Grants Pass Water Quality Monitoring 2003-2005

Rogue Valley Council of Governments

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Abstract

This report summarizes water quality data collected in the Middle Rogue Watershed on streams in the Grants Pass area by the Rogue Valley Council of Governments. Samples were collected for two years beginning in April 2003 and ending in April 2005. The purpose of the monitoring study was to evaluate baseline water quality in the Grants Pass area focusing primarily on tributaries. A secondary goal of the project was to evaluate the effect (if any) the City is having on water quality. Prior to this study water quality information focused on the Rogue River, data about tributary health and contribution to the Rogue River was not known. This report summarizes the monitoring program and data collected from six tributaries and the Rogue River.

Study Highlights

- Water quality results found are similar to other streams in the region for temperature, bacteria, nutrients, and dissolved oxygen. Bear Creek, located approximately 35 river miles upstream of Grants Pass, has a TMDL for nutrients and dissolved oxygen. In addition, a TMDL addressing bacteria and temperature for the Middle Rogue is in development. As a result, it is likely that these waters will be 303(d) listed in the near future for similar parameters.
- Pollutant concentrations are greater in the summer months (individual grab sample results) while higher pollutant loadings were found in the winter.
- Generally water quality decreased at downstream sampling sites.
- Tributary impacts on the Rogue River were not apparent based on the study results. Loading calculations on all streams and continued sampling of the sites is recommended to continue to evaluate the influence of the tributaries and development in the Grants Pass urban area.

Rogue River at Baker Park

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Section 1.0 Introduction and Overview

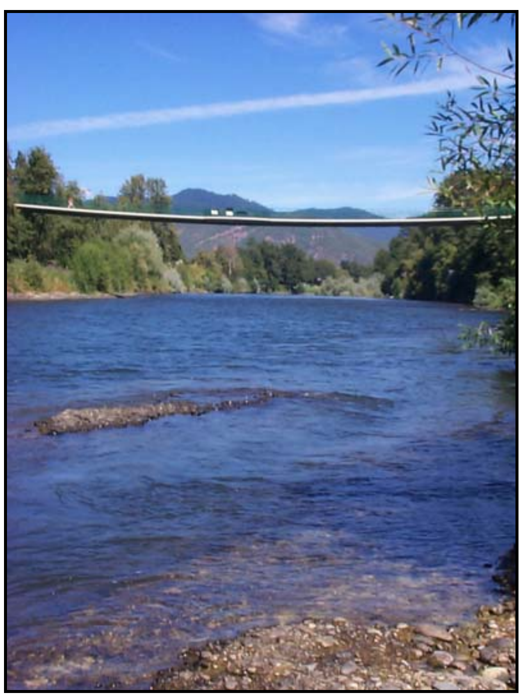
1.1 Introduction

The Rogue River has one of the healthiest fish runs on the west coast of the United States. Salmonids including Coho, Chinook (spring and fall), and steelhead (summer and winter) use the Rogue and its tributaries for spawning and survival. These waters are also inhabited by a wide variety of other species including resident trout and Pacific Lamprey. The condition of water quality in Grants Pass tributaries was not well recorded and a need existed for water quality information to assess restoration and protection needs.

In response to these needs, the Grants Pass water quality monitoring program was initiated in April of 2003. Samples were collected for two years on six tributary streams and the Rogue River. Samples were collected on Jones Creek, Fruitdale Creek, Allen Creek, Gilbert Creek, Sand Creek, and Skunk Creek. The program was designed to establish baseline water quality data for the tributaries of the Rogue River flowing through the City of Grants Pass.

The major goals of the monitoring program were:

(1) Evaluate water quality in the Grants Pass Urban Area,
(2) Assess tributaries contribution to the overall pollutant loading of the Rogue River,
(3) Utilize stream water quality to assess overall watershed health,
(4) Identify how water quality is changing over time.



