

# INTERMEDIATE WATER QUALITY ASSESSMENT REPORT FOR THE CONFEDERATED TRIBES OF COOS, LOWER UMPQUA AND SIUSLAW INDIANS



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## I. Introduction

This assessment report focuses on data collected by the Tribes' intermediate 106 water quality monitoring program in waters of or pertaining to the Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indians' (CTCLUSI) reservation or other Tribal lands.

Environmental issues within the Tribes' ancestral watersheds can take many years to develop or may have an immediate impact on our natural and cultural resources. The Tribe's Department of Natural Resources (DNR) overarching goal is to continuously strengthen and modify the Tribes' capacity to develop and sustain environmental programs that address environmental issues pertaining to Tribal lands and watersheds. Below is a broad list of environmental issues occurring within the Tribes' ancestral watersheds, in no particular order of importance.

- Downward trend of salmonid returns and habitat.
- Environmental impacts linked directly to natural resource extraction.
- Water quality degradation due to point and non-point water pollution.
- Urban and industrial discharges.
- Environmental changes attributed to climate change.
- Spreading of existing and new invasive species.
- Toxins within water, sediment, and traditional foods.
- Maritime spill response and impacts to traditional foods.

## Atlas of Tribal Water Resources

Waterbody Type	Count	Size	Unit
Stream/Creek/River	1	0.72	Miles
Lake/Reservoir/Pond	1	54.4	Acres
Ocean Coast	1	2.09	Miles
Tidal Wetlands	2	5.03	Acres

Overview of the Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians' (CTCLUSI) Reservation and Tribal lands:

- CTCLUSI Reservation and Tribal lands total approximately 358.74 acres.
- This land base includes approximately 1.69 acres of tidelands and 2.09 miles of shoreline.
- Tribal lands are dispersed among three different 4th field HUC watersheds.
  - Sixes: 300,331 acres
  - Coos: 471,477 acres
  - Siuslaw: 496,417 acres
- Waters located on Tribal property consist of:
  - 0.72 miles of rivers and streams.
  - 54.4 acres of lakes
  - 3.34 acres of wetlands, excluding tidelands.
  - One major potable aquifer system is located on the Tribes' Florence, Oregon Reservation. This system is drawing water from the North Florence Dunal Aquifer, an EPA designated sole source aquifer.

## II. Water quality monitoring program and assessment methods

### A. Introduction

The purpose of the Tribes' Water Quality Monitoring Program is to determine whether water quality criteria/benchmarks are being met and beneficial uses are being supported for waterbodies of or pertaining to the reservation and other Tribal lands. Establishing a baseline of water quality condition for all Tribal waters and periodically reassessing the baseline water quality to evaluate short-term variability and long term trends is an important component of this program objective.

<b>Monitoring Objectives</b>	
<b>Program Area</b>	<b>Objectives</b>
Overall Water Quality Program	<ol style="list-style-type: none"> <li>1. Establish baseline water quality conditions for all pertinent uses.</li> <li>2. Document short term and long-term water quality trends.</li> <li>3. Assess whether water quality standards are being met and beneficial uses are being supported.</li> <li>3. Develop and test ecological indicators and monitoring designs.</li> <li>4. Assess local water quality issues such as; low dissolved oxygen, eutrophication, chemical &amp; biological (e.g. bacteria) contamination, habitat modification, and cumulative impacts.</li> </ol>
Non-point Source Program	<ol style="list-style-type: none"> <li>1. Identify and employ monitoring techniques to determine and quantify the effectiveness of watershed improvement projects.</li> <li>2. Build partnerships with water quality stakeholders to reduce non-point source water pollution.</li> </ol>
Water Quality Standards	<ol style="list-style-type: none"> <li>1. Identify reference conditions for the development of numerical and biological criteria.</li> <li>2. Develop and refine tribal water quality standards.</li> <li>3. Determine if water resources are meeting tribal water quality standards.</li> </ol>
Wetlands	<ol style="list-style-type: none"> <li>1. Develop Wetlands Program.</li> <li>2. Develop indicators and assess beneficial use attainment.</li> </ol>

## **B. Monitoring Program Overview**

Water quality monitoring is conducted by the CTCLUSI Department of Natural Resources (DNR) staff and is implemented according to the program's EPA [QAPP](#).

During the 2011 water year, the water quality monitoring program continued to collect baseline estuarine water quality monitoring data at four fixed stations. These data were collected at 15 minute sample intervals year round. The station locations and parameters measured are listed in the table below. The Tribes' continuous estuarine water quality monitoring program implements a combination of National Estuarine Research Reserve (NERR) System Wide Monitoring Program (SWMP) and USGS recommended equipment and protocols for the collection and management of these data (see [CDMO NERR SWMP Data Management Manual](#) and the USGS manual '[Guidelines and Standard Procedures for Continuous Water-Quality Monitors: Station Operation, Record Computation, and Data Reporting](#)').

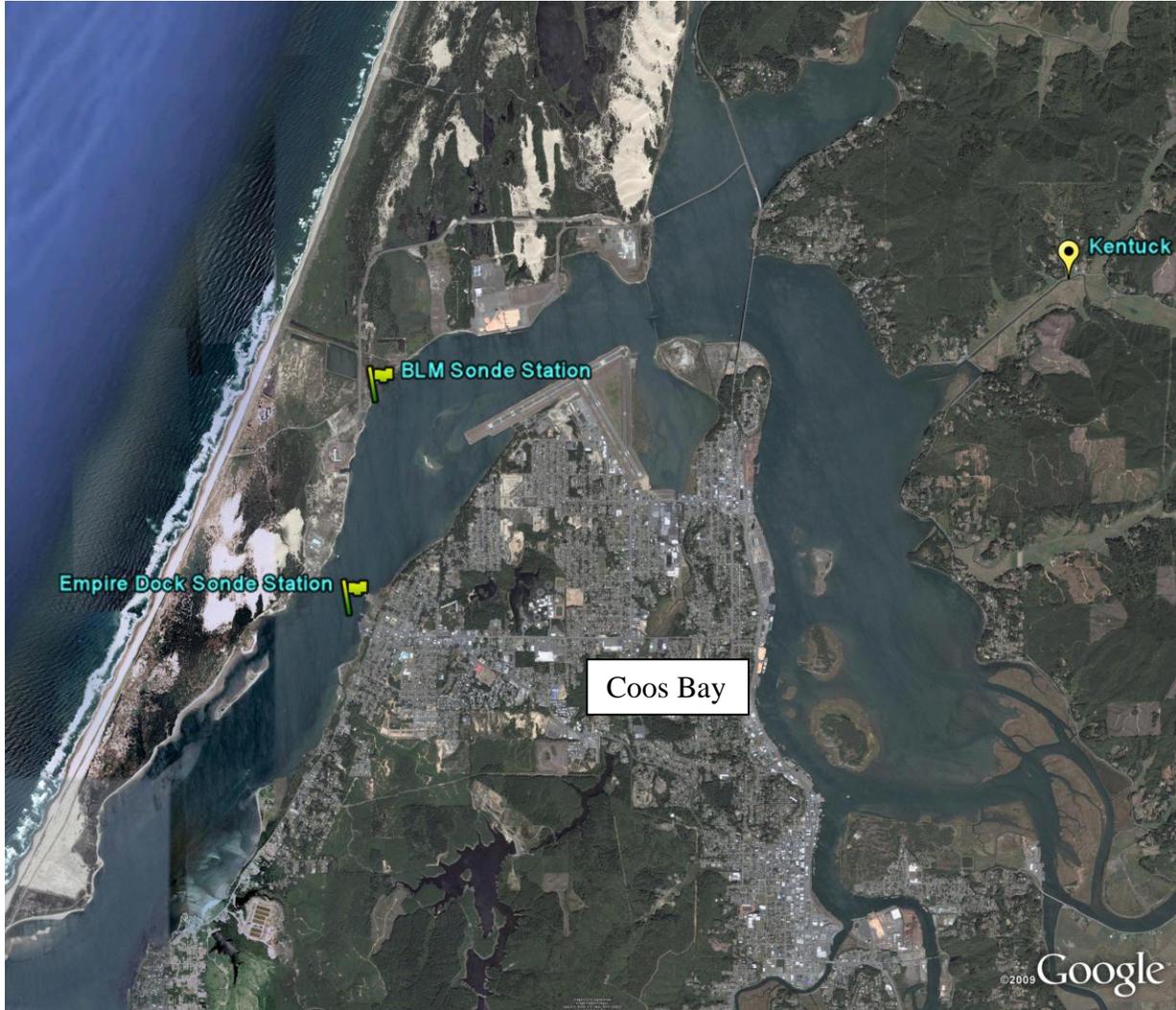
The Tribes' water quality monitoring program also collects discrete water quality data on an annual to quarterly basis (as staff and resources allow) at one freshwater site (Sixes River, located within the Sixes River watershed in Curry County) and one upper estuarine site (Kentuck Slough, located within the Coos watershed lowlands). Protocols implemented for the collection of these data are primarily those outlined in the Oregon Department of Environmental Quality (ODEQ) '[Watersheds Assessment Field Sampling SOP's](#)'.

