

**FINAL REPORT AND ACCOUNTING
OWEB GRANT # 204-074**

VOLUNTEER WATER QUALITY MONITORING
SALMON-DRIFT CREEK WATERSHED COUNCIL

March 2006

Prepared for:

Oregon Watershed Enhancement Board
Oregon Department of Environmental Quality

Project Dates: August, 2004 through August, 2005

SALMON-DRIFT CREEK WATERSHED COUNCIL
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A. What is the Condition of the Watersheds:

1. Drift Creek: The USFS (United States Forest Service) has designated the Drift Creek watershed as a Tier 1 Key Watershed. Drift Creek is the only key watershed in the Siletz Basin. Coho and Steelhead populations are severely depressed in Drift Creek basins (ODFW data Buckman et al). Drift Creek is listed as a “source area” for Steelhead by the ODFW (Oregon Department of fish and wildlife). The MidCoast Watersheds Council has designated Drift Creek as a high priority for protection and enhancement. Drift Creek is on the DEQ’s 303(d) list from main-stem to headwaters for exceeding temperature standards.

2. Rock Creek: Rock Creek Coho (Devils Lake system) are one of the most stable and productive natural runs on the central Oregon coast (Buckman and Nickleson). Discussion from “Preliminary analysis of genetic structure of Oregon Coastal Coho populations” (Johnson, Banks, and Lawson) and “Genetic Population Structures of central Oregon Coast coho salmon” (Ford, Teel, Van Doornik, Kuligowski and Lawson, 2005), state that the Rock Creek (Devils Lake) coho are “genetically distant.” “PCA analysis revealed a moderate degree of clustering among populations, with the Devil’s Lake cluster most noticeably distanced from other populations.” (Johnson, Banks and Lawson, 2005)

Since these Coho are an important wild population, the watershed group and other agencies such as Devils Lake Water Improvement District (DLWID), ODFW, and NOAA Fisheries are particularly concerned with conditions on Rock and Thompson Creek as major tributaries of Devils Lake. Important management decisions need to be made that could have a critical impact on this particular Coho population. MidCoast Watersheds Council has designated Rock Creek as a high priority for protection and enhancement. (Thompson and Devils Lake are on the 303(d) list.)

3. The Salmon River: The Salmon River is about 25 miles long and has a basin area of 77 square miles. (United States Forest Service, Salmon River Watershed Analysis, 1999). Salmon River is managed for hatchery and wild stocks. The Oregon Department of Fish and Wildlife estimates a total of 121.5 miles of fish habitat in the Salmon River drainage (ODFW, 1997). Native fish populations are generally in decline. The United States Forest Service states that, “Habitat and water quality data is limited for the system and a monitoring program is needed to better determine the condition of the habitat and needs for restoration.” (USFS 1999)

The United States Forest Service’s assessment states “Monitoring appears to be lacking for water quality parameters (fecal coliform, turbidity, dissolved oxygen, pH) on Salmon River. (USFS, 1999)

The document further states that, “Although there were no data available on suspended sediments, turbidity is thought to be a problem.”

The Salmon River from mouth to headwaters is listed on the Environmental Protection Agency’s 303(d) list of Water Quality Impaired Stream Segments for high water temperature and dissolved oxygen.

Salmon River is currently managed for wild stocks of Chum, Steelhead and Cutthroat trout. Fall Chinook and Coho are managed for wild and hatchery stocks. Fall Chinook is considered to be a

healthy stock and is used as an indicator group to represent all north-migrating Oregon coastal fall Chinook in ocean harvest management under the U.S. Canada treaty.

Chum salmon are native to the Salmon River basin. Wild winter Steelhead are depressed and currently under review. Cutthroat trout are native and are thought to be in decline.

B. Background of the Current Water Monitoring Project:

The basin assessment research and scoping completed by SDCWC in 2001 revealed there is very little baseline water quality and quantity data available to identify specific problems or to develop enhancement and restoration strategies. The participants in this project, including the MidCoast and Nestucca-Neskowin Watershed Councils, Oregon DEQ, Oregon Coast Community College, The Nature Conservancy, Devils Lake Water Improvement District, and United States Forest Service want to document the baseline water quality conditions of Drift, Schooner and Rock Creek Basins and the Salmon River.

The Salmon-Drift Creek Watershed Council (SDCWC) developed a quality assurance plan in 2001 (updated in 2002 and 2003 and 2004) with assistance of ODEQ. Goals included establishing baseline water quality and flow information, monitoring for bacterial contamination, identification of temperature limited areas and cold-water *refugia*, and determining potential priority restoration areas.

In summers of 2001, 2002 and 2003 a water quality lab was set up in a facility owned by Oregon Coast Community College (OCCC), using equipment loaned by ODEQ. In 2001 there were 10 volunteers and 10 community college students participating in the project. For the year 2002 over 15 volunteers participated in the effort with assistance from 2 Oregon Coast Community College students. In the summer season of 2003, SDCWC volunteers monitored flow, temperature, surface water chemistry and began initial bacterial testing. An OCCC student assisted.

Funding from OWEB Grant #201-410 supported this water monitoring project for 2002 and 2003. Funding from OWEB grant # 204-062 supported the water monitoring project for 2003 and 2004.

Funding from OWEB grant # 204-074 supported the current project. Laboratory work was done at the Devils Lake Water Improvement District office due to construction at OCCC and then moved to McKenzie Environmental Consulting office during the summer 2005 field season. Fall and winter monitoring for these grants utilized SDCWC volunteers and OCCC students.

For all monitoring, the Oregon Department of Environmental Quality (ODEQ) has done quality control and has integrated the data into the state database. USFS hydrologists assist with flow and Vemco monitoring placement advice. USFS uses SDCWC data for regional planning and for its current Siletz Basin watershed analysis planning. The USFS will also utilize SDCWC data on the upcoming (2006) regional planning effort for the Salmon River and Cascade Head Management area. DEQ has indicated that SDCWC data will be utilized in the Mid-Coast TMDL process.

Following an OWEB review team's recommendation (2001), bacterial sampling was initiated during the 2002 sampling season to determine potential sites for further investigation. For these first two sampling periods (fall/winter 2002/03) processing and interpretation was done by the Yachats Water

Quality Monitoring Group. The Yachats group also supplied technical advice and supplies to accomplish the bacterial testing.

In 2003 SDCWC in cooperation with a consortium of other local groups raised money to fund a laboratory to process bacteria samples. During the summer 2003 sampling season bacterial monitoring continued but was limited due to lack of funds. Bacterial processing on a bi-weekly basis was initiated at the NNCW cooperative lab with the “bridge grant” OWEB funds (#204-062) beginning in August, 2003. This work has continued throughout 2004 and 2005. An increased frequency of monitoring was initiated during the summer of 2005 to meet the DEQ standard of 5 samples within a 30 day time period.

Flow equipment (USGS and OWRD specification) was purchased jointly with Devils Lake Water Improvement District (OWEB grant #201-410). Technical advice was obtained from the Oregon Water Resources Department, Rickley Hydrological, and USFS hydrologists, Jan Robbins (Waldport Ranger District) and Kami Ellingson, (Hebo Ranger District). Personnel from Devils Lake Water Improvement District (DLWID) assisted with flow data collection. OWRD has assisted in flow measurement guidance and “SDCWC flow monitoring volunteers” have completed OWRD workshops.

In 2003 Devils Lake Water Improvement District provided funding for the SDCWC to purchase 10 additional Vemco units which allowed an expanded temperature monitoring effort. This expanded effort allowed winter placement of Vemcos in the lake and additional summer monitoring in Devils Lake and its main tributary streams.