All Sports Park Bridge over Rogue River

1.2 Purpose

The purpose of this report is to present the data and summarize findings of the monitoring program for 2003 through 2005. This summary is intended to assist the City of Grants Pass, the Rogue Valley Council of Governments, regulatory agencies, the Middle Rogue Watershed Association, and other interested groups in:

1) Identifying pollution entering the Rogue River from its tributaries,
2) Improving the understanding of Grants Pass's effect on water quality,
3) Assisting groups in prioritizing projects and maintaining water quality.

A secondary purpose of the report is to provide a tool for Grants Pass to facilitate greater understanding of local watershed health and the necessity for taking action to reduce water quality pollution in the Grants Pass area. This initial study may be used to guide future monitoring and restoration efforts.

1.3 Water Quality Standards

The 1972 Federal Water Pollution Control Act (Clean Water Act) is the primary piece of legislation addressing water pollution in the United States. Section 303(d) of the Clean Water Act requires states to identify waterbodies that are not meeting water quality standards. Once identified, these waterbodies are placed on a list of "water quality limited" streams, called the 303(d) list. For each waterbody on the list, the state identifies the specific pollutants (or parameters) that are a problem for that waterbody. The state must then develop "Total Maximum Daily Loads" (TMDLs) for each of the identified parameters.

A TMDL defines the theoretical amount of pollution that can be present in a waterbody without causing impairments to the designated beneficial uses. Rogue River main stem from estuary to Lost Creek Dam designated beneficial uses include public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, commercial navigation and transportation.

The Middle Rogue, an area that includes the Grants Pass area, has been 303(d) listed for bacteria and temperature. Tributaries including Allen Creek, Fruitdale Creek, and Jones Creek were identified as streams of concern for sedimentation and flow modification. Additionally, Fruitdale Creek was identified for temperature. However, DEQ requested additional information be gathered to asses these listings.

1.4 Monitoring Program Overview

Data was collected from upstream and downstream sites on Sand Creek, Jones Creek, Fruitdale Creek, Gilbert Creek, Allen Creek, Skunk Creek, and the Rogue River. Sites were selected based on discussion with the City of Grants Pass, Josephine County, Middle Rogue Watershed Association, and analysis of area conditions. The upstream sites were located near the City limits of Grants Pass to evaluate what the conditions were entering the City, and downstream sites were located close to the mouth of the creek prior to discharge into the Rogue River to evaluate changes in water quality. Evaluating water quality at these downstream sites combined with selected discharge measurements helped in understanding how much the tributaries contribute to the overall pollutant loading to the Rogue River. A discussion of parameters tested and potential sources are listed in Table 1.1.

Sampling location description and photos are listed in Appendix A.

Table 1.1: ***Parameters and Potential Sources***.

Parameters Tested	Potential Contributors to Stream Degradation
Temperature	Loss of riparian vegetation and low flows.
pH	Chemicals and other materials include concrete washout in streams.
Dissolved Oxygen	Stagnant waters decrease the amount of dissolved oxygen. Oxygen is consumed in the breakdown of organic mater.
E. coli	Livestock, leaking septic systems, pet waste, cross connections, feral animals, waterfowl
Total Suspended Solids	Erosion and sedimentation from construction sites, agricultural areas, and loss of streamside vegetation.
Phosphorus	Inputs from sewage, septic systems, detergents, and fertilizers
Ammonia	Septic systems, agricultural runoff, and waste water treatment plant discharge.
Conductivity	Chemicals disposed of in creeks, agricultural and urban runoff
Turbidity	Loss of riparian vegetation, channel erosion, erosion from poorly protected or unprotected construction, and agricultural sites.

Geese and ducks present along the banks of the Rogue River

Section 2.0 Methods

Water quality sampling consisted of monthly grab samples collected at each site. Samples were analyzed for temperature, pH, dissolved oxygen, total phosphorus, ammonia, *E. coli*, turbidity, total suspended solids, and conductivity. Flow was measured on Allen and Gilbert Creek. Water samples were transported by RVCOG to the lab under agreement with the Medford Regional Wastewater Reclamation Facility and analyzed by RVCOG personnel.

