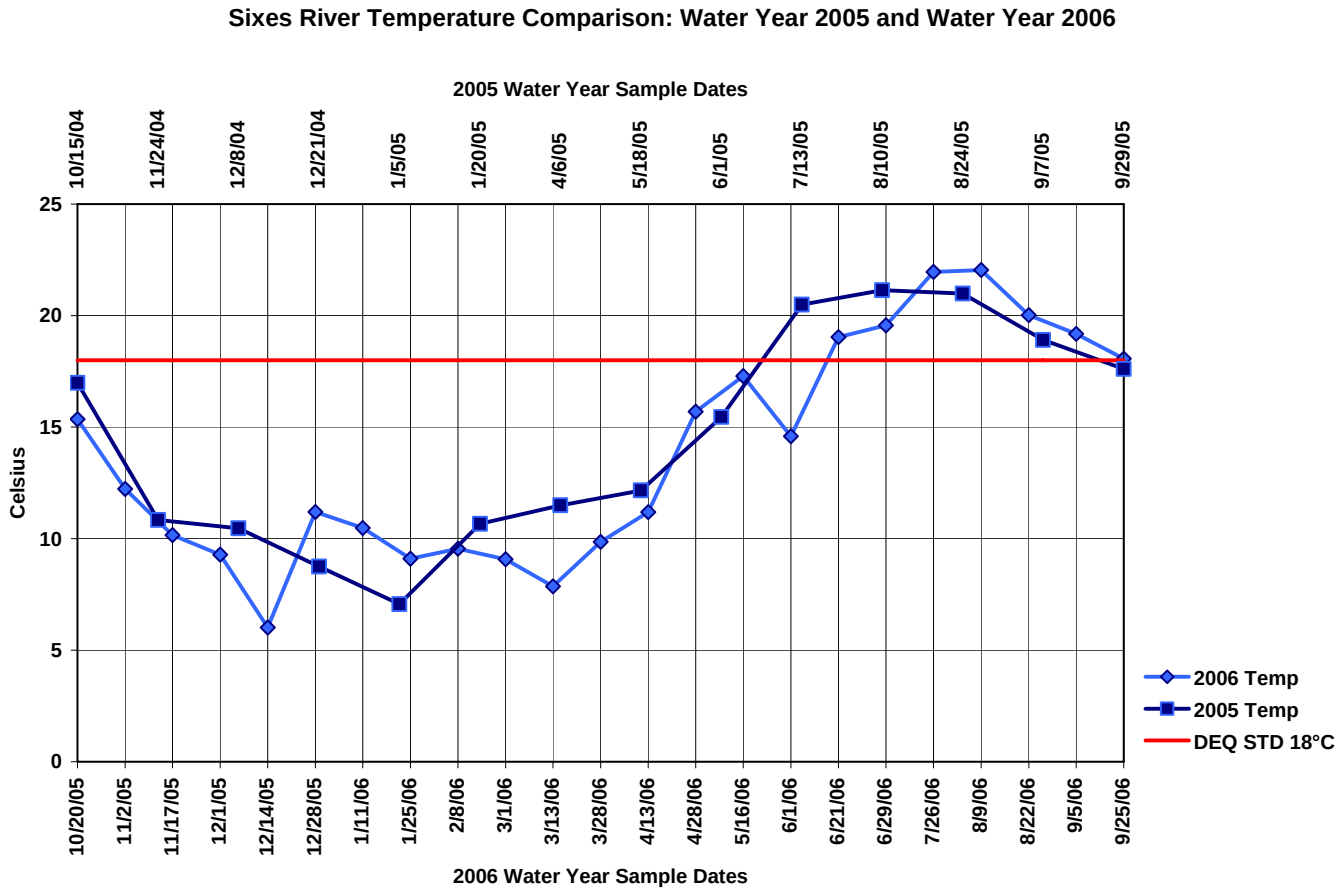
5) <u>Sixes River (WQS07)</u> [42.810972, 124.445361 – Sixes River Watershed]

The Sixes River stream monitoring site is located approximately 4 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 water Quality Monitoring under Sampling Protocols). 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.

The following graphs attempt to compare baseline trends emerging from the nearly two years of data collected semi-monthly at the Tribes' Sixes River sampling location. Each graph compares discrete data collected for each parameter throughout the entire water year. Although these are discrete data, we have created line graphs in an attempt to facilitate the quick visual identification of emerging baseline patterns occurring within and between water years 2005 and 2006 while simultaneously comparing these data to ODEQ standards.

In addition to the semi-monthly sampling, CTCLUSI deploys an automated VEMCO temperature datalogger at this site during summer months. The VEMCOs are used for long – term deployment and record the temperature at the site at 30 minute intervals. VEMCO data collected by our program in the summer of 2006 have were viewed and summarized using an ODEQ developed MS Excel macro called HYDROSTAT_Simple.xls.