In late 2003- 2004 SDCWC added streams in the far northern section of Lincoln County to its monitoring project. These include lower tributaries to the Salmon and the main stem Salmon River. Specific sites include Bear, Slick Rock, Panther and Deer Creek in addition to sites on the main stem (Red Bridge, Otis Bridge, above and below the ODFW hatchery complex). SDCWC also works with the Neskowin Nestucca Watershed Council which has defined Deer Creek as high priority for restoration and enhancement. (Deer Creek begins in Tillamook County and flows into the Salmon River in North Lincoln County).

The project was been supported in-kind by Oregon Coast Community College (OCCC), which has supplied laboratory space, some equipment and chemicals and advertising of the project. However, as previously discussed lab work was moved to DLWID due to OCCC construction in 2004.

The college has paid the salary of Instructor, Katheryne McKenzie, (summer terms 2001, 2002, 2003) whose water quality monitoring class was involved in the monitoring effort. OCCC offered the WQM course in 2003 & 2004 & 2005 but due to low enrollment numbers, Ms. McKenzie donated her teaching time and expertise to a small number of OCCC students.

The ODEQ, USFS offer technical support and equipment. The former DLWID manager was an integral member of the collection team and a key component to the QA/QC.

Donations of volunteer time have been very generous. Contribution of time from many volunteers including retired corporate executives, personnel from The Nature Conservancy coastal reserves program, local science educators and students as well as a Ph D atmospheric scientist have enriched

the program. The program also has a network of local landowners who assist with sample collection or allow access to streams.

The project continues to work with local government and area schools. In 2003 SDCWC was recognized as a leader in developing wide community support and received a statewide SOLV award.

In 2004 the group received the Annual Community Service Award from Mayor at the Annual Lincoln City Days sponsored by Chamber of Commerce. The Mayor, in bestowing the award, spoke about the value of the water monitoring project to the city and its residents.

C. The Monitoring Program:

The objective of the water monitoring program on the Salmon River, main stem and tributaries, as well as Drift and Schooner Creeks and Devils Lake and its tributaries Rock, Thompson and Neotsu Creeks is to gain baseline information (surface water chemistry, temperature, flow and bacterial monitoring.) The baseline study can assist in TMDL planning and further determine if there are “hot spots” and trends that need further investigation. Data collected under this grant that are related to Section 303(d) Category 5 water bodies (those that do not meet water quality standards and where TMDLs are needed for variables as turbidity, DO, bacteria, and temperature) will be collected in cooperation and coordination with the DEQ (following DEQ protocols).

The dissolved oxygen information is pertinent for the current 303d listing on Salmon River. One monitoring site is at Otis Bridge which is a quarterly DEQ monitoring site. There are two additional main stem upstream sites monitored for dissolved oxygen levels. Steve Hanson of DEQ has indicated that collecting dissolved oxygen data may assist in specific identification of the extent and portions of Salmon River that are in violation of standards. This data will be particularly useful for the upcoming Total Maximum Daily Load (TMDL) survey of the MidCoast (2007).

1. Surface Water Chemistry Monitoring:

The initial water quality monitoring effort (2001) centered on Drift Creek. In 2002 the program was expanded (OWEB grant #201-410) to the Rock Creek basin (Devils Lake watershed) and tributary streams of Devils Lake. In 2003 the group expanded its effort to include areas within Devils Lake (proper), and Devils Lake’s adjacent wetlands (OWEB grant #204-062). In 2004/05, SDCWC (OWEB #204-274) added the mainstem Salmon River and major tributary streams which include Bear, Slick Rock, Panther and Deer Creek.

Biweekly ambient surface water sampling was carried out under the current grant from June 2004 through July 2005 on Drift and Schooner Creek, the Devils Lake tributaries of Rock and Thompson Creeks and on the main stem Salmon River and its major tributaries.

The ambient water quality parameters measured are temperature, dissolved oxygen, turbidity, conductivity and pH. Additional turbidity measurements were taken at peak storm events.

2. Flow Monitoring:

Stream discharge or stream flow monitoring studies utilized USGS and Oregon Water Resources Department approved instrumentation and procedures. Paul Katen, a SDCWC volunteer, conducted the Council's water discharge (flow) measurements. He and Lori Campbell, former DLWID manager who also assists in the flow metering, completed flow measurement training by Oregon Water Resources Department.

Our report on OWEB Grant # 201-410 presented the results of our stream flow monitoring in 2001, 2002, and 2003. Stream flows were not monitored during the summer of 2004 as a result of a combination of delays due to instrumentation upgrade and repair and the high August and September rainfall, which brought the stream levels up. In 2005 we conducted stream flow monitoring in the late summer on Drift and Schooner Creeks and the Salmon River.

The goal of the monitoring program is, in part, to determine how low the flow gets in late summer and early fall in the various streams. The measurement program typically ends when the fall rains begin and the stream flows begin to increase.

3. Temperature Monitoring:

VEMCO continuous temperature recorders were installed in the various locations discussed below. These electronic automated monitors precisely recorded the water temperatures every 30 minutes. Area streams were monitored throughout the summer from June through October for all years 2001 through 2005. All data were collected following the DEQ Stream Temperature Protocol (Version 2.0) and were processed utilizing the DEQ Hydrostat Reader software.

The SDCWC began its summer stream temperature measurement program in the summer of 2001. In this program 16 Vemco temperature sensors were deployed in Drift and Schooner Creeks and in the Devils Lake watershed tributaries. The DEQ provided considerable assistance by processing the data files in this first year of our monitoring program.

During the 2002 summer season SDCWC placed 22 Vemco continuous temperature recorders throughout the Drift Creek, Schooner Creek, and Devils Lake watershed tributaries.

For the 2003, 32 Vemco units were deployed. All pre and post deployment accuracy checks, in-stream audit measurements, data processing and analysis were completed by volunteers in the SDCWC.

For the summer of 2004 Vemco temperature sensors were again deployed to measure lake and stream temperature during the summer. SDCWC placed Vemco sensors at monitoring locations used in previous years in Drift Creek, Schooner Creek, Devils Lake its main tributaries and the wetlands adjacent to the lake. In 2004 we expanded our monitoring network to include the Salmon River and its main tributaries. A total of 31 temperature sensors were deployed by the Council. Five sensors were placed in the Drift Creek watershed, 4 in the Schooner Creek watershed, 4 in Devils Lake (to measure vertical profiles in 2 locations), 9 in Devils Lake tributaries and adjacent wetlands, and 9 sensors were placed in the Salmon River watershed. One of the sensors in the Salmon River

watershed was used to monitor air temperature, it determine whether these sensors could be used in this role as a data source for developing the DEQ TMDL model database.

In 2003 (and 2004) Boise Cascade monitored stream temperatures in Rock Creek (the main tributary of Devils Lake) at 7 locations in both the main-stem and tributaries. Boise completed the analysis of this data and provided a copy of the data to the Council. The Boise data for 2004 is included in both our statistical summary and the plots of temperature distribution in the stream and will discussed below.

In the summer of 2005 the SDCWC deployed 40 Vemco temperature loggers throughout the watershed. In this study the Council has further expanded its studies in the Salmon River watershed, deploying a total of 13 sensors in the Salmon River system.