RVCOG equipment, sampling and testing procedures are all DEQ approved. In addition, the program operates under a Quality Assurance/Quality Control Plan (QA/QC) overseen by DEQ and the program results meet or exceeds DEQ requirements. The QA/AC protocol includes internal measures (duplicate samples and external measures (bi-monthly splits with DEQ).

Parameters monitored:

- Water temperature was recorded during each site visit using a calibrated thermistor or a thermometer.
- PH was measured using a calibrated Hach pH meter.
- Dissolved oxygen was measured using the modified winkler titration and back titrated using 0.1 N Potassium BiIodate. (*Standard Methods, 19th Ed, Methods 4500-OC).* Measured by DO meter as per Hach manual, calibrated against known standard.
- Total phosphorus was measured using the modified ascorbic acid method and a Spectronic Instruments Spectronic 20D+ Model Spectrophotometer (*Method 365.1, Storet 70507).*
- *E. coli* was measured using an IDEXX Quanti-tray/2000 method.
- Turbidity was measured using a calibrated turbidity meter (Hach 2100P Turbidimeter).
- Total suspended solids were measured using the total suspended solids method and Fishers 47 mm fiber filter paper.
- Conductivity was recorded by a calibrated Hach conductivity meter.
- Flow was measured using a pygmy meter and top setting wading rod.

Rogue River from All Sports Park Bridge

Section 3.0 Monitoring Results and Discussion

Fourteen sites were monitored in the Grants Pass urban area from April of 2003 through 2005 (see Appendix A and B for monitoring photo location and description). All data were physically collected by RVCOG Natural Resources staff following ODEQ protocols and standards for quality assurance-quality control. Monthly monitoring data is listed by site in Appendix B.

3.1 Data Summary

Data results show that the monitored streams have water quality concerns similar to other streams in the region (Table 3.1): temperature, bacteria, nutrients, and dissolved oxygen, particularly in the summer months (Table 3.2 and 3.3). Throughout the two year sample period, two creeks never exceeded the absolute standard of 406 mpn *E. coli*, Rogue River and Jones Creek. All locations, except Jones Creek at the upper site, exceeded the *E. coli* average standard 126 mpn. As a result, further testing is recommended to determine whether area waters exceed the 30-day log mean standard of 126 mpn.

Water quality has been found to decrease due to a variety of influences including climate (low flows and warmer temperatures), domestic usage (lawn watering, fertilization, and pet waste), recreational uses, agricultural influences (canals), leaking septic systems, wildlife and feral animals, construction and other factors. Non-point source runoff from residential homes, businesses, and irrigation runoff from agricultural practices are also likely sources of pollutant loadings.

Table 3.1: ***Water quality data summary, April of 2003 through April of 2005***

	Temp (C◦)	pH	Dissolved Oxygen (mg/l)	Dissolved Oxygen% Saturation	Conductivity	Turbidity (ntu's)	E. coli (mpn)	Phosphorus (mg/l)	Ammonia (mg/l)
Averages	13.1	7.7	9.3	92	161	6	250	0.087	0.113
Maximum	24.4	9.1	13.3	134	757	80	2419	0.578	1.032
Minimum	4.1	6.3	3.6	11	8	1	0	0.001	0.000
Median	13.0	7.7	9.5	93	139	4	116	0.079	0.085
Range	20.3	2.8	9.7	123	749	79	2419	0.577	1.032
Count (n)	357	355	353	352	356	359	347	353	286

Table 3.2: ***Summer water quality data summary, April 2003 through April 2005***

	Temp (C◦)	pH	Dissolved Oxygen (mg/l)	Dissolved Oxygen % Saturation	Conductivity	Turbidity (ntu's)	E. coli (mpn)	Phosphorus (mg/l)	Ammonia (mg/l)
Averages	15.9	7.6	8.4	88	149	4.9	319	0.105	0.132
Maximum	24.4	9.1	12.1	134	364	79.6	2419	0.578	1.032
Minimum	5.7	6.3	3.6	11	8	0.5	0	0.008	0.0
Median	16.6	7.7	8.3	89	113	3.4	176	0.094	0.109
Range	18.7	2.8	8.5	123	356	79.1	2419	0.57	1.032
Count (n)	197	196	195	195	197	197	190	195	141