## Monitoring Locations:

Waterbody Name	Lat./Long	Parameters monitored	Monitoring frequency	303d List Parameter(s)
Coos River, Lower Bay – Coos Watershed	43° 24' 50" N 124° 16' 44" W	Field Measurements: Water Temperature, Dissolved Oxygen, Salinity/SpCond, pH, Turbidity, and Depth	Year Round: 15 minute intervals	<b>Parameter:</b> Fecal Coliform <b>Season:</b> Year Around <b>Listed:</b> 2004 <b>Beneficial Use(s):</b> Shellfish growing <b>Status:</b> Water quality limited, 303(d) listed, TMDL needed
		Laboratory: Bacteria ( <i>e.coli</i> and enterococci)	Monthly	
		Laboratory: Nutrients (TN and TP)	Annually to Quarterly (as staff and resources allow)	
Coos River, Lower Bay – Coos Watershed	43° 23' 39.19" N 124° 16' 49.42" W	Field Measurements: Water Temperature, Dissolved Oxygen, Salinity/SpCond, pH, Turbidity, and Depth	Year Round: 15 minute intervals	<b>Parameter:</b> Fecal Coliform <b>Season:</b> Year Around <b>Listed:</b> 2004 <b>Beneficial Use(s):</b> Shellfish growing <b>Status:</b> Water quality limited, 303(d) listed, TMDL needed
		Laboratory: Bacteria ( <i>e.coli</i> and enterococci)	Monthly	
		Laboratory: Nutrients (TN and TP)	Annually to Quarterly (as staff and resources allow)	
North Fork Siuslaw River – Siuslaw Watershed	43° 58' 40" N 124° 04' 48" W	Field Measurements: Water Temperature, Dissolved Oxygen, Salinity/SpCond, pH, Turbidity, and Depth	Year Round: 15 minute intervals	<b>Parameter:</b> Sedimentation <b>Season:</b> Undefined <b>Listed:</b> 1998 <b>Beneficial Use(s):</b> Resident fish and aquatic life , Salmonid fish rearing, Salmonid fish spawning <b>Status:</b> 303(d)  <b>Parameter:</b> Temperature <b>Season:</b> Year Around (non-spawning) <b>Listed</b> :2004 <b>Beneficial Use(s):</b> Salmon and trout rearing and migration <b>Status:</b> Water quality limited, 303(d) list, TMDL needed.
		Laboratory: Bacteria ( <i>e.coli</i> and enterococci)	Monthly	
		Laboratory: Nutrients (TN and TP)	Annually to Quarterly (as staff and resources allow)	
Siuslaw River Cox Island – Siuslaw Watershed	43° 58' 27" N 124° 04' 16" W	Field Measurements: Water Temperature, Dissolved Oxygen, Salinity/SpCond, pH, Turbidity, and Depth	Year Round: 15 minute intervals	<b>Parameter:</b> Sedimentation <b>Season:</b> Undefined <b>Listed:</b> 1998 <b>Beneficial Use(s):</b> Resident fish and aquatic life , Salmonid fish rearing, Salmonid fish spawning <b>Status:</b> 303(d)  <b>Parameter:</b> Temperature <b>Season:</b> Year Around (non-spawning) <b>Listed</b> :2004 <b>Beneficial Use(s):</b> Salmon and trout rearing and migration <b>Status:</b> Water quality limited, 303(d) list, TMDL needed.
		Laboratory: Bacteria ( <i>e.coli</i> and enterococci)	Monthly	
		Laboratory: Nutrients (TN and TP)	Annually to Quarterly (as staff and resources allow)	
Sixes River – Sixes Watershed	42° 48' 39.5" N 124° 26' 43.3" W	Laboratory: Nutrients (TN and TP) and Macroinvertebrates	Annually to Quarterly (as staff and resources allow)	<b>Parameter:</b> Dissolved Oxygen <b>Season:</b> Oct. 15 to May15 <b>Listed:</b> 2004 <b>Beneficial Use(s):</b> Salmon and steelhead spawning <b>Status:</b> Water quality limited, 303(d) listed, TMDL needed.  <b>Parameter:</b> Temperature <b>Season:</b> Year Around <b>Listed:</b> 2004 <b>Beneficial Use(s):</b> Salmon and trout rearing and migration <b>Status:</b> Water quality limited, 303(d) list, TMDL needed.
Kentuck Slough – Coos Watershed	43° 25' 51" N 124° 10' 24.3" W	Laboratory: Nutrients (TN and TP)	Annually to Quarterly (as staff and resources allow)	<b>Waterbody Name:</b> Coos River <b>4<sup>th</sup> Field HUC Record ID:</b> COOS 17100304 20675 <b>LLID River Mile:</b> Coos Bay1243397433543 7.8 to 12.3  <b>Parameter:</b> Fecal Coliform <b>Season:</b> Year Around <b>Listed:</b> 2004 <b>Beneficial Use(s):</b> Shellfish growing <b>Status:</b> Water quality limited, 303(d) listed, TMDL needed

C. Maps of Monitoring Sites

Coos Bay Sonde Stations and Kentuck Sample Site



North Fork and Cox Island Siuslaw Sonde Stations



## Sixes River Sample Site



**D. Total Extent of Waters Assessed**

During the 2011 water year, our program continuously monitored baseline water quality at 4 locations on two rivers pertaining to Tribal lands (the Coos and North Fork Siuslaw River). Those data collected at the continuous monitoring stations represent approximately 75% of the total stream and 90% of the total tideland miles (approx. 0.72 miles of rivers and streams and 1.69 miles of tideland) of or pertaining to Tribal lands. Additional water quality assessment data such as nutrient, bacteria and benthic macroinvertebrate data were collected less frequently and included sample sites other than the continuous monitoring sites. The reduced sampling frequency and disparity among parameters monitored at different sites is due primarily to funding and staff resource constraints (see table above for parameters measured at each site and monitoring frequency). The program did not monitor any wetlands or lakes and did not collect any habitat assessment data other than macroinvertebrates due to funding and staff resource constraints.

**E. Data Analysis and Assessment**

The goal for all waters of or pertaining to Tribal lands is to support the following Tribal and/or state designated beneficial uses.

**Tribal Goals/Designated Beneficial Uses for the Waters of or Pertaining to Tribal Lands**

<b>Designated Use</b>	<b>Coos River/Lower Bay</b>	<b>North Fork/ Mainstem Siuslaw River</b>	<b>Sixes River</b>
<b>Salmon and Trout Rearing and Migration</b>	X	X	X
<b>Commercial and/or Recreational Shellfish Harvesting</b>	X	X	----
<b>Aesthetic Quality</b>	X	X	X
<b>Water Contact Recreation</b>	X	X	X

CTCLUSI does not yet have Tribal or EPA approved water quality standards. Therefore, our program primarily refers to ODEQ water quality standards to evaluate water quality data generated by our monitoring program. In addition to ODEQ criteria, our program refers to the Oregon Watershed Enhancement Board (OWEB) recommended indicator criteria to evaluate total nitrogen, total phosphorus and turbidity data generated by the Tribes' monitoring program. In addition to the water quality parameters listed below, the Tribes' water quality monitoring program also collects annual macroinvertebrate samples from the Sixes River sample site. Macroinvertebrate data collected by our program are evaluated per the Benthic Invertebrate Index of Biological Integrity – BIBI (modified Karr 1998).