Prior to the 2005 sampling program Boise cascade lands were sold to Forest Capital Partners. Forest Capital Partner decided not to continue with its temperature monitoring program in Rock Creek. Since Rock Creek is the major tributary to Devils Lake and an important Coho spawning stream the Council wanted to continue the monitoring program. The Council was given permission to access FCP properties and was given a key to gain access to these private lands. In the summer of 2005, the Council placed its own sensors at the same locations measured in 2003 and 2004 by Boise.

The stream temperature data collected during the summer of 2005 is still being processed and will not be completed until the spring of 2006. Similarly the analysis of the summer 2004 stream temperature data had not been completed at the time the report on OWEB Grant 204-062 was submitted in February 2005. As a result of the time delays in processing the temperature data the summer 2004 stream temperature data is presented in this report.

4. Bacterial Monitoring:

Bacterial sampling was initiated during the 2002 sampling season to determine potential sites for further investigation. Follow up monitoring continued during the summer 2003 field season but at a lower number of samples than was desired due to lack of funds. Regular processing of samples began late in summer (August, 2003) when OWEB funding became available (table of results attached).

SDCWC's bacterial monitoring program utilizes the Colilert system and detects total coliforms and E. coli. Results from this initial monitoring demonstrate a need for more consistent and timely basin information. Partners who together funded a bacterial processing lab include: Devils Lake Water Improvement District, the Surf Rider Group, Native Fish, Oregon Trout, Nestucca-Neskowin Watershed Council, Audubon Society and SDCWC.

The laboratory is housed at Neskowin Valley School and also serves this school. A volunteer has been trained by ODEQ to prepare and process the samples. This allows for strict quality control.

The bacterial processing volunteer also demonstrates processes in the lab for Neskowin Valley School Students and initiated a "where does the poop go?" science study for younger grades. This study focused on septic and sewer systems and bacteria. Students observed the laboratory work and processing of samples.

Initial data illustrates that there may be multiple areas of bacterial contamination. There may be reason for concern due to the results which show high numbers of colony forming bacteria in the local basins of North Lincoln County. More specific work seems necessary. Based on initial results, SDCWC would like to concentrate on precisely locating sampling stations in an effort to track sources of contamination. Correlating seasonality, rainfall patterns and other factors in relationship to contamination numbers may provide some insight.

D. Results and Discussion:

It is difficult to draw any firm conclusion after five years of baseline studies. However, SDCWC water quality monitoring efforts can show some trends in local streams. Of critical importance seems to be the amount of in-stream water in the streams available for fish and wildlife. A second issue that is most critical appears to be high summer water temperatures that might impact stream-life health. A third issue is bacterial contamination and tracking the source of the contamination.

1. Water Quality:

a. pH: is a measure of how acidic or basic a solution is. pH which varies too far from the neutral range (7) can severely impact biological conditions in the stream. pH as measured in lower Drift Creek was at a threshold level that exceeded (too alkaline) DEQ standards all four years of the monitoring. Results in both Rock Creek (Devils Lake watershed) and Thompson Creek are within the acceptable category (see attached tables). Drift Creek (near Elks Park) tested at levels that exceed alkaline standards in late winter (03) and early spring (04). pH in the Salmon River system appears to meet standards. Results of pH for the 2004/2005 season show that all streams meet standards (within 6.5 to 8.2 pH). There are periods in the late summer months when pH tends toward the alkaline (8+). However, this may result from biological productivity (increased CO₂).

b. DO: is an important indicator of water quality for aquatic organisms. It is essential for all plants and animals. Oxygen is a particularly sensitive factor because chemicals, biological processes and temperatures often determine its availability.

In all years of monitoring, the group measured levels that might be of concern. In the late summers of both 2002 and 2003 and 2004 when extremely low flows occurred, dissolved oxygen numbers in Thompson Creek fell to a critical level. Dissolved oxygen concentrations on lower Drift Creek sampling stations were also in the low range during periods of lower flow (see tables).

Gorton Road bridge monitoring site on lower Drift Creek (2003 and 2004) consistently shows lower DO levels in the late summer months when flows are low and temperatures are high. This also seems to correspond to high numbers in conductivity readings. It should be noted that these numbers also correspond to lowest low tide conditions so these results should not be due to salinity. No other stream segment had low DO readings during the summer monitoring 2003.

Sites on the Salmon River include five mainstem sites: Otis Bridge, above and below the ODFW hatchery, above "Red bridge"—above Slick Rock and at the Salmon Berry Road Bridge. Of particular concern on the lower mainstem Salmon is the 303d listing for dissolved oxygen. Collecting dissolved oxygen data may assist in specific identification of the extent and portions of the river that are in violation of standards.

The monitoring team initiated Winkler measurements of Dissolved Oxygen in August, 2004. This method was specifically included for this OWEB grant #204-074 (due to request by ODEQ volunteer monitor director, Steve Hanson).

In August 2004 low D.O. concentrations were measured in both Drift Creek sites and all sites on the Salmon River.

Weather conditions were unusual the summer of 2004 and quite different than in the past three monitoring periods. There was heavy rainfall in August and early September. Therefore the streams did not get to the lowest flow levels as seen in usual fall weather patterns. Lowest DO levels have previously been measured in lowest flow and warmest water conditions (such as those in late summer and early fall). After the period of low D.O. levels in August, 2004 D.O. readings resulted in standard levels with increased rainfall/water flow in the rivers.

In 2005 throughout August, low D.O. levels were measured in Salmon River, and lower Drift Creek. The Otis bridge collection site on the Salmon River and the Salmonberry bridge sites consistently measured low D.O. levels. There was variance in results from samples taken at the junction of Slick Rock Creek. Again, heavy rainfall in September, 2005 brought coastal streams to high flow levels.

c. Turbidity: is simply defined as water clarity. Materials that become mixed and suspended in water reduce water clarity. During the summer plankton can contribute to turbidity. In the winter during periods of heavy run-off silt can be a factor. Measured turbidity did not show problems during summer 2001, 2002 or 2003. The group began monitoring turbidity during peak winter precipitation events starting fall 2003.

A peak precipitation event on Jan. 30, 2004 resulted in a recalibration of the turbidity meter in order to capture the higher numbers. (see table). It was quite dramatic for the monitoring team to see the change in turbidity from background summer readings. As the team has been able to monitor year round it is apparent that the winter rain influenced turbidity readings differ substantially from summer lower flow conditions.

On advice of Steve Hanson, ODEQ volunteer monitor advisor, the monitoring team will measure the duration of higher than background turbidity in future peak precipitation events. The duration of higher turbidity readings will provide more useful information to ODEQ.