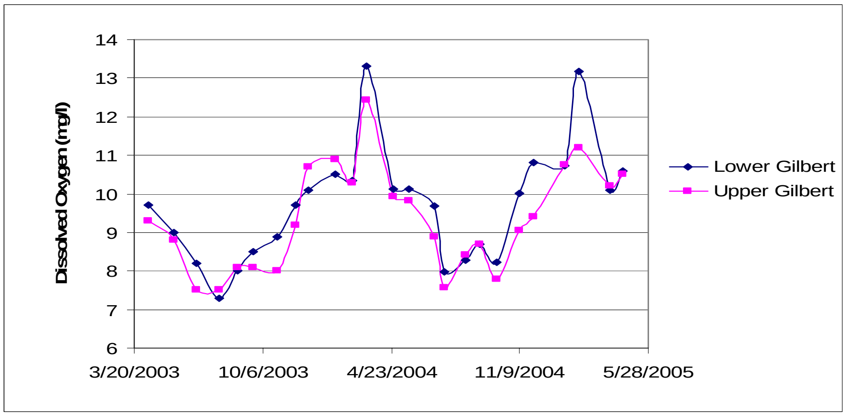
Table 3.3: ***Winter water quality data summary from April 2003 through April 2005***

	Temp (C◦)	pH	Dissolved Oxygen (mg/l)	Dissolved Oxygen % Saturation	Conductivity	Turbidity (ntu's)	E. coli (mpn)	Phosphorus (mg/l)	Ammonia (mg/l)
Averages	9.6	7.7	10.5	97	176	6.3	165	0.065	0.095
Maximum	18.3	8.6	13.3	126	757	45.3	1986	0.192	0.62
Minimum	4.1	6.8	8.2	70	46	0.9	0	0.001	0.0
Median	8.9	7.7	10.5	97	164	4.5	96	0.065	0.073
Range	14.2	1.9	5.1	56	711	44.4	1986	0.191	0.62
Count (n)	160	159	158	157	159	162	157	158	145

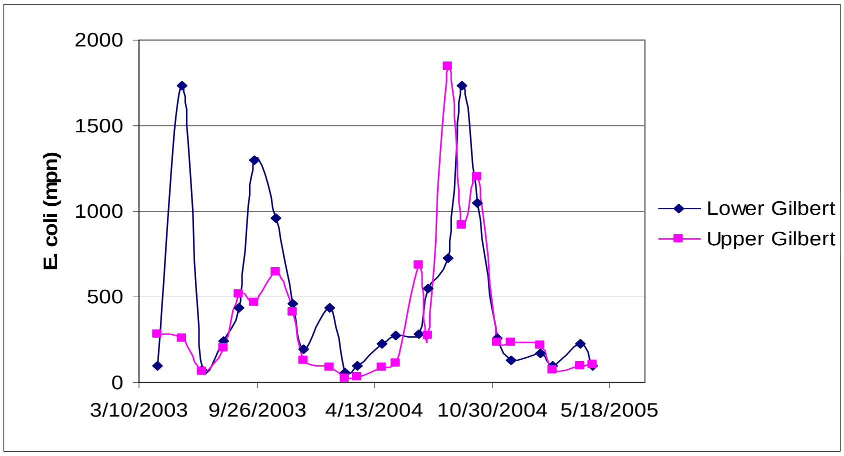
3.2 Water Quality Upstream vs. Downstream Sites

Downstream sites generally decreased in water quality with higher turbidity, *E. coli*, total suspended solids, phosphorus, and ammonia levels (Graphs 3.2 and 3.3). Median summer dissolved oxygen levels were generally greater at downstream sites consistent with cooler temperatures (Graph 3.1). This may be caused by greater turbulent flows at lower sites and input of groundwater or other water sources. The influence on the up and downstream sites can be seen by looking at Gilbert Creek as an example. Graphs 3.1 through 3.3 show the levels of dissolved oxygen, *E. coli*, and phosphorous. Elevated levels of *E. coli* and phosphorous in Gilbert Creek occurred during times of warm weather and more often at the lower sample location. Seasonal changes in dissolved oxygen can be seen in Graph 3.1. Data from other stations can be referenced in Appendix B.