<b>Designated Uses</b>	<b>Water Quality Parameter</b>			
<b>Aquatic Life</b>	<b>Temp*</b>	<b>D.O.</b>	<b>Turbidity</b>	<b>pH</b>
Salmon and Trout Rearing and Migration	<b>Summer and Early Fall</b>  <b>Not greater than 18° C</b>  7-day max daily average	For estuarine water, the dissolved oxygen concentrations may not be less than <b>6.5 mg/l</b> (for coastal water bodies)	Indicator: 50 NTU maximum above background	6.5 - 8.5
<b>Citation</b>				
	<a href="#">OAR 340-041-0028:</a> WATER POLLUTION DIVISION 41 WATER QUALITY STANDARDS: BENEFICIAL USES, POLICIES, AND CRITERIA FOR OREGON	<a href="#">OAR 340-041-0016:</a> <a href="#">ibid</a>	<a href="#">OWEB Watershed Assessment Manual</a>	<a href="#">OAR 340-041-0021; 0225 (b);0305 (a):</a> <a href="#">ibid</a>
<b>Water Contact</b>	<b>Enterococci organism levels</b>			
Recreational Uses	No more than 158 colony forming units (158 MPN) per 100 milliliters of marine water			
<b>Citation</b>				
<a href="#">Oregon Department of Human Services</a>				
<b>e.coli organism levels</b>				
126 E. coli/100 ml (30-day log mean—minimum 5 samples)				
406 E. coli/100 ml (no single sample can exceed the criteria)				
<b>Citation</b>				
<a href="#">OAR 340-041-0009:</a> WATER POLLUTION DIVISION 41 WATER QUALITY STANDARDS: BENEFICIAL USES, POLICIES, AND CRITERIA FOR OREGON				
<b>Aesthetics</b>	<b>Nutrients</b>		<b>Turbidity</b>	
	Total Phosphorus Evaluation Criteria: greater than 0.05 mg/l		Indicator Criteria: Background < 50 NTU + 5 NTU or more	
	Total Nitrate Evaluation Criteria: greater than 0.30 mg/l		Indicator Criteria: Background > 50NTU + 10% or more	
<b>Citation</b>				
<a href="#">OWEB Watershed Assessment Manual</a>				

\* OAR 340-041-0028, (7): Oceans and Bays. Except for the Columbia River above river mile 7, ocean and bay waters may not be warmed by more than 0.3 degrees Celsius (0.5 degrees Fahrenheit) above the natural condition unless a greater increase would not reasonably be expected to adversely affect fish or other aquatic life. Absent a discharge or human modification that would reasonably be expected to increase temperature, DEQ will presume that the ambient temperature of the ocean or bay is the same as its natural thermal condition.

### III. Data Analysis Results

#### A. Summary of Data Collected

The following data summaries of Tribal water quality monitoring data are for the 2011 water year (unless otherwise indicated) and are presented in tabular format.

Lower Coos Surface Water Quality Monitoring Data for Water Year 2011  
(Oct 2010 to Sept 2011)\*

BLM Sonde Station Discrete Data Summary **							
BLM Grabs Wet Season: 10/01/2010 to 05/31/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	10.57	33.48	21.04	98.62	9.66	7.76	5
Median	10.27	32.54	20.24	100.1	10.07	7.76	4
Minimum	9.19	22.57	13.69	92.2	7.86	7.67	3
Maximum	13.65	48.81	31.85	108.3	10.73	7.82	10
Count	5	5	5	5	5	5	5
BLM Grabs Dry Season: 06/01/2011 to 09/30/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	11.47	46.54	30.15	89.47	8.05	7.82	3
Median	10.47	51.32	33.53	95.1	8.56	7.8	3
Minimum	9.7	36.9	23.38	69.5	<b>6.37</b>	7.76	2
Maximum	14.23	51.41	33.54	103.8	9.21	7.91	4
Count	3	3	3	3	3	3	3
BLM Sonde Station Continuous Data Summary **							
BLM Sonde Wet Season: 10/01/2010 to 05/31/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	10.57	38.91	24.77	98.70	9.42	7.97	9
Median	10.30	39.59	25.18	97.50	9.44	7.97	2
Minimum	6.94	7.89	4.39	66.40	<b>5.70</b>	7.34	-1
Maximum	17.79	51.82	33.82	120.40	11.58	8.35	<b>988</b>
Count	23324	23324	23324	19840	19840	22009	23254
BLM Sonde Dry Season: 06/01/2011 to 09/30/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	14.0	47.8	31.2	92.0	10.9	7.8	4
Median	14.3	48.8	31.9	91.9	10.4	7.8	2
Minimum	8.6	32.7	20.5	44.2	<b>4.1</b>	7.0	-1
Maximum	<b>18.5</b>	52.5	34.3	135.2	17.7	8.3	<b>260</b>
Count	11709	11709	11709	11574	11574	11574	11709

\* Values in bold represent seasonal maximum or minimum single values that failed to meet ODEQ water quality standards but are generally considered to be anomalies attributable to seasonal extremes (temp) or localized conditions (turbidity). \*\* Estuary habitat tends to have tidal (salinity/ temp) and open water characteristics (high temp/ low DO) that are not comparable to mainstem and side channel water quality parameters.

## Data Summary (cont.)

Lower Coos Surface Water Quality Monitoring Data for Water Year 2011  
(Oct 2010 to Sept 2011)\*

Empire Sonde Station Discrete Data Summary**							
Empire Grabs Wet Season: 10/01/2010 to 05/31/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	10.53	37.92	24.04	100.78	9.67	7.87	4
Median	10.26	37.53	23.66	100.30	9.88	7.86	3
Minimum	9.30	30.55	18.85	95.20	8.20	7.77	3
Maximum	12.97	49.67	32.46	110.10	10.80	8.00	6
Count	5	5	5	5	5	5	5
Empire Grabs Dry Season: 06/01/2011 to 09/30/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	11.09	47.76	30.98	89.80	8.09	7.76	2
Median	10.01	51.52	33.64	95.70	8.71	7.70	2
Minimum	9.08	39.86	25.46	69.20	<b>6.40</b>	7.67	2
Maximum	14.19	51.89	33.84	104.50	9.17	7.90	2
Count	3	3	3	3	3	3	3
Empire Sonde Station Continuous Data Summary **							
Empire Sonde Wet Season: 10/01/2010 to 05/31/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	10.49	42.29	27.12	97.85	9.12	8.02	8
Median	10.26	43.92	28.22	97.90	9.17	8.04	8
Minimum	7.18	9.90	5.59	72.40	6.62	7.49	7
Maximum	16.71	52.33	34.18	121.30	11.48	8.22	8
Count	23177	23177	23177	4770	4770	23177	23177
Empire Sonde Dry Season: 06/01/2011 to 09/30/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	12.96	48.74	31.77	103.21	8.98	7.91	3
Median	13.05	49.59	32.41	101.90	8.83	7.90	2
Minimum	8.74	35.76	22.59	44.00	<b>4.12</b>	7.56	-1
Maximum	17.41	51.80	33.77	160.70	14.40	8.24	<b>921</b>
Count	11611	11611	11611	6585	6585	11611	10425

\* Values in bold represent seasonal maximum or minimum single values that failed to meet ODEQ water quality standards but are generally considered to be anomalies attributable to seasonal extremes (temp) or localized conditions (turbidity). \*\* Estuary habitat tends to have tidal (salinity/ temp) and open water characteristics (high temp/ low DO) that are not comparable to mainstem and side channel water quality parameters.

## Data Summary (cont.)

Lower Siuslaw Surface Water Quality Monitoring Data for Water Year 2011  
(Oct 2010 to Sept 2011)\*

North Fork Sonde Station Discrete Data Summary**							
North Fork Grabs Wet Season: 10/01/2010 to 05/31/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	9.86	4.85	2.92	93.48	10.50	7.43	6
Median	9.26	0.23	0.11	97.90	11.21	7.32	8
Minimum	7.86	0.06	0.03	81.30	7.62	7.02	2
Maximum	14.33	23.39	14.19	100.20	11.90	7.75	11
Count	5	5	5	5	5	5	5
North Fork Grabs Dry Season: 06/01/2011 to 09/30/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	15.47	22.92	14.28	104.07	9.55	7.55	3
Median	16.58	29.19	18.05	106.70	9.29	7.51	3
Minimum	12.67	2.79	1.46	98.00	9.04	7.44	3
Maximum	17.17	36.78	23.33	107.50	10.31	7.69	4
Count	3	3	3	3	3	3	3
North Fork Sonde Station Continuous Data Summary **							
North Fork Sonde Wet Season: 10/01/2010 to 05/31/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	9.97	6.83	4.10	99.57	11.03	7.07	7
Median	9.38	0.57	0.28	99.80	11.30	6.98	4
Minimum	4.78	0.04	0.02	35.20	<b>3.05</b>	6.04	-2
Maximum	<b>18.66</b>	48.28	31.35	127.30	14.64	8.35	<b>988</b>
Count	23323	23323	23323	23323	23323	23323	23318
North Fork Sonde Dry Season: 06/01/2011 to 09/30/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	17.19	23.97	14.80	88.01	7.77	7.36	4
Median	17.25	24.99	15.26	89.70	7.79	7.36	2
Minimum	10.30	0.19	0.09	19.70	<b>1.81</b>	6.59	-1
Maximum	<b>21.72</b>	48.65	31.68	154.80	13.56	8.22	<b>911</b>
Count	11709	11709	11709	11709	11709	11709	11707

\* Values in bold represent seasonal maximum or minimum single values that failed to meet ODEQ water quality standards but are generally considered to be anomalies attributable to seasonal extremes (temp) or localized conditions (turbidity). \*\* Estuary habitat tends to have tidal (salinity/ temp) and open water characteristics (high temp/ low DO) that are not comparable to mainstem and side channel water quality parameters.