In 2004 through 2005, turbidity levels measured higher than “previously measured” background levels for the past three summers. This may be as a result of increased rainfall and runoff during the summer months. Throughout the testing year (August, 2004-August, 2005) turbidity levels higher than the previous records of turbidity were measured.

d. Conductivity: This is the measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate and phosphate or sodium, magnesium, calcium, iron and aluminum ions. Significant changes in conductivity can be an indicator that a discharge or some other source of pollution has entered the stream. Measurements in the lower areas of Drift Creek in 2003 and 2004 might indicate a cause for concern. There were significantly higher numbers at the Gorton Road bridge site on Drift Creek. This site is immediately below numerous small hobby cattle and horse farms. These higher numbers occurred in late summer at extremely low flow conditions. At present, additional

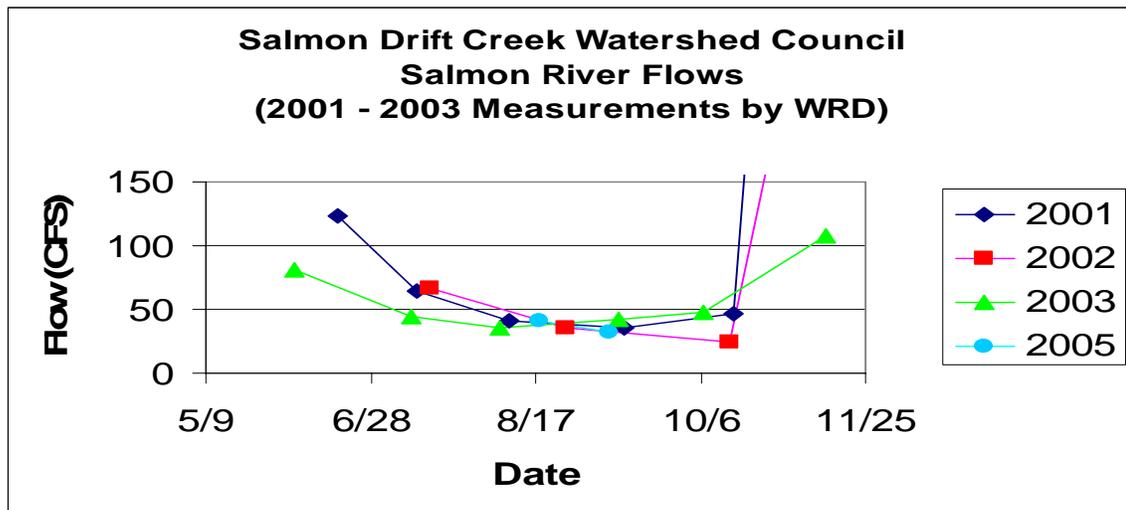
conductivity readings fall within acceptable levels or level of no concern on other monitored stream reaches (see attached tables).

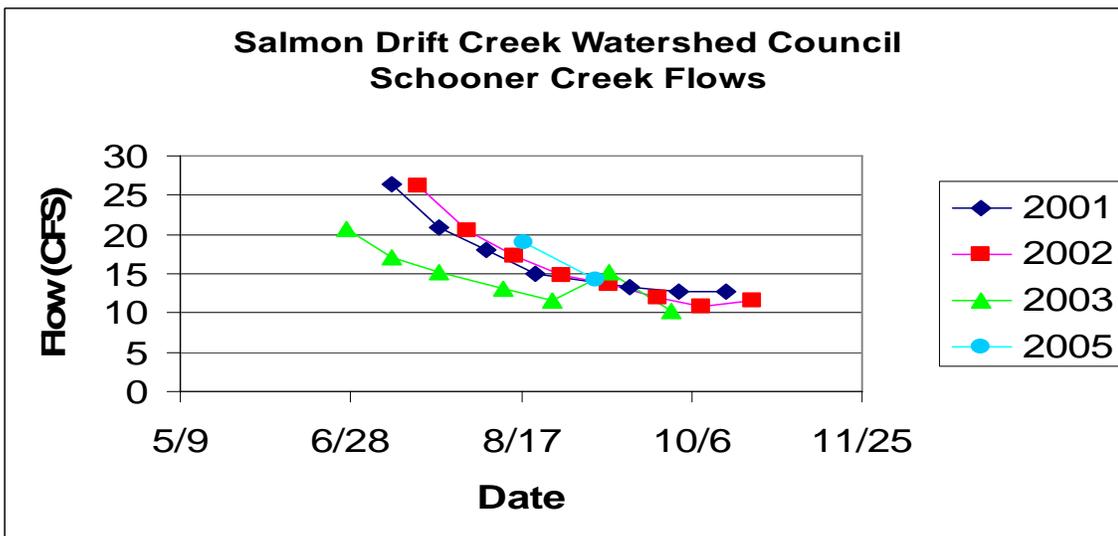
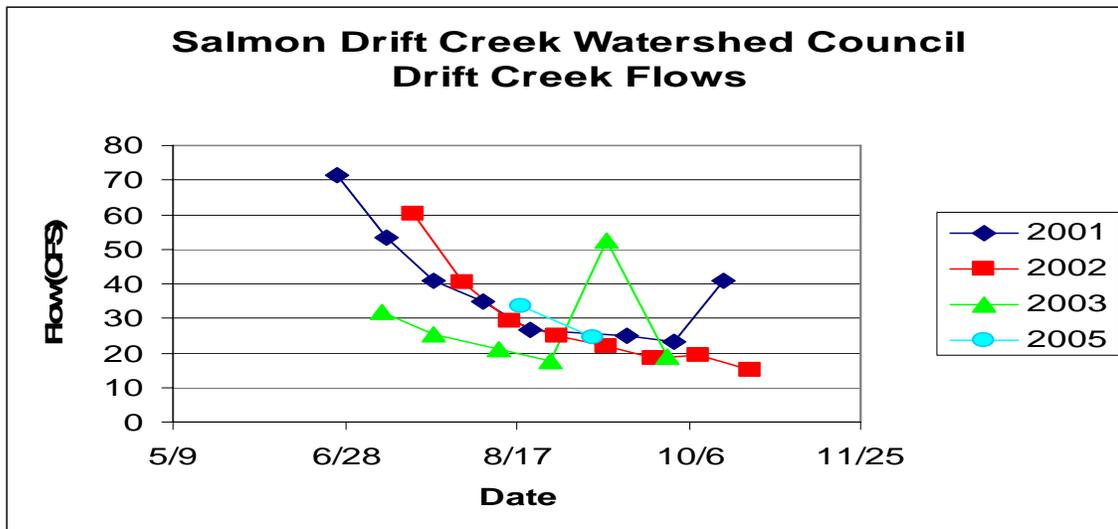
As mentioned previously, Drift Creek at the Gorton Road Bridge has had extremely high conductivity readings (see tables) during late summer and early fall. The tide conditions were analyzed and these readings should not have been due to salinity.

During the testing year 2004/2005 conductivity met standards on all sites. There is a remarkable consistency to the numbers. At each site the numbers do not seem to vary.

2. Flow:

The enclosed graphs show the stream flows in Schooner Creek, Drift Creek and the Salmon River by calendar date for the years 2001, 2002, 2003, and 2005. Prior to the summer of 2005 the Salmon River stream flow was monitored by Water Resources Department. However, WRD removed their staff gage and stopped making discharge measurement in 2004 in the Salmon River. During the summer of 2005 the SDCWC made stream flow measurements in the Salmon River in order to at least partially continue the historical record for that river.





During the late summer, measured flow in Drift Creek typically falls well below Oregon Department of Fish and Wildlife recommended minimum in-stream levels. (ODFW recommends 25 CFS.) Measured low flow in Drift Creek in October 2002 was 15.03 CFS and in 2003 the low flow for Drift Creek was measured at 17 CFS.

ODFW in-stream flows take into account flows necessary for healthy aquatic life. Inadequate in-stream water can clearly impact fish and aquatic resources. This low flow is a concern even before there is any significant water removal by municipalities. Flow in Drift Creek is measured below the KGBLB water treatment facility. These discharge measurements, the only flow data available for Drift Creek, were invaluable in the development of minimum stream flows allowable under the Settlement Agreement for the proposed water rights for Lincoln City. As part of the Settlement Agreement the City must install a staff gage and conduct discharge measurements in Drift Creek in order to assure the flow does not fall below the minimums established in the Settlement Agreement.. The SDCWC plans to continue its monitoring Drift Creek flow as a check on the measurements taken by Lincoln City.