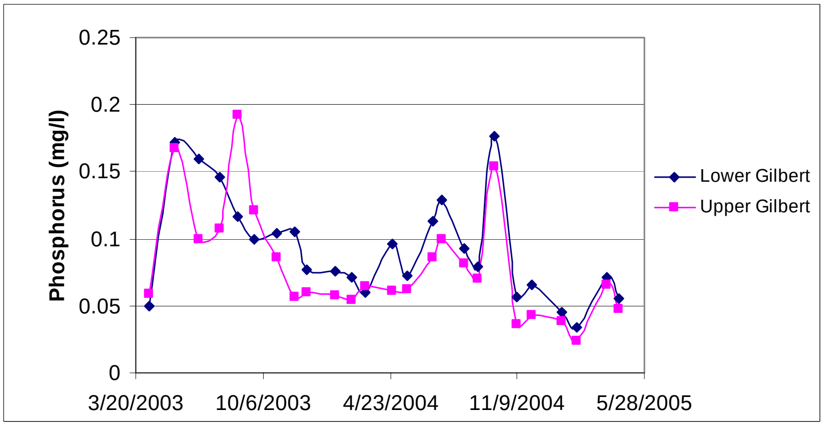
Graph 3.1*: Gilbert Creek Dissolved Oxygen Levels at Gilbert Creek Park (Upper Gilbert) and Central Avenue (Lower Gilbert), from April 2003 through April 2005*



Graph 3.2: ***Gilbert Creek E. coli levels at Gilbert Creek Park (Upper Gilbert) and Central Avenue (Lower Gilbert), from April 2003 through April 2005***



Graph 3.3: ***Gilbert Creek phosphorus levels for at Gilbert Creek Park (Upper Gilbert) and Central Avenue (Lower Gilbert), from April 2003 through April 2005***



3.3 Irrigation

Irrigation runoff and diversions influence Grants Pass tributaries by changing flow patterns and influencing water quality. Four of the six creeks monitored are impacted by irrigation canals and return flow. Two of these creeks, are directly affected by irrigation dams: Jones Creek and Sand Creek. Lower Jones Creek and upper Sand Creek are blocked during the summer months by irrigation diversions (Figure 3.1). Jones Creek at the lower site has greater ammonia, turbidity, *E. coli* and phosphorus levels then the upper site however, *E. coli* levels did not exceed the 406 MPN standard.

Figure 3.1: Jones Creek Irrigation Diversion

The upper site of Sand Creek is regularly stagnant during the summer irrigation season due to an irrigation dam. Stagnant flow and high volume caused dissolved oxygen levels to decrease. Samples were not collected at the upper site when flows were too low or water was stagnant.

The two other creeks, Fruitdale and Allen Creek, are affected by irrigation drainage. During the summer irrigation season, the upper site along Fruitdale Creek remains dry from May through December while flow is present at the lower site from December through October.

Upper Allen Creeks flow is supplemented by irrigation return flow in the summer moths. Algal booms appeared in upper Allen Creek once irrigation levels declined, this occurred in November of 2003 and 2004. During this time levels of both ammonia and phosphorous were high while dissolved oxygen was low.

3.4 Pollutant Loadings

Discharge was measured on Allen Creek and Gilbert Creek using a pygmy meter and top setting wading rod. Measurements were used to analyze daily loads of total suspended solids, phosphorous, and ammonia. Skunk Creek was used as an alternate when flow measurements could not be recorded in Allen or Gilbert Creek.

