

2015-2016

Skagit Stream Team Annual Water Quality Report

*Citizen Monitoring Summary for the Samish Bay, Padilla Bay,
Clyde Creek, Gages Slough, Trumpeter Basin, Kulshan Creek,
Nookachamps Creek and Fisher Creek Watersheds*



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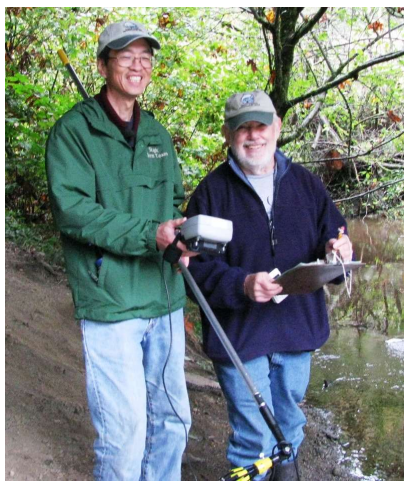


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Skagit Stream Team

2015 - 2016 Annual Water Quality Report



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I. Introduction

This report summarizes the results of the 2015-2016 Skagit Stream Team Program, the seventeenth consecutive year of data collection by volunteers. From October 2015 through August 2016, sixty-one dedicated citizen volunteers monitored the water quality of freshwater streams that drain into Skagit County's Samish Bay, Padilla Bay, the Skagit River and Burrows Bay. In addition to regularly sampled watersheds, the nine members of the Samish Storm Team sampled twenty sites in the Friday Creek watershed during eighteen rain events.

This report is meant to provide useful and reliable background WQ data. It is not intended to provide a legal documentation of water quality violations. All data and methods are available to the public.

Background

The Skagit Stream Team Program was established in 1998 to educate and involve local citizens in the protection and stewardship of local streams. Sponsors include Skagit Conservation District (SCD) in partnership with the Padilla Bay National Estuarine Research Reserve (PBNERR), City of Mount Vernon, City of Burlington, City of Anacortes, and Skagit County. Funding was provided by the Washington State Conservation Commission, the Washington State Department of Ecology's Centennial Clean Water Fund Program, and partnering jurisdictions. Local citizens volunteered approximately 1,175 hours during the 2015-2016 sampling season.

Skagit Stream Team Objectives

- To inspire community stewardship of water resources by educating local citizens about land use and non-point sources of pollution and involving them in the process of water quality data gathering;
- To develop and implement a routine sampling program that can be used to assess water quality trends, characterize the existing water quality of priority freshwater drainages, and determine how water quality conditions compare to State Standards;
- To document improvements in water quality as a result of the implementation of Best Management Practices on farmlands and the repair and/or replacement of failing septic systems;
- To teach community volunteers the sampling and analytical techniques used by environmental professionals, how to manage the data collected and create a database, and the importance of establishing a long-term water quality monitoring program.

Volunteers measured fecal coliform (FC) bacteria, dissolved oxygen (DO), water temperature, turbidity, and total depth. Some of the questions the study hoped to address were:

- How do water quality conditions compare to State Standards in our priority watersheds?
- Could water quality conditions support aquatic life such as salmon?

II. Methods

Efforts were made to insure high quality data from this volunteer-based study. Quality Assurance/Quality Control (QA/QC) plans and laboratory plans were submitted to and approved by the WA Department of Ecology. These plans have since been updated and revised. Volunteers were given ten hours of training before sampling in the field, and were accompanied by a trainer for their first sampling. All analysis and collection methods are detailed in the QA/QC plan, and are available on request.

The Samish watershed had two upper and two lower teams, and was coached by Jennifer Hinderman, SCD. The Padilla Bay watershed had two teams each on No Name Slough, Joe Leary Slough, and in the village of Bay View, coached by Susan Wood, PBNERR. Nookachamps Creek had two upper and two lower teams coached by Cindy Pierce, SCD. Fisher Creek, Kulshan Creek, and Trumpeter Basin each had two teams coached by Kristi Carpenter, SCD. Gages Slough had two teams coached by Cindy Pierce. Clyde Creek was monitored by two teams coached by Susan Wood.