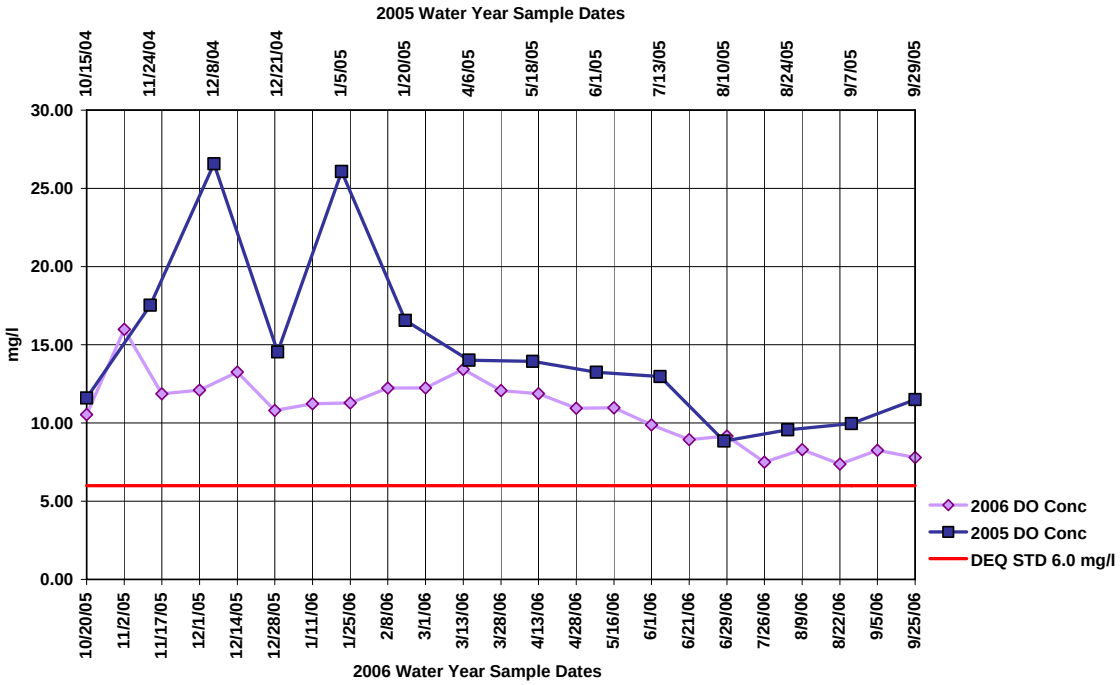

Sixes River Summer 2006 VEMCO Temperature Analysis
Temperature degrees (C)
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
18.0
07/01/06
07/08/06
07/15/06
07/22/06
07/29/06
08/05/06
08/12/06
08/19/06
08/26/06
09/02/06
09/09/06
09/16/06
09/23/06
09/30/06
Dates
7-Day Avgs
Salmon and Trout Rearing and Migration STD 18C



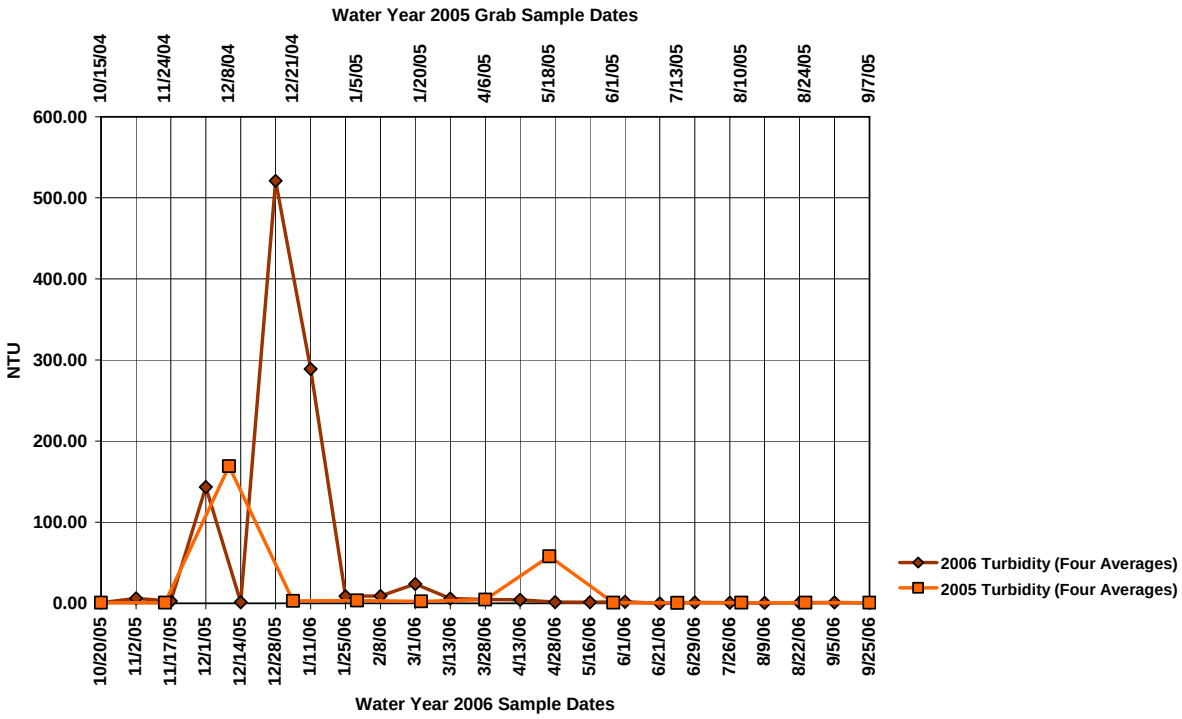
The following table lists the discrete summer 2005 and 2006 temperature data collected by our program at the Sixes River site that either met or exceeded the 18°C standard for salmon and trout rearing and migration. Throughout both the 2005 and 2006 summer sampling season, all but the early June temperature measurements either met or exceeded the state standard. Both sets of summer data appear to indicate a summer warming trend beginning in late May that peaks in August. The VEMCO temperature data collected throughout August and September 2006 also indicates a similar warming trend.