Winter pollutant loadings for total suspended solids, phosphorus, and ammonia are greater than summer levels for both Allen (Table 3.4 and 3.5) and Gilbert Creek (Table 3.6 and 3.7). However, summer concentrations of pollutants are higher. High levels of both ammonia and phosphorous occurred in the winter of 2003 for both Allen and Gilbert Creek from December to February. Allen Creeks phosphorous and ammonia levels reached higher than Gilbert, Allen reached 0.057 lbs/day for phosphorous and 0.076 lbs/day for ammonia. Gilbert Creek phosphorous levels reached 0.033 lbs/day and 0.044 lbs/day for ammonia.

Table 3.4: ***Allen Creek summer pollutant loading, May1-November 30***

	Total Suspended Solids (mg/l)	Total Suspended Solids (lbs/day)	Total phosphorous (mg/l)	Total phosphorous (lbs/day)	Ammonia (mg/l)	Ammonia (lbs/day)	Flow (cfs)	Flow (l/day)
Averages	4	0.64	0.110	0.016	0.156	0.016	2.673	65400
Maximum	20	2.49	0.173	0.048	0.389	0.055	7.684	187997
Minimum	0	0	0.061	0.002	0.012	0.003	0.368	9003
Median	4	0.28	0.108	0.010	0.134	0.006	1.727	42253
Range	20	2.49	0.112	0.046	0.376	0.052	7.316	178993
Count (n)	14	9	13	9	11	9	9	9

Table 3.5: ***Allen Creek winter pollutant loading, December 1-April 30***

	Total Suspended Solids (mg/l)	Total Suspended Solids (lbs/day)	Total phosphorous (mg/l)	Total phosphorous (lbs/day)	Ammonia (mg/l)	Ammonia (lbs/day)	Flow (cfs)	Flow (l/day)
Averages	2	0.46	0.082	0.019	0.117	0.026	3.963	96952
Maximum	4	1.30	0.115	0.057	0.255	0.076	9.685	236953
Minimum	0	0	0.042	0.001	0	0	0.381	9322
Median	2	0.43	0.081	0.015	0.115	0.008	3.56	87074
Range	4	1.3	0.073	0.056	0.255	0.076	9.304	227632
Count (n)	12	11	12	11	10	11	11	11

Table 3.6: ***Gilbert Creek summer pollutant loading, May1-November 30***

	Total Suspended Solids (mg/l)	Total Suspended Solids (lbs/day)	Total phosphorous (mg/l)	Total phosphorous (lbs/day)	Ammonia (mg/l)	Ammonia (lbs/day)	Flow (cfs)	Flow (l/day)
Averages	3	0.1	0.116	0.005	0.142	0.007	0.961	23502
Maximum	9	0.20	0.176	0.008	0.571	0.017	1.697	41519
Minimum	0	0	0.056	0.002	0	0	0.413	10105
Median	1	0	0.109	0.005	0.073	0.004	1.008	24662
Range	9	0.2	0.120	0.007	0.571	0.017	1.284	31414
Count (n)	13	10	14	10	11	10	10	10

Table 3.7: ***Gilbert Creek winter pollutant loading, December 1-April 30***

	Total Suspended Solids (mg/l)	Total Suspended Solids (lbs/day)	Total phosphorous (mg/l)	Total phosphorous (lbs/day)	Ammonia (mg/l)	Ammonia (lbs/day)	Flow (cfs)	Flow (l/day)
Averages	3	0.96	0.064	0.014	0.056	0.014	3.890	95179
Maximum	13	4.06	0.096	0.033	0.170	0.044	7.981	195263
Minimum	0	0	0.034	0.002	0.010	0.000	0.602	14729
Median	2	0.40	0.066	0.010	0.049	0.006	3.076	75257
Range	13	4.06	0.062	0.031	0.160	0.044	7.379	180535
Count (n)	11	11	11	11	10	10	11	11

Measuring discharge on Allen Creek

Skunk Creek had overall higher pollutant loadings than Allen or Gilbert Creek, however, it had only a limited number of discharge measurements (3) and is a highly managed waterway running directly through the city center. As a result, the influence of nonpoint source pollution from residential and commercial developments, storm drain discharges, irrigation return flows, and other sources contribute to the water quality in Skunk Creek.