As part of the agreement that allowed the recent modifications to the Lincoln City Schooner Creek Water Treatment Plant inlet, the City is required to maintain a flow of at least 3 CFS downstream of the plant in order to protect the fish habitat. In 2002 the SCDWC measured a minimum flow in Schooner Creek of 10.81 CFS just above the water treatment plant on October 9. As a result of the 3 CFS by-pass requirement, the City can be severely limited in the amount of water that it can withdraw from Schooner Creek. The SCDWC plans to continue to monitor the flow both upstream and downstream of the plant to assure that City is in compliance with its permits.

3. Temperature:

As mentioned above, the stream temperature data collected during the summer of 2005 is still being processed and will not be completed until the spring of 2006. Processing the 2005 temperature data, including all of the accuracy checks according the DEQ protocol and completing the DEQ temperature audits sheets required for each sensor is a rather laborious process. As of March 1, 2006 the Council has downloaded the data from the Vemco temperature sensors and has completed both the pre- and post-deployment accuracy checks. The temperature audit forms have been completed. Those sensors that have met all the criteria for accuracy are processed with the DEQ program Hydrostat Reader to generate plots of the raw and 7-Day Maximum. Summary statistic tables and graphs of 7-Day Maximums of the 2005 will be generated from the Hydrostat analysis.

Similarly the analysis of the summer 2004 stream temperature data had not been completed at the time the report on OWEB Grant 204-062 was submitted in February 2005. As a result of the time delays in processing the temperature data the summer 2004 stream temperature data is presented in this report.

For the summer of 2004 Vemco temperature sensors were again deployed to measure lake and stream temperature during the summer. SCDWC placed Vemco sensors at monitoring locations used in previous years in Drift Creek, Schooner Creek, Devils Lake its main tributaries and the wetlands adjacent to the lake. In 2004 SCDWC expanded the monitoring network to include the Salmon River and its main tributaries. A total of 31 temperature sensors were deployed by the Council. Five sensors were placed in the Drift Creek watershed, 4 in the Schooner Creek watershed, 4 in Devils Lake (to measure vertical profiles in 2 locations), 9 in Devils Lake tributaries and adjacent wetlands, and 9 sensors were placed in the Salmon River watershed.

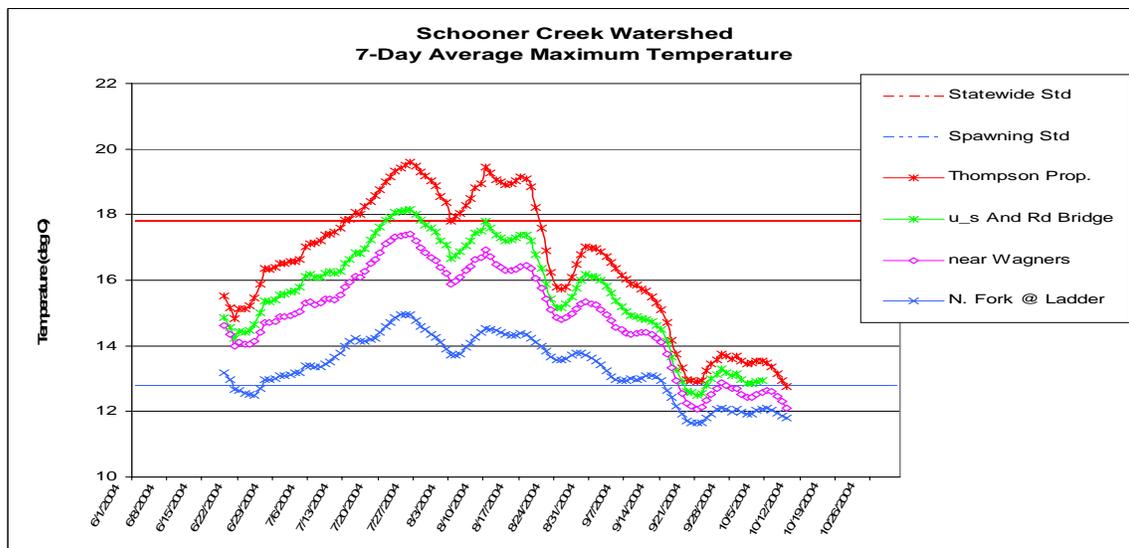
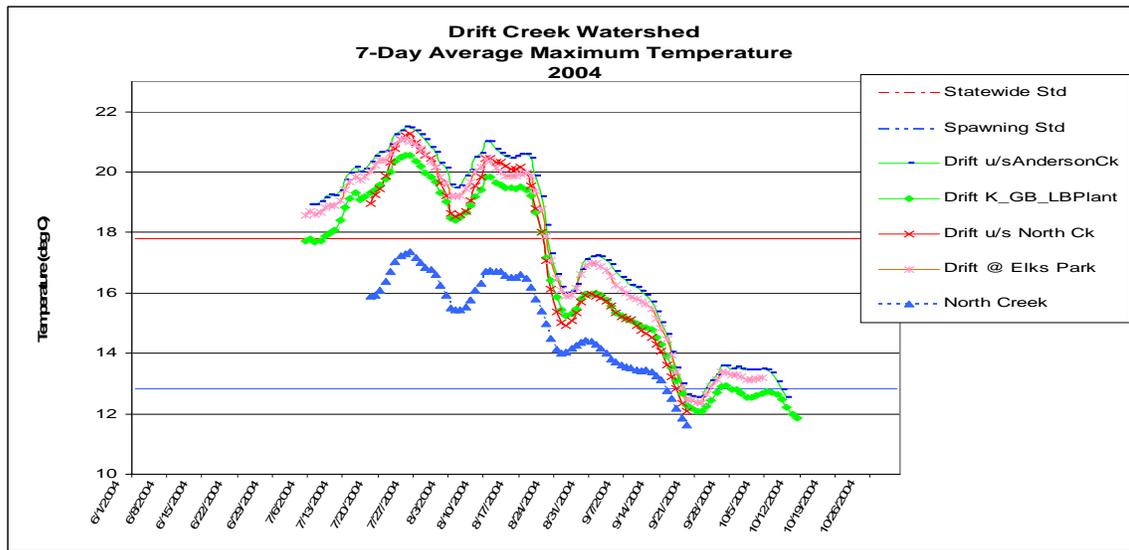
The SCDWC and the Siuslaw National Forest staff, who also monitor stream temperatures during the summer, have exchanged data sets. The Council has provided the Siuslaw staff with copies of our data for 2004. Unfortunately, due to a programming error the Suislaw staff did not collect any data in the summer of 2004.