At each site, samples were usually taken every two weeks. Temperature, dissolved oxygen (DO), and salinity (when applicable) were measured on-site with an electronic YSI Data Probe. Field measurements and samples were taken just below the surface, in the deepest part of the stream that could be reached. Depth was measured for some sites using staff gages. Samples were tested for Fecal coliform either at the Padilla Bay volunteer lab (Padilla, Samish, Nookachamps, Fisher Creek samples), taken to Burlington Wastewater Treatment Plant (Gages Slough), taken to the Mount Vernon Wastewater Treatment Plant (Trumpeter Basin, Kulshan Creek) or the Anacortes Waste Water Treatment Plant (Clyde Creek) for analysis. Turbidity was measured either in Padilla Bay's lab or in the field. Volunteers also recorded water appearance and color. Quality procedures are outlined in more detail in Appendix C.

Quality control checks by staff were conducted periodically in the lab and in the field to assure that volunteers were using proper and consistent protocols.

The data was recorded on field sheets (See Appendix D) and transferred to a Microsoft Excel spreadsheet by a volunteer. Padilla Bay and Conservation District staff verified all data entries, making edits as appropriate. Any anomalies were recorded in the metadata.

In accordance with state standards, annual fecal coliform (FC) results were calculated using the geometric mean. "Too Numerous To Count" (TNTC) results were assigned a value of 1600 CFU/100 ml. Volunteers in Padilla Bay's lab ran two FC lab tests for each sample, generating a high and low reading, from which an average was calculated. Averages were calculated for dissolved oxygen, temperature and turbidity levels.

III. Samish Storm Team

In 2015-2016, Storm Team volunteers continued monitoring the Friday Creek watershed for the second year. Friday Creek is the largest tributary of the Samish River. Assessing water quality during high flows is important since storms can flush large volumes of pollutants into streams. Monitoring many sites throughout the drainage during storm events when high fecal coliform numbers are expected may detect priority areas for clean up. Special thanks to our Storm Team volunteers for their ongoing commitment – in the worst of weather. Complete data are found in Appendix B.

IV. Sites

Samish River Watershed

Figure 1. Map of Samish Sites



Table 1. Samish Sampling Locations

US1	Friday Creek @ Pomona Grange Park	N48°33'55.02 W122°20'49.49
US2	Swede Creek @ Grip Rd	N48°33'17.75 W122°17'16.23
US3	Thomas Creek @ F&S Grade Rd	N48°31'42.93 W122°16'44.69
US4	Willard Creek @ 8274 F & S Grade Rd	N48°31'13.65 W122°15'58.07
LS1	Hwy 99 Bridge over Samish River	N48°31'32.58 W122°20'24.78
LS2	Samish River @ Jolly Road	N48°32'25.47 W122°20'36.36
LS3	Chuckanut Bridge over Samish River	N48°31'0.69 W122°22'43.29
LS4	Mouth of the Samish River (boat dock)	N48°19'11 W122°19'47

Nookachamps Creek

Figure 2. Map of Nookachamps Creek Sites



Table 2. Nookachamps Creek Sampling Locations

UN1	Lake McMurray Estates	N48°19'37 W122°13'10
UN2	Big Lake Outflow	N48°23'57 W122°14'24
UN3	Otter Pond Road	N4824'10 W122°13'44
UN4	Knapp Road	N4825'43 W122°15'32
LN1	SR 538 and N Waugh Road	N48°26'10.14 W122°17'29.88
LN2	SR 9 and Babcock	N48°26'45.56 W122°15'8.65
LN3	Swan Road	N48°27'13.79 W122°16'17.84
LN4	Francis Road	N48°28'5.47 W122°17'38.72

No Name Slough

Figure 3. Map of No Name Slough Sites



Table 3. No Name Slough Sampling Locations

NN1	Marihugh Road Culvert	N48°17'53. W122°17'31
NN2	Bay View Road Ravine	N48°18'121 W122°17'41
NN3	Egber's Field Bridge	N48°18'30. W122°17'53
NN4	Field Culvert, Bay View-Edison Road	N48°19'11 W122°19'47