To gain a better understanding of Grants Pass tributary water quality pollutant loadings need to be assessed for all tributaries.

3.5 Rogue River Data Summary

Tributaries within Grants Pass likely contribute to pollutant loadings in the Rogue River (Table 3.4 and 3.5). However, water quality changes due to tributary influence is not apparent based on the data collected. Ammonia was the only parameter with significant elevated levels at the lower site, but this sampling location was near the City of Grants Pass's Waste Water Treatment Plant.

Table 3.8: ***Rogue River at Baker Park, Upper Sample Site***

	Temp (C◦)	pH	Dissolved Oxygen (mg/l)	Dissolved Oxygen% Saturation	Conductivity	Turbidity (ntu's)	E. coli	Phosphorus (mg/l)	Ammonia (mg/l)
Averages	13.0	7.8	10.2	101	87.2	6	58.9	0.093	0.080
Median	14.1	7.8	10.0	100	87	3	29.1	0.083	0.052
Maximum	20.8	8.0	12.7	118	120	34	344.8	0.159	0.200
Minimum	5.7	7.3	8.1	86	67	2	8.6	0.062	0.000
Range	15.1	0.8	4.6	32	53	32	336.2	0.097	0.200
Count (n)	24	24	24	24	24	24	24	24	18

Table 3.9: ***Rogue River at All Sport Park, Lower Sample Site***

	Temp (C◦)	pH	Dissolved Oxygen (mg/l)	Dissolved Oxygen% Saturation	Conductivity	Turbidity (ntu's)	E. coli	Phosphorus (mg/l)	Ammonia (mg/l)
Averages	12.9	7.9	10.5	103	93	7	67	0.098	0.145
Median	12.1	7.8	10.71	101	92	4	23	0.092	0.109
Maximum	21.5	8.64	12.5	134	210	33	345	0.148	0.620
Minimum	4.9	7.04	8.4	91	8	2	4	0.067	0.000
Range	16.6	1.6	4.1	43	202	31	341	0.081	0.620
Count (n)	25	25	24	24	25	25	24	25	20

Further monitoring is recommended in order to gain a better understanding of the Grants Pass watershed. As the area continues to develop, changes to water quality and quantity will likely be observed, affecting the overall health of the watershed and the Rogue River.

All Sports Park Bridge in Grants Pass

Section 4.0 Recommendations

Continued data collection is recommended to establish baseline conditions and begin to evaluate trends in water quality. A greater time period allows for the inclusion of more data including extreme events, climatic variability, and use changes (land and water). In addition, continued monitoring efforts also provide a record of project impacts/project effectiveness, educational efforts, and other factors on water quality.

Recommendations/Concerns:

1. Continue the existing monitoring to fully evaluate changes in Grants Pass tributaries to help identify and remove or reduce pollutant input.

2. Collect stormwater samples from storm drains three times per year: dry weather, first flush, and 60 days after the first flush. Allowing for the evaluation of fluctuations in parameter levels. The program should include: temperature, pH, conductivity, biological oxygen demand, turbidity, total suspended solids, and E. coli. Monitoring efforts would characterize the nature of the effluent discharging from storm sewers into the Rogue River and its tributaries.

3. Record discharge on each stream in order to calculate pollutant loadings. Established staff gauges would allow for evaluation of the relationship between flow changes and parameter concentration levels.

4. Nitrate testing is recommended to identify possible fertilizer, chemical, and fecal waste contamination. Excessive levels of nitrates affect the health of aquatic wildlife by reducing oxygen exchange.

5. In order to fully understand watershed health and water quality trends, a greater number of streams need to be monitored. Each stream has separate inputs and must be studied individually but must also be compared to the overall system to understand how it influences watershed health.

6. Public education and outreach is recommended to increase local awareness of streams. Events such as creek clean-ups, volunteer monitoring programs and riparian restoration allows for public involvement which builds community and watershed understanding.