Date	Time	Temp °C
7/13/2005	15:13	20.5
8/10/2005	15:15	21.1
8/24/2005	16:00	21.0
9/7/2005	13:52	18.9
Date	**Time**	**Temp °C**
6/21/2006	15:13	19.0
6/29/2006	14:30	19.6
7/26/2006	14:04	22.0
8/9/2006	14:53	22.1
8/22/2006	14:10	20.0
9/5/2006	13:40	19.2
9/25/2006	14:02	18.1

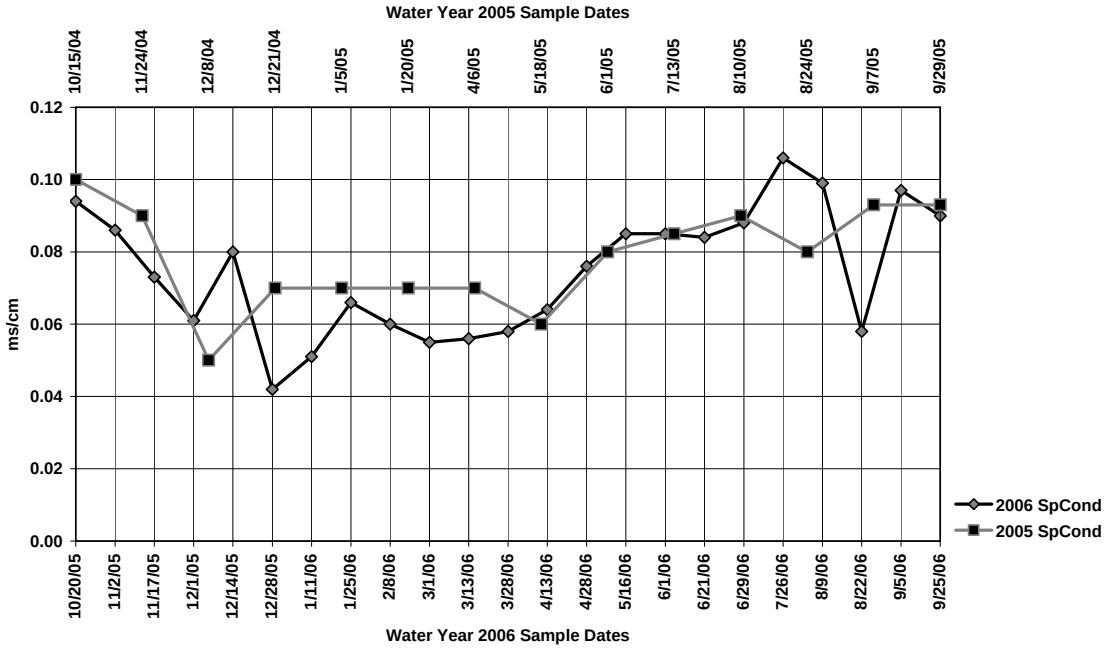
Sixes River DO Comparison:
Water Year 2005 and Water Year 2006