**Data Summary (cont.)**

Lower Siuslaw Surface Water Quality Monitoring Data for Water Year 2011  
(Oct 2010 to Sept 2011)\*

Cox Island Sonde Station Discrete Data Summary**							
Cox Island Grabs Wet Season: 10/01/2010 to 05/31/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	9.92	4.01	2.34	96.34	10.85	7.45	6
Median	8.71	0.21	0.10	98.00	11.39	7.46	7
Minimum	7.77	0.06	0.00	82.60	7.79	7.16	4
Maximum	15.00	18.10	10.71	102.00	12.03	7.77	8
Count	5	5	5	5	5	5	5
Cox Island Grabs Dry Season: 06/01/2011 to 09/30/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	14.98	24.35	15.31	106.47	9.79	7.49	2
Median	15.98	32.37	20.27	108.60	9.81	7.52	2
Minimum	12.54	2.37	1.23	97.50	9.25	7.36	2
Maximum	16.41	38.30	24.42	113.30	10.30	7.59	3
Count	3	3	3	3	3	3	3
Cox Island Sonde Station Continuous Data Summary **							
Cox Island Sonde Wet Season: 10/01/2010 to 05/31/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	10.19	7.48	4.50	100.44	11.06	7.18	6
Median	9.64	0.67	0.33	101.10	11.36	7.09	4
Minimum	4.85	0.04	0.02	58.00	<b>5.23</b>	6.47	0
Maximum	<b>18.73</b>	49.42	32.23	129.00	14.40	8.24	<b>996</b>
Count	19209	19209	19209	19209	19209	19209	19205
Cox Island Sonde Dry Season: 06/01/2011 to 09/30/2011	Temp (°C)	SpCond (ms/cm)	Salinity (ppt)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
Mean	16.93	23.57	14.52	89.59	7.96	7.34	22
Median	17.13	23.74	14.43	90.80	8.13	7.29	2
Minimum	8.86	0.10	0.05	37.90	<b>3.39</b>	6.77	-1
Maximum	<b>21.34</b>	50.22	32.62	152.10	13.22	8.28	<b>832</b>
Count	11708	11708	11708	11708	11708	11708	11703

\* Values in bold represent seasonal maximum or minimum single values that failed to meet ODEQ water quality standards but are generally considered to be anomalies attributable to seasonal extremes (temp) or localized conditions (turbidity). \*\* Estuary habitat tends to have tidal (salinity/ temp) and open water characteristics (high temp/ low DO) that are not comparable to mainstem and side channel water quality parameters.

## **Bacteria Data**

Coos - BLM <i>E. coli</i>		Coos - Empire Dock <i>E. coli</i>		Siuslaw – North Fork <i>E. coli</i>		Siuslaw – Cox Island <i>E. coli</i>	
Sample Date	MPN/100 ml	Sample Date	MPN/100 ml	Sample Date	MPN/100 ml	Sample Date	MPN/100 ml
10/13/10	<10	10/13/10	<10	10/14/10	<10	10/14/10	<10
12/2/10	120.5	12/2/10	20.5	12/1/10	196	12/1/10	121.5
1/19/11	10.0	1/19/11	31.0	1/20/11	15.0	1/20/11	25.5
3/7/11	15.0	3/7/11	10.0	3/4/11	<10	3/4/11	15.0
4/13/11	<10	4/13/11	<10	4/14/11	20.5	4/14/11	<10
6/2/11	<10	6/2/11	<10	6/1/11	20.5	6/1/11	25.5
7/12/11	10.0	7/12/11	<10	7/13/11	41.5	7/13/11	25.5
8/10/11	<10	8/10/11	<10	8/11/11	<10	8/11/11	<10

Coos - BLM Enterococci		Coos - Empire Dock Enterococci		Siuslaw - North Frk Enterococci		Siuslaw – Cox Island Enterococci	
Sample Date	MPN/100 ml	Sample Date	MPN/100 ml	Sample Date	MPN/100 ml	Sample Date	MPN/100 ml
10/13/10	<10	10/13/10	<10	10/14/10	<10	10/14/10	42.5
12/2/10	<10	12/2/10	<10	12/1/10	20.5	12/1/10	36.0
1/19/11	10	1/19/11	<10	1/20/11	<10	1/20/11	<10
4/13/11	<10	4/13/11	<10	4/14/11	<10	4/14/11	<10
6/2/11	<10	6/2/11	<10	6/1/11	<10	6/1/11	<10
7/12/11	<10	7/12/11	<10				
8/10/11	<10	8/10/11	<10	8/11/11	<10	8/11/11	<10

Sixes River <i>E. coli</i>	
Sample Date	MPN/100 ml
9/14/11	41.0

Sixes River Enterococci	
Sample Date	MPN/100 ml
9/14/11	<10

No single samples exceeded criteria (Enterococci 158 MPN/100 ml of marine water; *E.coli* 406 MPN/100 ml of water )

**Nutrient Data – Total Nitrogen (TN) and Total Phosphorous (TP)**

Coos - BLM				Coos – Empire Dock				Coos – Kentuck Slough			
Date	Station	TP µg/l	TN µg/l	Date	Station	TP µg/l	TN µg/l	Date	Station	TP µg/l	TN µg/l
9/22/11	BLMLT	<b>70.9</b>	<b>374.1</b>	N/A	-----	N/A	N/A	9/22/11	KSLT	<b>50.5</b>	<b>569.2</b>

Siuslaw – North Fork				Siuslaw – Cox Island				Sixes River			
Date	Station	TP µg/l	TN µg/l	Date	Station	TP µg/l	TN µg/l	Date	Station	TP µg/l	TN µg/l
9/23/11	NFLT	16.8	<b>303.4</b>	9/23/11	CILT	42.9	<b>370.4</b>	9/26/11	Sixes	12.7	132.0

Values in bold represent exceedances in maximum single values

## **Benthic Macroinvertebrate Data: Sixes River**

### **Benthic Invertebrate Index of Biological Integrity-BIBI (modified Karr 1998)**

- Sampling Method: D-frame net, 4 square feet composite, 500 micron mesh.
- Subsampling: Entire sample. Level 3 PNW standard taxonomic effort.
- Abundances adjusted to a full sample and square meter basis