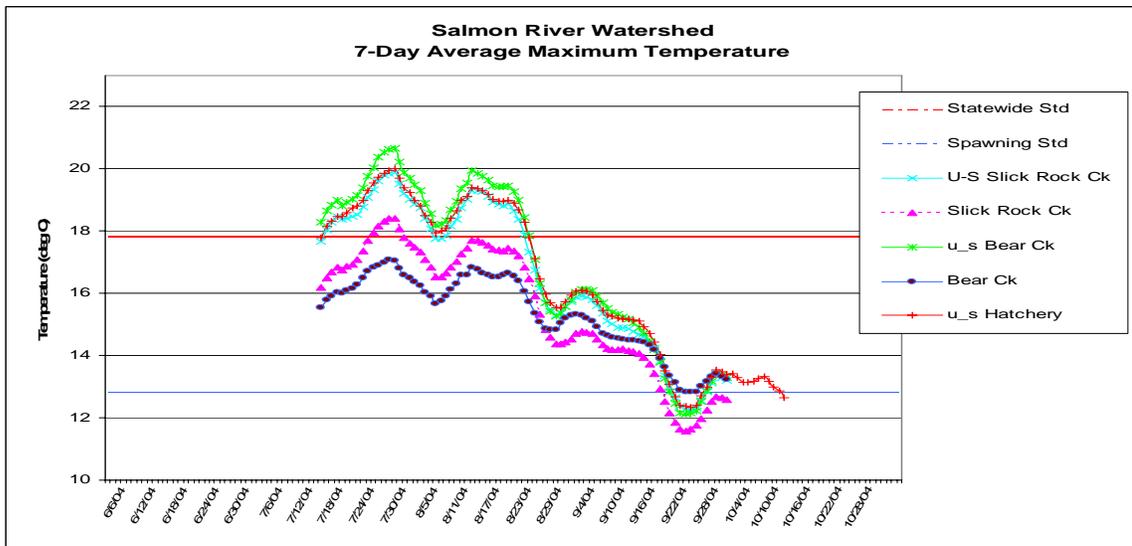
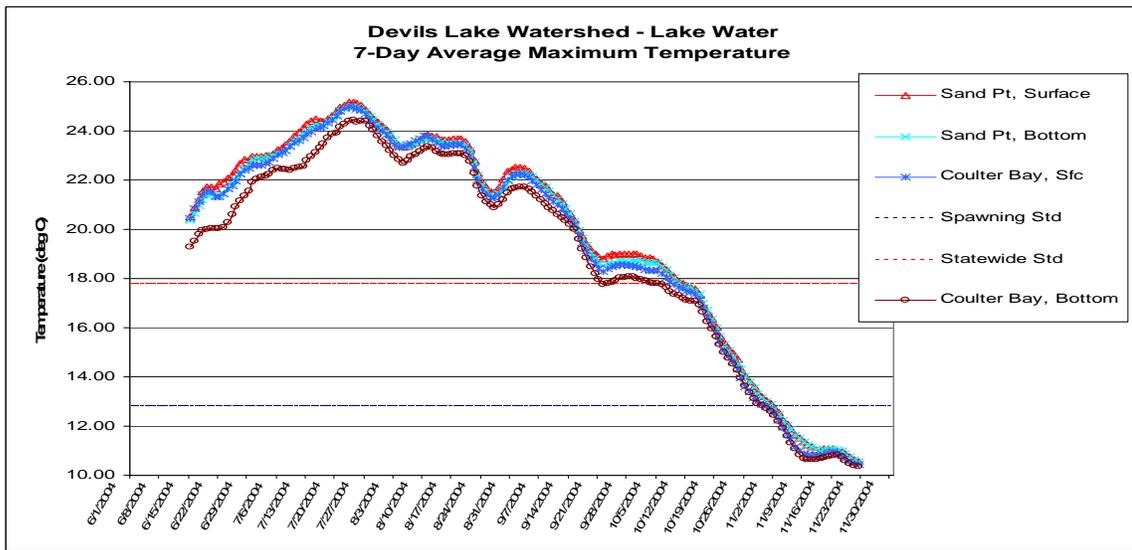
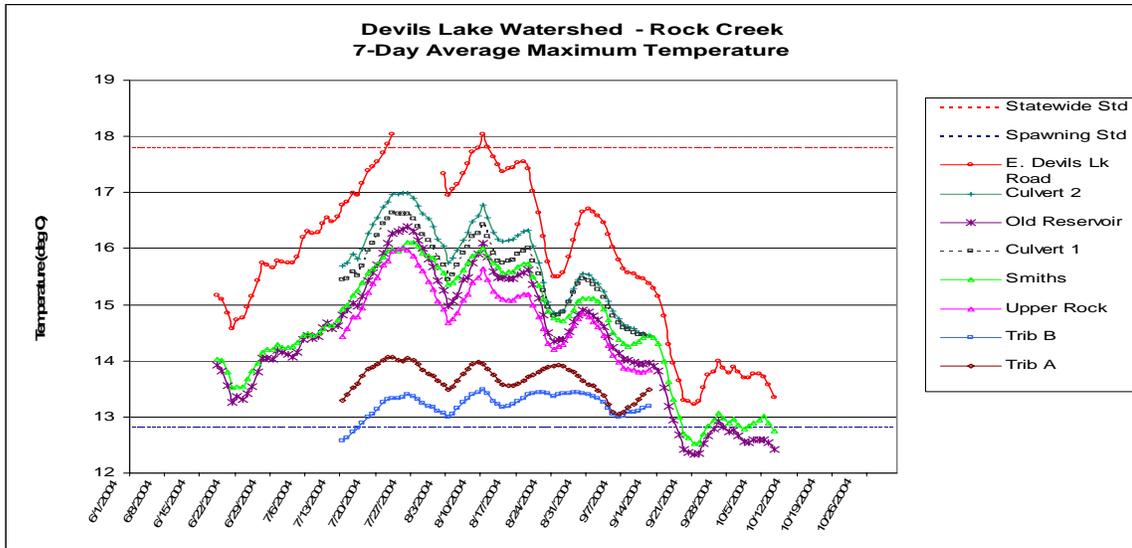
The statistics shown in the tables generally show an increasing temperature as one moves downstream (e.g., see maximum temperatures listed for Schooner Creek). Variations in this pattern do occur when a significant cold tributary flows into the main stem (e.g., see the impact of Devils Lake Rock Creek Tributary A on downstream locations).

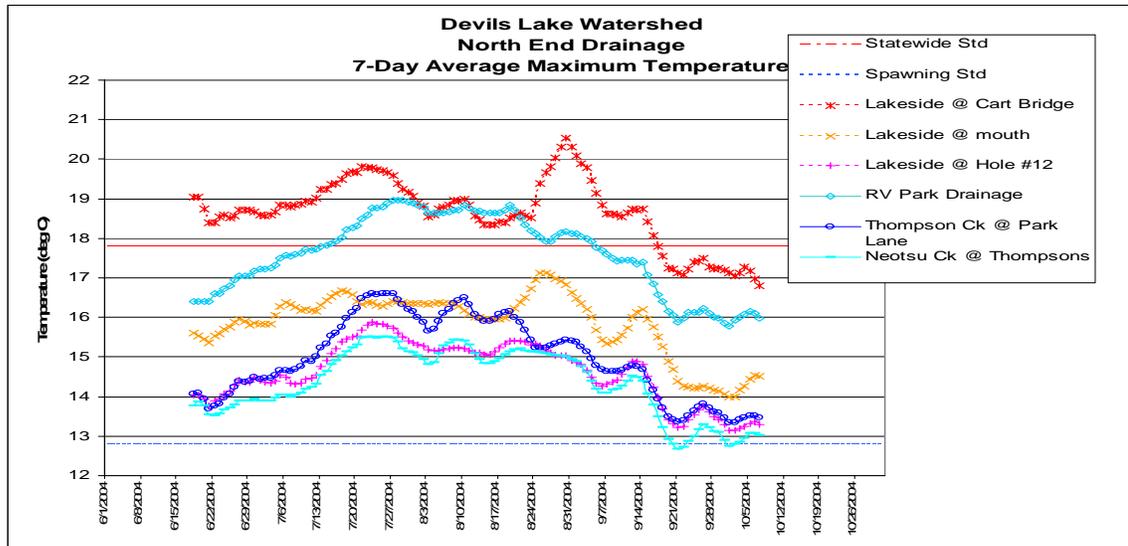
To further visualize and discern the temperature changes as one moves downstream, the project modified the output graphs of the Hydrostat Reader program to allow plotting all of the temperature

sensors in a watershed on a single graph. The attached graphs of stream temperature profiles contain plots of the 7-Day Average Maximum Temperatures in each of the watersheds.