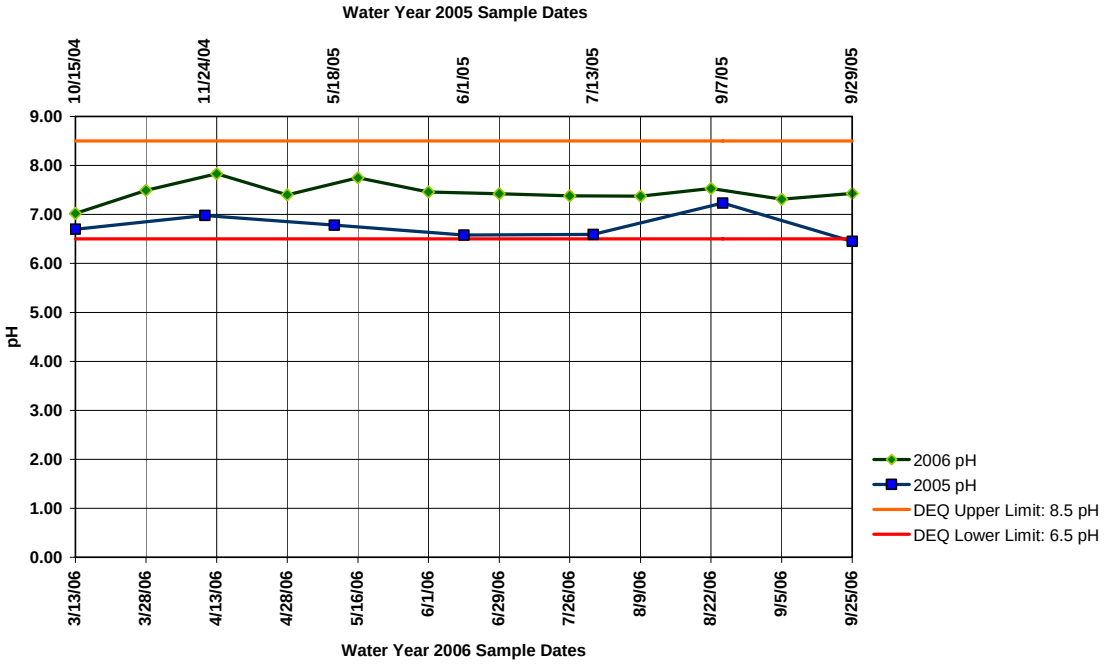
Sixes River Turbidity Comparison:
Water Year 2005 and Water Year 2006



Sixes River SpCond Comparison:
Water Year 2005 and Water Year 2006



Sixes River pH:
Water Year 2005 and Water Year 2006



Sixes River Statistics: Water Year 2005

Statistics	Temp °C	SpCond	DO mg/l	pH	Turbidity NTU
Q3	18.6	0.1	16.1	6.9	3.3
Max	21.1	0.1	26.6	7.2	169.0
Median	13.8	0.1	13.6	6.7	0.9
Min	7.1	0.1	8.8	6.5	0.6
Q1	10.7	0.1	11.5	6.6	0.8
Mean	14.5	0.1	14.8	6.8	18.8
Std Dev	4.8	0.0	5.5	0.3	47.7

Sixes River Statistics: Water Year 2006

Statistics	Temp °C	SpCond	DO mg/l	pH	Turbidity NTU
Q3	18.6	0.1	12.1	7.5	7.3
Max	22.1	0.1	16.0	7.8	521.0
Median	12.2	0.1	11.0	7.4	1.8
Min	6.0	0.0	7.4	7.0	0.0
Q1	9.7	0.1	9.1	7.4	1.0
Mean	13.9	0.1	10.8	7.4	44.8
Std Dev	4.9	0.0	2.1	0.2	122.5

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 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 2006. 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. Of the sites currently monitored by our program, Kentuck Slough has the highest levels of *E. coli* and *Enterococcus.* No samples collected by our program during water year 2006 at this site have exceeded either of these criteria.

Sixes River *E.coli* Data: Water Year 2006

Sample Date	Analyte	MPN/100mL Undiluted Sample
5/16/06	E. coli.	< 10.0
6/1/06	E. coli.	< 10.0
6/29/06	E. coli.	< 10.0
7/26/06	E. coli.	< 10.0
8/6/06	E. coli.	< 10.0
8/22/06	E. coli.	< 10.0
9/5/06	E. coli.	< 10.0
9/25/06	E. coli.	< 10.0

Sixes River *Enterococcus* Data: Water Year 2006

Sample Date	Analyte	MPN/100mL Undiluted Sample
5/16/06	Enterococci	< 10.0
6/1/06	Enterococci	< 10.0
7/26/06	Enterococci	< 10.0
8/9/06	Enterococci	< 10.0
8/22/06	Enterococci	< 10.0
9/25/06	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. Point source contributions 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 completion of this report summarizes the hard work and long hours put in by tribal staff to develop and implement a WQP that meets both Tribal needs and EPA program requirements. 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 our ancestral watersheds.