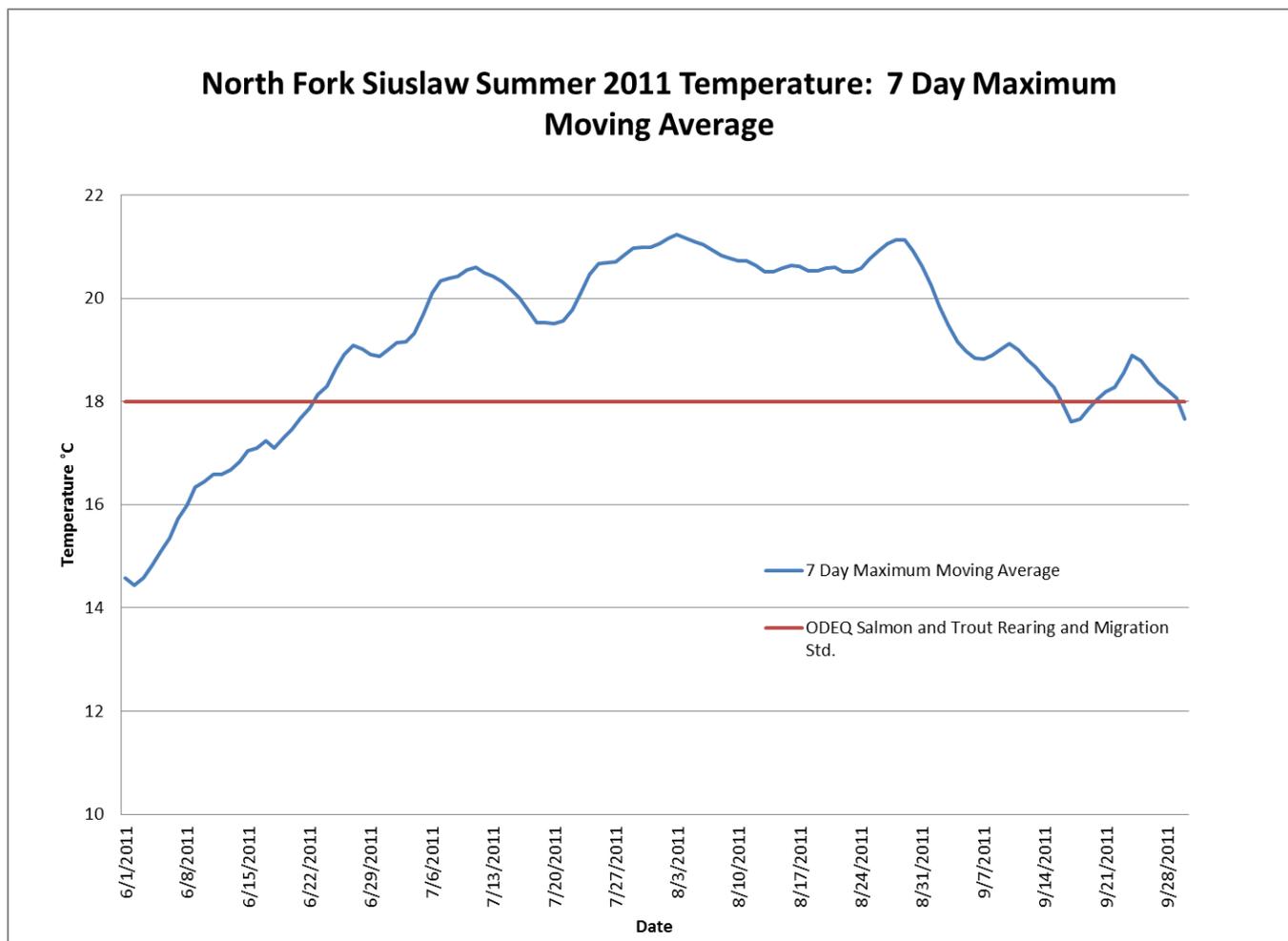
Site	Sixes River	Sixes River	Sixes River			
Date	7/28/2009	8/13/2010	9/16/2011			
METRIC	Value	Score	Value	Score	Value	Score
D Total number of taxa	50	5	49	5	49	5
D Number Ephemeroptera taxa	10	5	11	5	12	5
D Number Plecoptera taxa	4	3	4	3	5	3
D Number Trichoptera taxa	6	3	7	3	6	3
D Number of long-lived taxa	4	3	3	3	3	3
D Number of intolerant taxa	0	1	1	1	1	1
I % Tolerant taxa	30.25	3	23.39	3	14.42	5
D % Predator	14.41	3	12.14	3	15.23	3
D Number of clinger taxa	32	5	28	5	27	5
I % Dominance (3 taxa)	39.26	5	29.36	5	34.53	5
<b>TOTAL SCORE</b>		<b>36</b>		<b>36</b>		<b>38</b>
<b>BIOLOGICAL CONDITION CATEGORY</b>						
Maximum score of 50.			Each metric scored: 1=low, 3=moderate, 5=high			
<b>OTHER COMMUNITY COMPOSITION METRICS THAT ARE INDICATIVE OF BIOLOGICAL CONDITION</b>						
Total abundance (m2)	2631		1531		3319	
D EPT taxa richness	20		22		23	
D Predator richness	9		9		7	
D Scraper richness	16		14		15	
D Shredder richness	3		2		3	
D %Intolerant taxa	0		0.18		0.16	
I Hilsenhoff Biotic Index	5.54		6.18		5.58	
I % <i>Baetis tricaudatus</i>	4.19		10.02		8.27	
I %Collector	50.86		61.2		61.41	
I %Parasite	4.09		4.39		4.7	
I %Oligochaeta	0.51		7.21		0	
I Number tolerant taxa	13		12		14	
I %Simuliidae	1.43		3.34		5.51	
I %Chironomidae	12.99		23.02		15.72	
L,M & H comparisons with a Pacific Northwest montane stream with high biological integrity.						
I= Metric value generally increases with declining biological integrity.						
D= Metric value generally decreases with declining biological integrity.						
L= Low biological integrity.			BIBI scores between 0-24.			
M= Moderate biological integrity.			BIBI scores between 25-39.			
H= High biological integrity.			BIBI scores >40.			

## B. Comparison of Data to Benchmark Criteria of Parameters of Concern

## Temperature

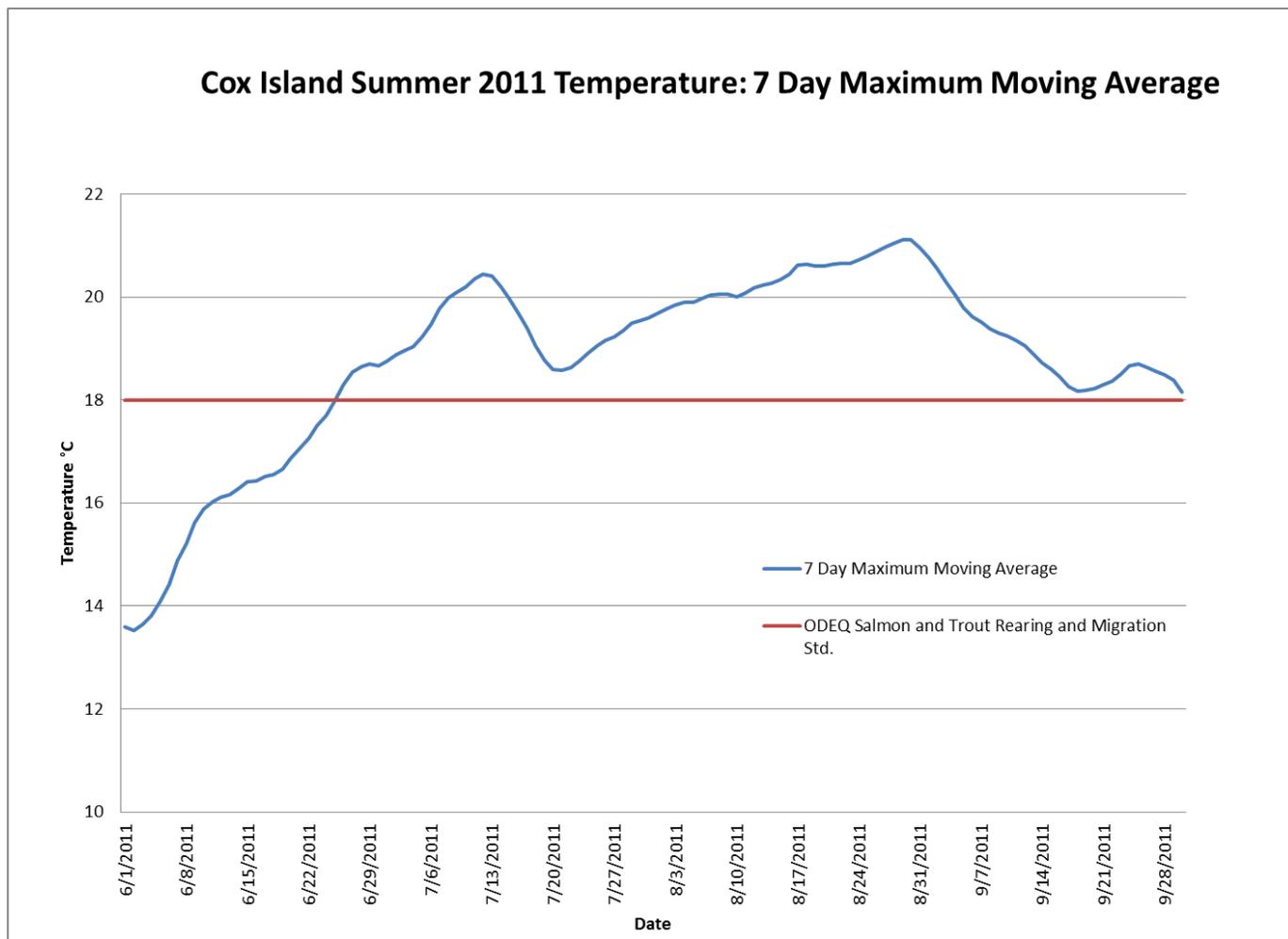
### North Fork Siuslaw Sonde Station – Lower Siuslaw Estuary:

The maximum temperature measured during the summer of 2011 at the North Fork (NF) Siuslaw Sonde Station was 21.7 °C. Further analysis of daily maximums recorded during the dry season (6/1-9/30/2011) at the NF sonde site indicates that the 7 day maximum moving average for temperature at this site frequently exceeded the ODEQ water temperature standard for salmon and trout rearing and migration (18°C); the North Fork Siuslaw River is designated fish use for the section river of the monitored by the Tribes' NF sonde.