These graphs are a visual presentation of some the data presented in statistical form in the enclosed spreadsheet. These plots generally show that the temperature in each stream increases as one moves downstream (see the spreadsheet to determine the sequence of measurement locations as one moves from upstream to downstream locations.) In several of the watersheds temperature sensors were also placed in main tributaries. As seen in the enclosed graphs these are often quite cold (see North Creek in the Drift Creek Watershed; Tributaries A & B in the Rock Creek watershed; and Slick Rock and Bear Creeks in the Salmon River Watershed).







The graph for Schooner Creek, which is the watershed from which Lincoln City draws its drinking water, clearly shows an increase in temperature as one moves from upstream to downstream (North Fork at Ladder, near Wagners, upstream of Anderson Road bridge, to Thompson property). The curves labeled “near Wagners” and “Up stream of Anderson Road Bridge” are immediately upstream and downstream of the treatment plant inlet. These curves show about 0.5 deg C temperature increase over a distance of about ½ mile. The nearly 2 deg C temperature increase between the Anderson Rd Bridge location and the “Thompson Property” also occurs over a distance of about ½ mile. However, the water level in that portion of the stream is, in general, significantly reduced due to the withdrawal by the City and also due to the fact that this reach is through agricultural land and is mostly devoid of shade trees.

The Sand Point and Coulter Bay graphs show the data for a temperature sensor near the surface and at the bottom of the lake at each location. This graph shows that the lake got quite warm in the summer of 2004 reaching about 25 deg C near the surface and that in mid-July there was about 1 deg C difference in the 7-Day maximum temperature from top to bottom. All three graphs show that the lake cooled to about 11 deg C by the end of November when the sensors were removed from the lake. These graphs also show that by November there was little vertical stratification in the lake and that the vertical profile was effectively uniform for the 7-Day Maximum temperature.

The rates of biological and chemical processes depend on stream temperatures. Optimal temperatures for trout and salmon are less than 55 degrees F (12.8 deg C). Causes of stream temperature changes include removal of streamside shading vegetation.

Temperatures in both upper and lower Drift Creek have exceeded recommended DEQ maximum temperatures in July for all years of the monitoring. Too high water temperature can cause problems for aquatic life. In the Rock Creek system temperatures changed dramatically in the 2 miles from the old city dam to where Rock Creek enters the culverts at East Devils Lake Road. This might have an extremely critical impact on young salmon, as the marshes adjacent to East Devils Lake Road, which are an important juvenile fish rearing area. Extreme temperatures can cause damage to young wild fish and also may be fatal.

4. Bacteria Monitoring:

Members of bacteria groups are used as indicators of possible contamination because they are commonly found in human and animal feces. Although, they are not harmful in themselves, they indicate the possible presence of pathogenic (disease causing) bacteria, viruses and protozoans. Water is tested for fecal coliforms and E. coli. The presence in streams suggest that pathogenic microorganisms might also be present. Sources of fecal contamination to surface waters include wastewater treatment plants, on-site septic systems, domestic and wild animal manure and storm runoff.

Total coliforms are a group of bacteria that are widespread in nature. All can occur in human feces but some can also be present in animal manure, soil and wood and in other places outside the human body. Total coliforms are used as a standard for drinking water because their presence indicates contamination. E. coli is a species of fecal coliform bacteria that is specific to fecal material from humans and other warm-blooded animals. EPA recommends E. coli as the best indicator of health risk from water contact in recreational waters.

SDCWC water project began routine monitoring for bacteria August, 2003. This monitoring utilizes the Colilert system and detects total coliform and E. coli. A volunteer from NNWC has been trained by ODEQ and processes all samples. Initial results indicate that during late summer and low flow conditions a majority of the areas sampled in North Lincoln County have high coliform readings. Many also have high E. coli levels.

Areas that most consistently had high numbers of both total coliform and E coli were all sites on Thompson Creek which is also listed by ODEQ on the 303d list December through January for fecal contamination. Many areas in the Devils Lake system and sites on lower Drift Creek had high readings of both total coliform and E. coli. A majority of the sampling sites on the Salmon River also had high readings for both types of bacteria.

Extremely high numbers at these sites persisted until late fall and early winter. (see attached tables). Winter numbers declined at most sampling sites. However, there were still persistent high numbers in many Devils Lake sites.

Thompson Creek, a major tributary stream to Devils Lake shows consistently high levels of both total coliform and E coli throughout the year.

Panther Creek in the Salmon River system also has high bacteria counts most of the year. Sites both above and below the fish hatchery on the main stem Salmon River also have consistently high bacteria counts. There are trailer parks adjacent to the river at these points which historically have had problems with septic/sewage. There are also numerous agricultural facilities (cattle grazing and horse farms) along this portion of Salmon River.

Devils Lake often has high bacteria counts as well. The highest numbers occur at the local swimming beaches and in the D River. The monitoring team would like to coordinate with the beach monitoring system during the summer months to determine if there is any correlation between higher bacteria counts on the D River and in the offshore area which DEQ monitors.

The Drift Creek system showed higher counts in early fall into mid winter (at periods of higher rainfall). The numbers fell during the later winter and rose again in early summer.

During the 2004/ 2005 testing period, higher numbers were read during the late summer and early fall. Most sites did not meet standards during this time frame. During the winter months most sites displayed a deceased bacteria count.

Beginning in April, 2005 most sites again measured high numbers. This persisted throughout the summer. The monitoring team did sampling to meet DEQ criteria 5 x in 30 days throughout the summer of 2005. Results are displayed on Excel spreadsheets attached.

It is the intention of the monitoring team to investigate the source of the bacteria to determine if the sources are human or animal. Determining source could provide possible remediation plans.

E. Data Products and Public Information:

The monitoring program is baseline, and will be conducted for a total of 10 years. The protocols are those of the ODEQ for surface water chemistry, temperature, bacterial contamination. Protocols are OWRD (USGS) for flow monitoring. The project utilizes the OWEB Water Quality Monitoring Technical Manual for procedural guidance.

ODEQ conducts field review of protocol and laboratory testing. SDCWC also relies on technical guidance from advisors (USFS, OWRD, and DLWID) and utilizes an ODEQ accepted QA/QC plan.

As projects designed to improve water quality are implemented in the basin, continued monitoring assists in the evaluation of project effectiveness. Similarly, as replanting and restoration projects are undertaken continued monitoring assists in the evaluation of these projects. Many monitoring sites are in the specific localities of previous restoration projects. In other cases, these sites are in areas where restoration work is planned.

1. Partnership and data sharing: The data has been provided to MCWC, ODEQ, EPA, USFS, OWRD, ODFW, ODA, DLWID, TNC, LSWCD, City of Lincoln City and Lincoln County, KGBLB water district, Panther Creek water district and other small local water districts, the Confederated Tribes of Siletz, and Boise Corporation now Forest Capital Partners. New data, as it is gathered and interpreted is provided to these groups.

USFS has incorporated Drift Creek and Salmon River data into its regional data base, which is used for watershed analysis and planning. Currently the lower Siletz basin is in the watershed analysis and review phase by Siuslaw National Forest. Information gathered from the watershed group monitoring project will assist in this planning effort and final plan.

ODFW has used the temperature data to develop basin-planning priorities. The MCWC incorporated data into its assessment and use the information in planning projects and as a baseline to evaluate project effectiveness.