Bay View Drainage

Figure 4. Map of Bay View Sites

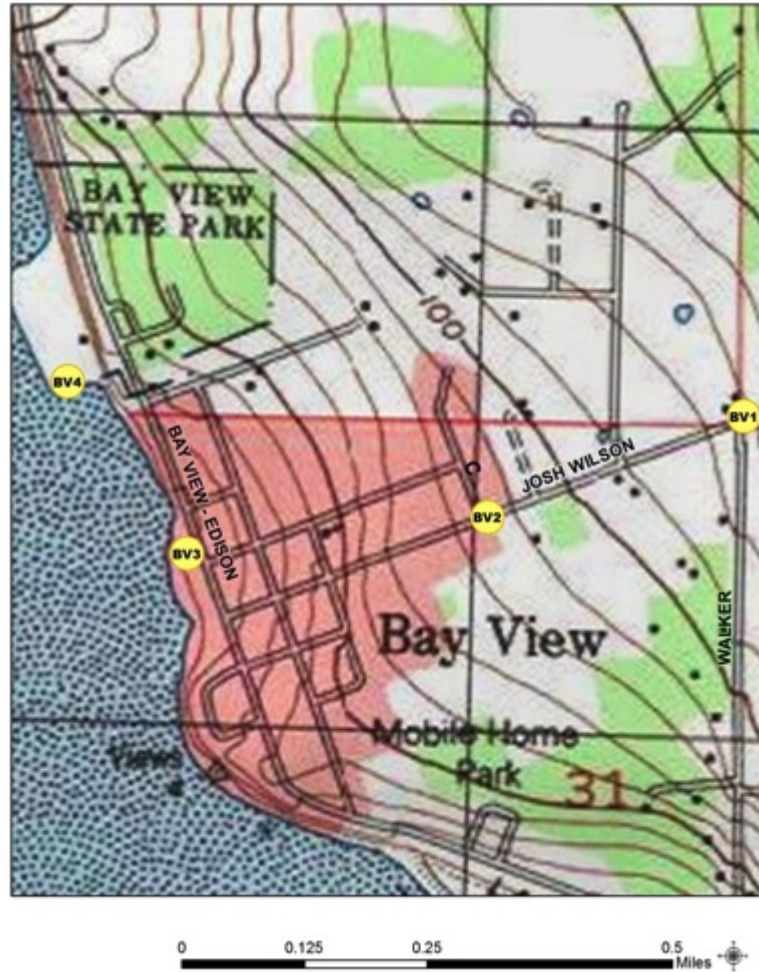


Table 4. Bay View Sampling Locations

BV1	Wilson Road and Walker Road	N48°29'11.94 W122°27'58.92
BV2	Wilson Road and C Street	N48°29'6.3 W122°28'19.26
BV3	Culvert at Boat Launch	N48°29'4.02 W122°28'43.2
BV4	N Beach at Bay View State Park	N48°29'13.02 W122°28'53.04