### Cox Island Sonde Station – Lower Siuslaw Estuary:

The maximum temperature measured during summer 2011 at the Cox Island Sonde Station was 21.3 °C. Further analysis of daily maximums recorded during the dry season (6/1-9/30/2011) at the Cox Island sonde site indicates that the 7 day maximum moving average for temperature at this site frequently exceeded the the ODEQ water temperature standard for salmon and trout rearing and migration (18°C); the Siuslaw River is designated fish use for the section river of the monitored by the Tribes' Cox Island sonde.



### Sixes River – Freshwater

No summer temperature data was collected in 2011 due to a lack of staff. Historically, this site exceeds the ODEQ water temperature standard for salmon and trout rearing and migration (18° C), the Sixes River is designated fish use for the section river of the monitored by the Tribes'.

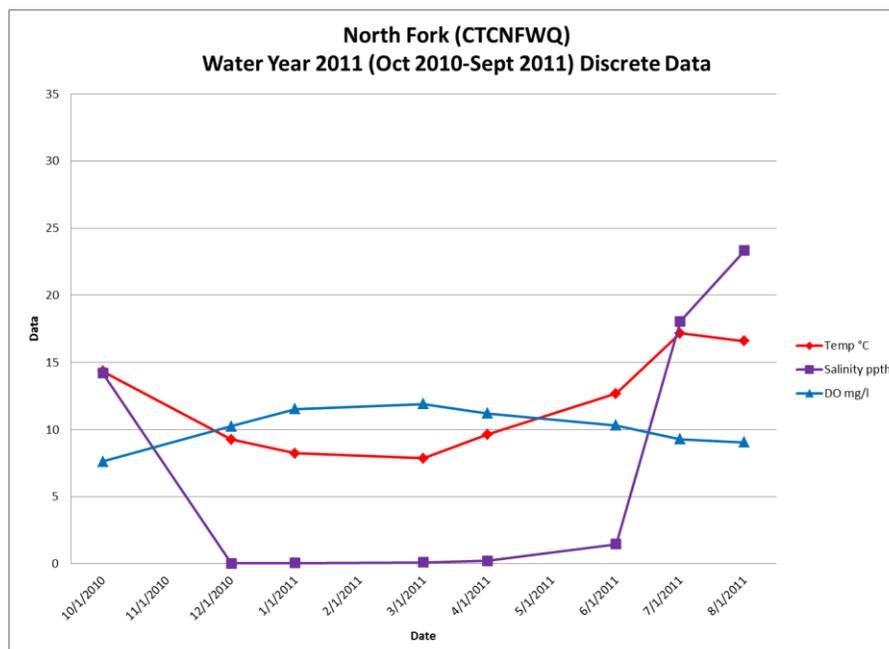
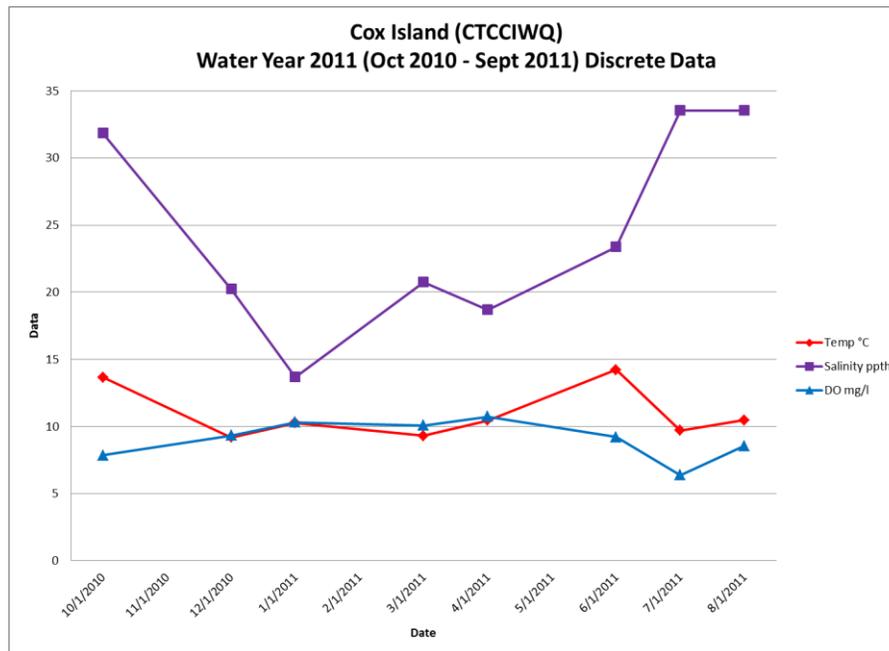
## Dissolved Oxygen

### **BLM and Empire Dock Sonde Stations – Lower Coos Estuary:**

Although minimum dissolved oxygen (DO) levels recorded at the Coos Bay BLM and Empire Dock sonde stations failed to meet the ODEQ estuarine dissolved oxygen criteria ( DO >6.5 mg/l), continuous data collected at these sites do not indicate consistent low DO measurements ; these are likely anomalies attributable to seasonal variability and/or localized site conditions.