On Rock Creek, SDCWC has previously coordinated with Boise biologist, David Anderson in sharing temperature data. Since Boise was acquired by Forest Capital Partners in 2005, SDCWC has worked to continue the monitoring with the timber company biologist's assistance. Working in

partnership with its forest biologist, Brain Kernohan, SDCWC volunteer monitors gained access to the private lands of Forest Capital Partners and installed temperature monitors where David Anderson had previously recorded data. SDCWC hopes to maintain a long term record of temperature on Rock Creek. The information will be shared with the private industrial timber owners, City of Lincoln City and other interested agencies.

The project coordinates with USFS & LSWCD in sharing data. All groups cooperate in order to have complementing data collection points and assist each other's projects. A larger watershed range is captured by having many groups supplement each other's temperature monitoring.

SDCWC received a National Forest Foundation Community Assistance Program grant (2005 through 2007) to work in partnership with the United States Forest Service—Hebo District. As part of this grant SDCWC will be building an action plan for projects on Salmon River. SDCWC is also teaming in a regional planning effort (2006) by the USFS, TNC, Sitka Center, Camp Westwind and other stakeholders. This planning effort headed by the USFS will concentrate on the Salmon River and Cascade Head management area. SDCWC's monitoring data will be utilized for management decisions. Further information gathered from the volunteer water quality monitoring project can strengthen assessments and help participants to prioritize projects.

The project partners with City of Lincoln City and Lincoln County. The project coordinates and communicates with DEQ beach sampling project and is also partnering with Surf Rider Foundation. SDCWC coordinates testing with DEQ's quarterly testing on Salmon River at Otis Bridge.

DLWID has utilized information in prioritization of projects and educational outreach. Of timely and pertinent value to DLWID is the utilization of the monitoring data for its TMDL planning. DLWID has utilized data gathered in 2002 to assist in current management decisions.

Lake temperature recordings have assisted studies to determine Coho usage of Devils Lake. During July of 2004, SDCWC volunteers coordinated with Parker Ogburn of OSU extension in his study to determine possible areas of summer lake rearing by native Coho salmon. Temperature information was utilized to guide the study, specifically in determining best areas for trap and camera placement.

Lake temperature monitoring may provide valuable information to an on-going study of invasive New Zealand Mud Snails by OSU Fisheries PhD candidate, Michael Liu.

The project has furnished information to OWRD, City of Lincoln City and KGBLB water district regarding flow measurements. This is a high priority issue as there are current water supply issues facing Oregon's coastal communities. Information gathered from the watershed group project can assist in resource allocation and expenditures. Further, the information gathered from the years 2001 through 2004 have been utilized in decision making and action planning by the City of Lincoln City Open Space Committee (a local bond funded environmentally-sensitive acquisition project.)

Temperature information is also valuable due to the on-going water withdrawal efforts by local municipalities. Temperature information is pertinent for work plans and fishery studies by Siletz Tribal biologists in lower Drift Creek and Siletz Bay. Drift Creek is listed (303d) due to temperature. Continued monitoring and additional deployment of the data recorders may provide necessary for site specific information towards protection and restoration efforts in these areas.

The City of Lincoln City has utilized SDCWC information. The Mayor and council have asked SDCWC to participate in water system planning meetings. They have requested input based on SDCWC work to assist the council in water conservation planning. The City water plant manager has utilized SDCWC data in application for various state and federal permits.

SDCWC input continues to be valuable for preparing and implementing Lincoln City's required water conservation management plan. The Lincoln City Mayor has requested SDCWC participation in conservation planning. SDCWC data has been and will be utilized in future discussions and in the planning process.

ODEQ has stated that SDCWC's temperature information would be used in the upcoming Mid Coast basin TMDL process. Eddie Huckins, Technical Specialist with the Lincoln County Soil and Water Conservation District, has been awarded a DEQ 319 grant that includes a temperature monitoring component for agricultural lands in the Mid Coast Basin. Mr. Huckins has been developing a quality assurance project plan (QAPP) for the Mid Coast basin temperature measurement program that will be used to develop TMDLs. He has coordinated efforts between the ODEQ and all organizations in Lincoln County collecting temperature data to assure all understand the data requirements of the temperature models to be used in the data analysis.

In 2005 Paul Katen, a SDCWC volunteer worked with Lincoln Soil and Water Conservation District personnel as part of their DEQ 319 grant (re: SB 1010 study). Paul, a leader in the SDCWC volunteer water quality monitoring project, also participated in planning efforts to produce TMDL temperature modeling for the Mid Coast planning region.

Oregon DEQ has indicated that this bacterial monitoring will assist in local TMDL development. Amy Chapman, Coordinator of Lincoln County Public Health and Bill Zekan, Lincoln County Sanitarian are in support of the volunteer monitoring efforts. SDCWC's data has been furnished to County agencies

2. Outreach:

Water quality monitoring provides a public relations bonus for the watershed council and OWEB. When volunteers are out in the watershed they are able to meet with land owners and other citizens. Specific contacts are made during monitoring efforts. Contacts have included local Realtors, Chamber of Commerce members, and small farm and timber-lot landowners. Follow up presentations and projects have resulted from these out in the field contacts.

The project utilizes publicity and information in local newspapers (Newport News Times and Lincoln City News Guard). There seems to be a high level of local interest. Monitoring projects have been covered extensively in these local newspapers. It is intended that the new project will have similar coverage. The project includes newspaper columns with watershed information that includes results of monitoring.

The monitoring team has been active in speaking to civic groups (Lions Club, Kiwanis, Chamber of Commerce, Oregon Coast Learning Center). Monitoring allows and fosters cooperation and partnerships with local agencies, the city of Lincoln City, the community college and water districts. There have been numerous teaching and field trip opportunities with the local "career tech" charter school.

Nestucca High School students and OCCC students have participated in the project. Students from the local Seventh Day Adventist School and Neskowin Valley School have also worked with monitoring team members. Local Boy and Girl Scouts also assist.

Exhibits describing results and the on-going project have been displayed at the public library. Informational displays have been presented at various city festivals including the Schooner Creek Festival, Earth Day, and Watershed Weeks.

In the spring of 2003 SDCWC had a booth at the local Chamber of Commerce Home and Garden show. This booth generated much enthusiasm for the monitoring project and allowed the “water quality team” to discuss results with many local citizens. During the show SDCWC gave away more than 300 water conservation kits. These kits were given to the group by City of Lincoln City Public Works Department. It was interesting to note that the Chamber chose to feature the watershed group in its advertising campaign.

The local Preservation Association of Devils Lake has utilized SDCWC’s displays and information at its annual meetings. This meeting is designed to inform and to educate lake residents.

A web page has been established. Monitoring results will soon be posted on the web page.

Matching and in-kind donations have been acquired to fund temperature monitoring, flow measurement and educational activities from DLWID, and OCCC.

The project allows citizens to participate in data gathering and decision making. This local input has a beneficial value recognized by ODEQ in its TMDL development. ODEQ feels that by utilizing the expertise of local residents and implementing longer term studies this will assist with improved development and local acceptance of TMDL management plans. The project provides an educational opportunity for all citizens and most importantly the local city council and county commissioners. By taking interested citizens and officials on water quality field trips the project helps people to learn about and know their own watersheds. This underscores the importance of local community ties and networking.

As more is learned about the basins, this knowledge will help in the pursuit of further restoration and information needs. SDCWC data provides quantifiable arguments and explicit direction for priority restoration efforts.