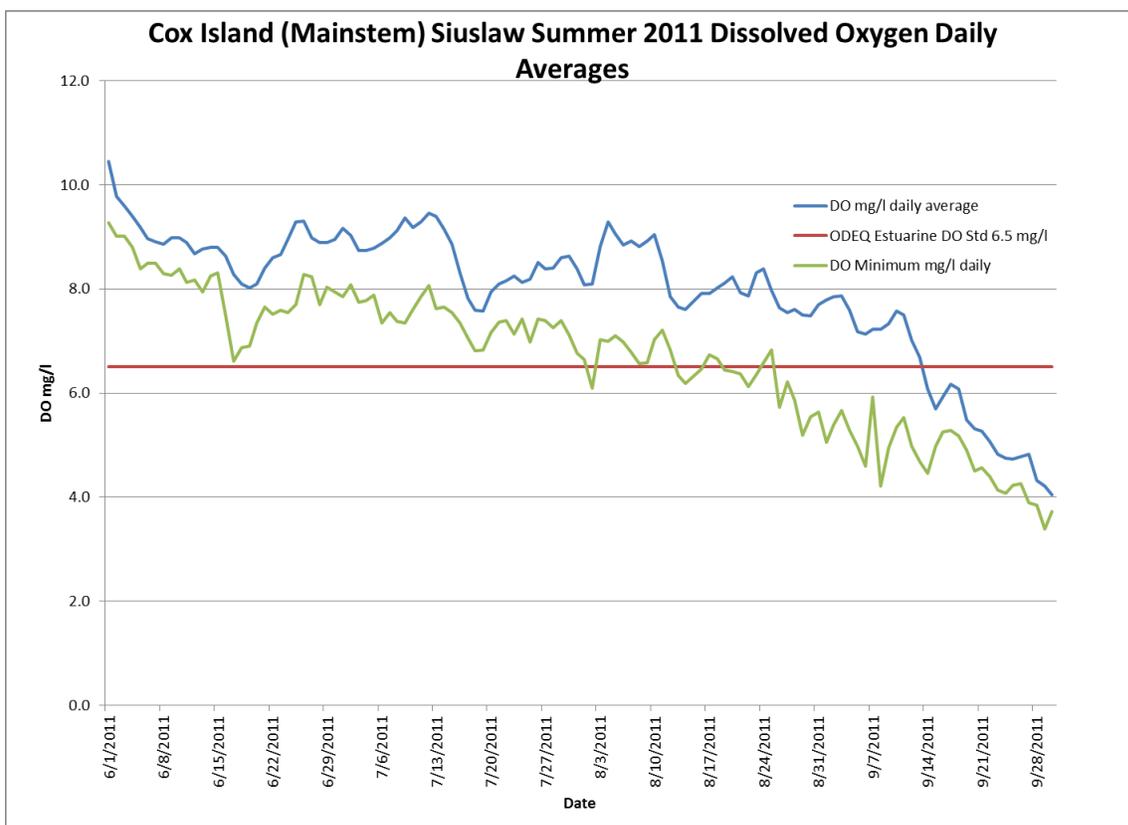
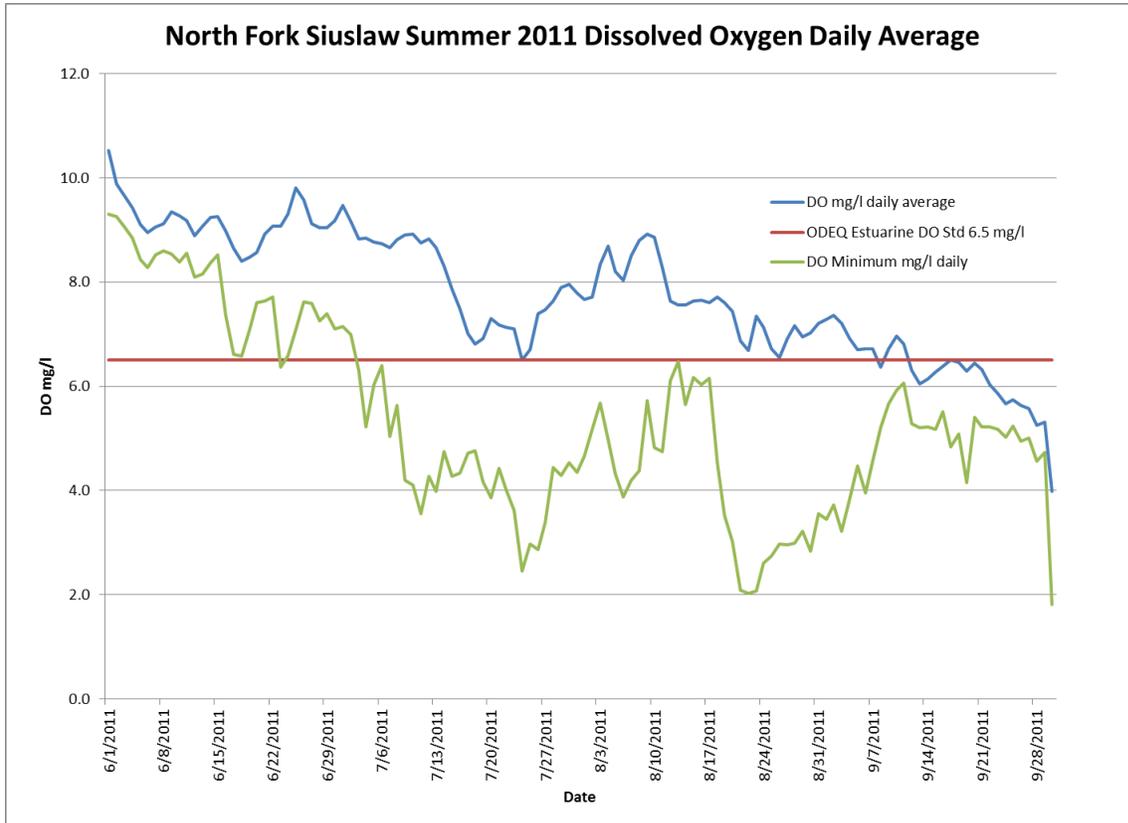
### **North Fork and Cox Island Sonde Stations – Lower Siuslaw Estuary:**

Discrete and continuous dissolved oxygen (DO) data collected at the North Fork and Cox Island sonde stations indicate that the concentration of DO at these sites consistently declines every year beginning in late spring/early summer and continues through fall. The following graphs capture discrete DO, temperature and salinity data collected for water year 2011. These graphs show a correlation between increasing water temperature and declining DO levels. Increasing tidal intrusion of marine water into the estuary is accompanied by declining precipitation which results in rising salinity, lowering the solubility of oxygen in water.

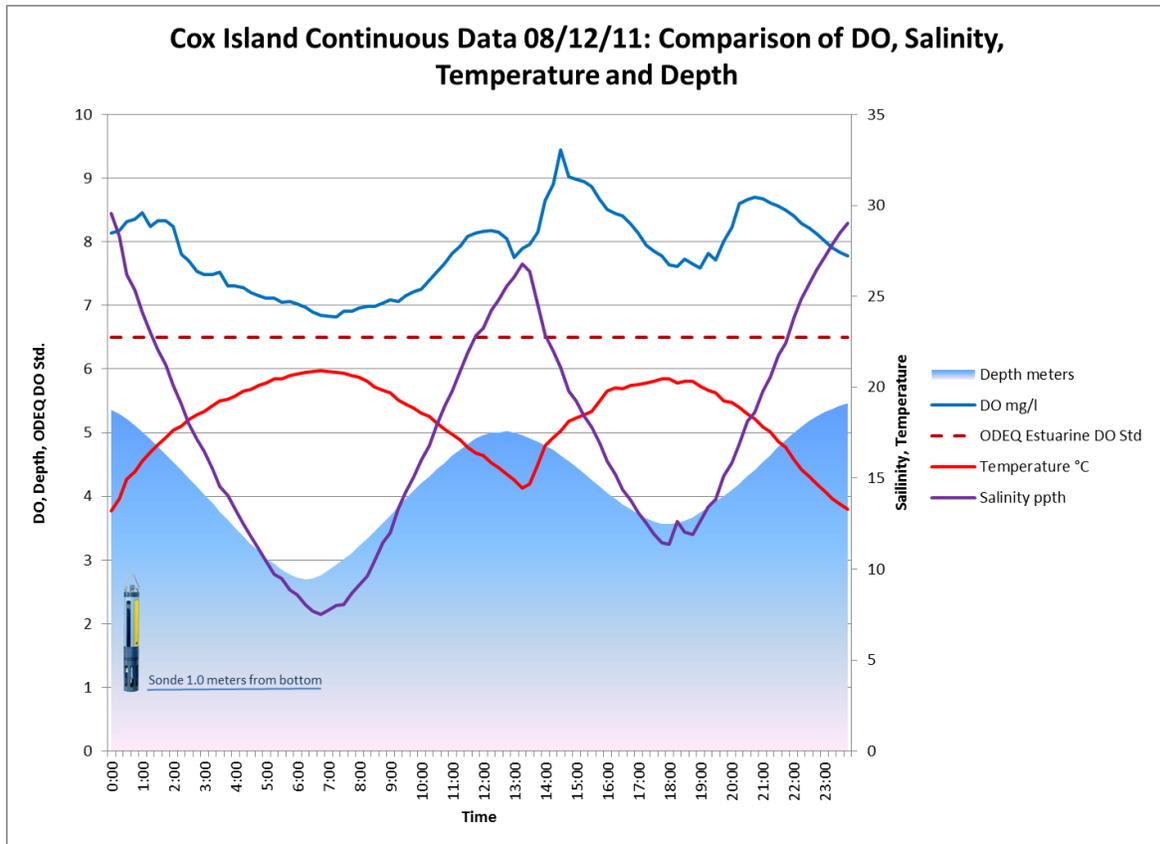
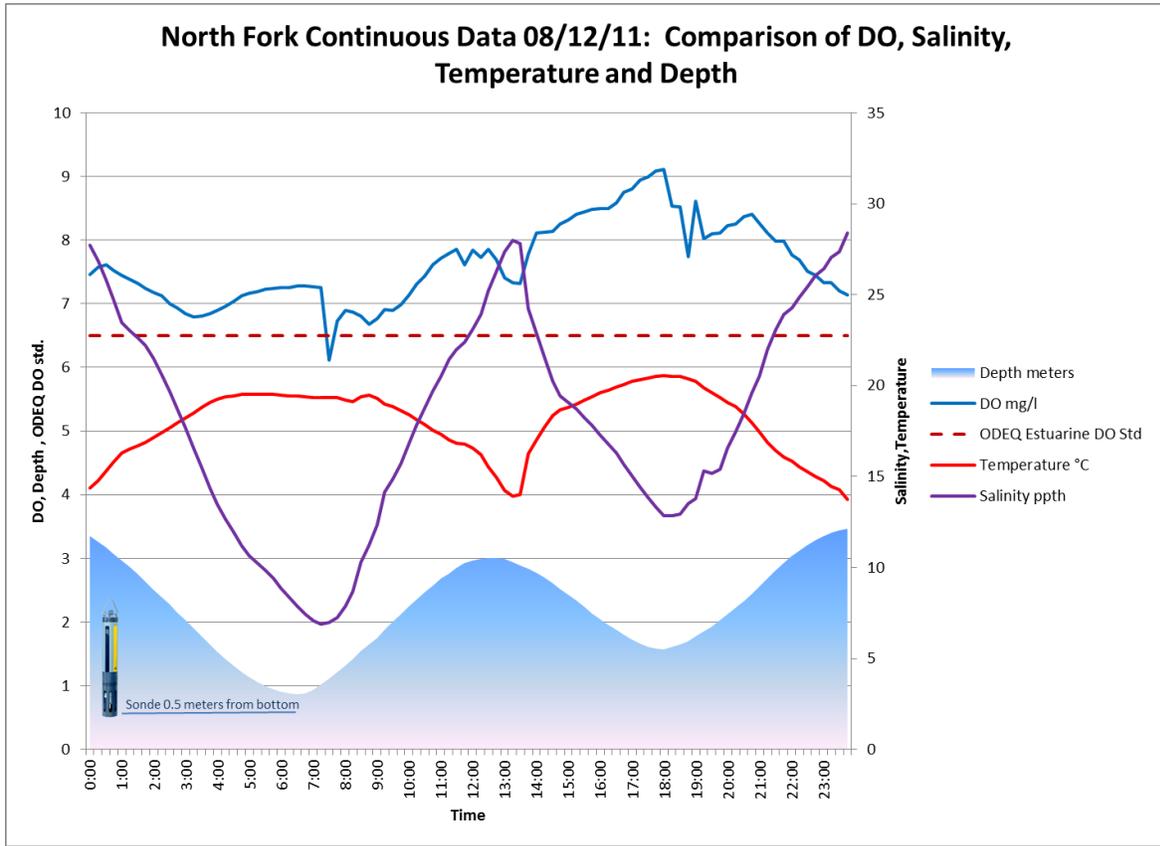


### North Fork and Cox Island Sonde Stations – Lower Siuslaw Estuary: cont.

Analysis of historic continuous DO measured by the Tribes at both the Tribes' North Fork Siuslaw Sonde and the 2008 decommissioned lower Mainstem Siuslaw Sonde Site (replaced with Cox Island Sonde Site 7/2009) indicates that daily minimum DO in summer and early fall at these lower Siuslaw River estuary sites consistently fails to meet the ODEQ estuarine dissolved oxygen criteria. These summer 2011 graphs represent typical DO trends for these sites since the Tribes began continuously monitoring water quality in 2006.



The following graphs capture continuous DO, temperature and salinity data measured on August 12, 2011.



**C. Extent to which Waters Meet Designated Uses or Tribal Goals**

<b>Designated Use</b>	<b>North Fork Siuslaw</b>	<b>Lower Coos Bay</b>	<b>Sixes River</b>
<b>Salmon and Trout Rearing and Migration</b>	Not Fully Supported	Not Enough Data to Determine	Not Fully Supported
<b>Commercial and Recreational Shellfish Harvesting</b>	Not Enough Data to Determine	Not Fully Supported	-----
<b>Water Contact: Recreational Activity</b>	Not Enough Data to Determine	Not Enough Data to Determine	Not Enough Data to Determine
<b>Aesthetics</b>	Not Enough Data to Determine	Not Enough Data to Determine	Not Enough Data to Determine

**D. Description of Why Waters are Potentially Not Meeting Designated Uses or Goals**

**North Fork Siuslaw**

**Temperature and Dissolved Oxygen – Salmon and Trout Rearing and Migration**

The North Fork Siuslaw has high summer and early fall temperatures accompanied by consistently low dissolved oxygen readings. The riparian habitat upstream of the site is highly disturbed and lacking in shade producing canopy. The lack of shade provided in the upstream riparian corridor likely contributes to the high summer and early fall temperatures recorded at the North Fork Siuslaw Sonde site. Elevated temperature likely contributes to the low dissolved oxygen levels recorded at the site. Mechanisms for lower summer DO, related to increasing temperature, include lower mg/l at saturation, increasing salinity, lower turbulence and increased biological demands.

**Sixes River**

**Temperature – Salmon and Trout Rearing and Migration**

Historically, the Sixes River site has had predictively high summer and early fall temperatures. Although located in a completely different watershed, riparian conditions at this site are similar to those found upstream of the North Fork Siuslaw Sonde site discussed above. Lack of shade provided in the upstream riparian corridor (measurements were taken in the center of the stream) likely contributes to the high summer and early fall temperatures recorded at the Tribes’ Sixes River monitoring site. Temperature data was not collected in 2011 due to a lack of staff.

## **IV. Discussion of Issues of Tribal Concern**

### **Data Gaps**

#### **Dissolved Oxygen**

In order to better understand the cause of low summer dissolved oxygen levels recorded at the North Fork and Cox Island Siuslaw sonde stations, the Tribes are planning to collect diel nutrient and Chlorophyll samples in the lower Siuslaw estuary. The expected result of these sampling events is a better understanding of whether the summertime low dissolved oxygen levels recorded at the North Fork and Cox Island sonde stations are potentially associated with algae production that may be caused by nutrient loading.

#### **Conclusion**

Data collected by our program in the 2011 water year appears to indicate trends are occurring at our sites similar to those observed by our program in previous years. Seasonal impairments to water quality (e.g. daily maximum temperatures and low dissolved oxygen concentrations) continue to occur at the Tribes' North Fork and Cox Island Sonde Stations.

## **Appendix A: QA/QC**

### **Quality Control for Meters and Probes:**

All meters and probes will be calibrated in accordance to the equipments operations manual prior to field deployment.

### **Quality Control for Microbiological Water Sampling:**

A 1:10 dilution will be used when running analytical E-Coli and *enterococcus* procedures. Field samples will be allowed to reach room temperature (per IDEXX recommended protocols) before they are diluted. 10ml of each water sample will be pipetted into a sterile, freshly opened, 120ml IDEXX sample bottle and quickly capped. After preparing all the samples taken for that day in the same way, distilled water will be decanted into the lab sample bottle so that the bottle is filled to the 100ml line.

### Blanks

For every sampling event, blanks of the distilled water used for the 1:10 sample dilutions will be run.

### Replicate Samples

One sample site will be chosen as a replicate site for each sampling event.

### Split Samples

For every 10 samples taken a split sample will be randomly chosen. A split sample consists of taking an additional 10 ml from the original sample bottle and testing it for E-Coli or enterococcus.

The IDEXX Lab will be quality controlled as specified in the IDEXX User Manual.

## **Nutrient Sampling Protocol:**

### **Field Grab Samples:**

At all sites, field calibration data including water temperature, salinity, specific conductance, and dissolved oxygen will be recorded with a hand-held YSI 650 MDS multi-parameter probe setup. A Hach 2100 turbidity meter will be used to measure turbidity. All grab samples will be taken on the same day between 3 hours before slack low water and slack low water. Efforts will be made to sample during spring tides at low-low tide, although this will not always be feasible due to the timing of tides and schedules of staff. Efforts will also be made to sample following a 72-hour dry period unless it substantially impacts the interval between semi-annual runs.

At each site, three consecutive samples (duplicates) will be collected by either wading or using a 2-L Van Dorn bottle held at 0.5 m above the channel bottom at the same level as the sonde. Samples from the Van Dorn bottle will be decanted into amber, wide-mouth, Nalgene bottles.

Sample bottles and equipment will be rinsed in tap water three times, acid washed (10% HCL), then in deionized water three times, then ambient water in the field three times. After a sample is collected, sample bottles will be immediately capped, placed on ice in the dark, and returned to the CTCLUSI laboratory. In the laboratory, samples will be stored at 4°C until filtration. Water samples will be filtered within 24 hours of collection.

## **Entry Verification**

Analysis results will be sent from the University of Washington Marine Chemistry Laboratory or other outside laboratory in Excel format. Files will consist of sampling station ID, date, replicate number, and parameter values expressed in unit concentrations.

## **Instrument/Equipment Testing, Inspection, and Maintenance Requirements**

All equipment (meters, probes, lab, and data loggers) will be tested and calibrated prior to deployment as stated in the equipments operations manuals. Equipment that fails to calibrate or is malfunctioning in any other way will not be used to collect water quality data until the equipment is repaired. Equipment log sheets will be placed in a folder to document all calibrations and testing. The Environmental Specialist will ensure that all equipment is in proper working order for the project.

Incubator temperatures will be recorded twice daily during microbiological analysis, with each reading separated by at least 4 hours.