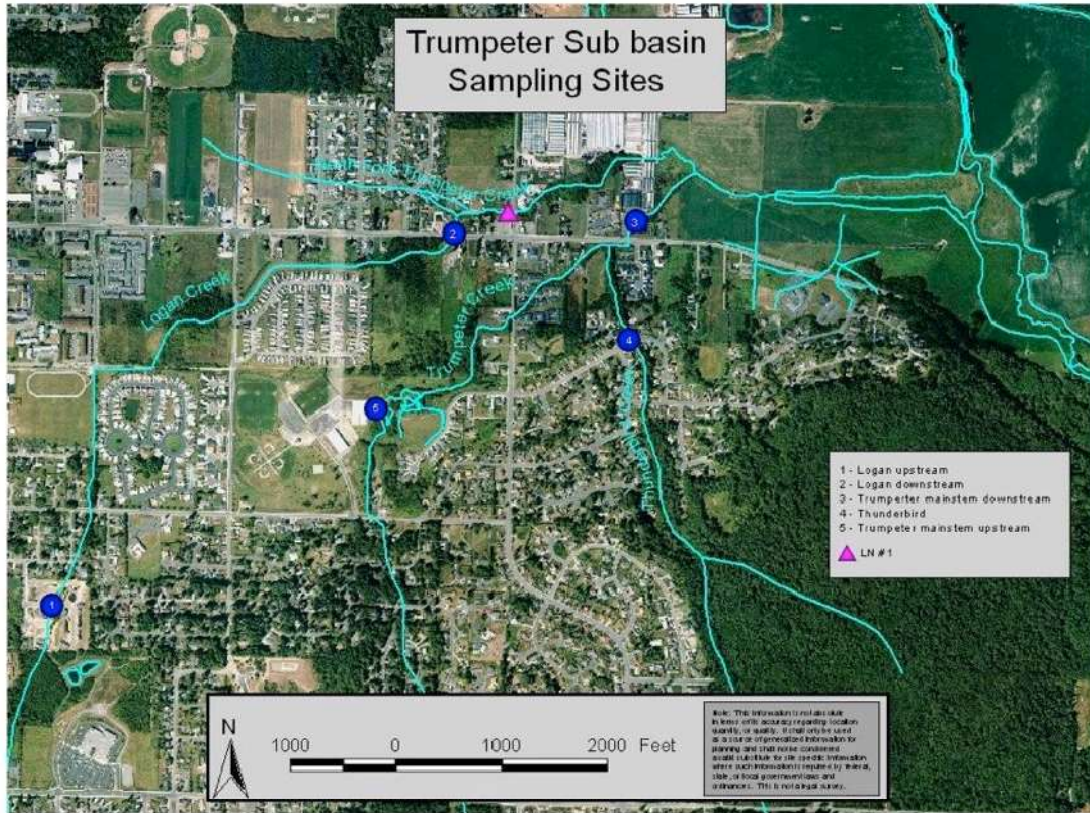
Joe Leary Slough

Figure 5. Map of Joe Leary Slough Sites



Table 5. Joe Leary Slough Sampling Locations

JL1	Dahlstedt Road	N48°30'53.35 W122°19'2.46
JL2	Hwy 99	N48°29'35.37 W122°20'6.61
JL3	Wilson Rd and Avon-Allen Rd.	N48°29'11.33 W122°22'41.96
JL4	Tide Gate	N48°31'4.90 W122°28'27.87



Trumpeter Basin

Figure 6. Map of Trumpeter Basin Sites

Table 6. Trumpeter Basin Sampling Locations

TB1	Stonebridge Adult Community, Logan Creek Bridge	N48°25'33 W122°18'32
TB2	College Way west of Martin . Waugh Road, Logan Creek	N48°26'09 W122°17'12
TB3	Summersun Nursery Footbridge, Trumpeter. Thunderbird	N48°26'07 W122°17'17
TB4	Culvert on Kiowa, Thunderbird	48°25'53 W122°17'12
TB5	Bakerview Park Footbridge, Trumpeter	N48°25'51 W122°17'48

Kulshan Creek

Figure 7. Map of Kulshan Creek Sites



Table 7. Kulshan Creek Sampling Locations

KC1	North end of S 14 th .Kulshan Trail	N48°25'59 W122°19'27
KC2	Parker Way	N48°25'59 W122°19'17
KC3	S side Roosevelt.1 blk W of Parker Way	N48°26'11 W122°19'25
KC4	E of Riverside - N of RR crossing	N48°25'54 W122°20'04
KC5	Freeway Drive at Lions Park	N48°25'43 W122°20'28

Clyde Creek

Figure 8. Map of Clyde Creek Sites



Table 8. Clyde Creek Sampling Locations

CC1	Jasper Way	N48° 29'43.4 W122°39'34.3
CC2	Clyde Way	N48°29'29.3 W122°39'40.9
CC3	Queen Ann Way	N48°29'21.1 W122°39'48.8
CC4	Marine Drive	N48°29'10.9 W122°39'54.5

Gages Slough

Figure 9. Map of Gages Slough Sites

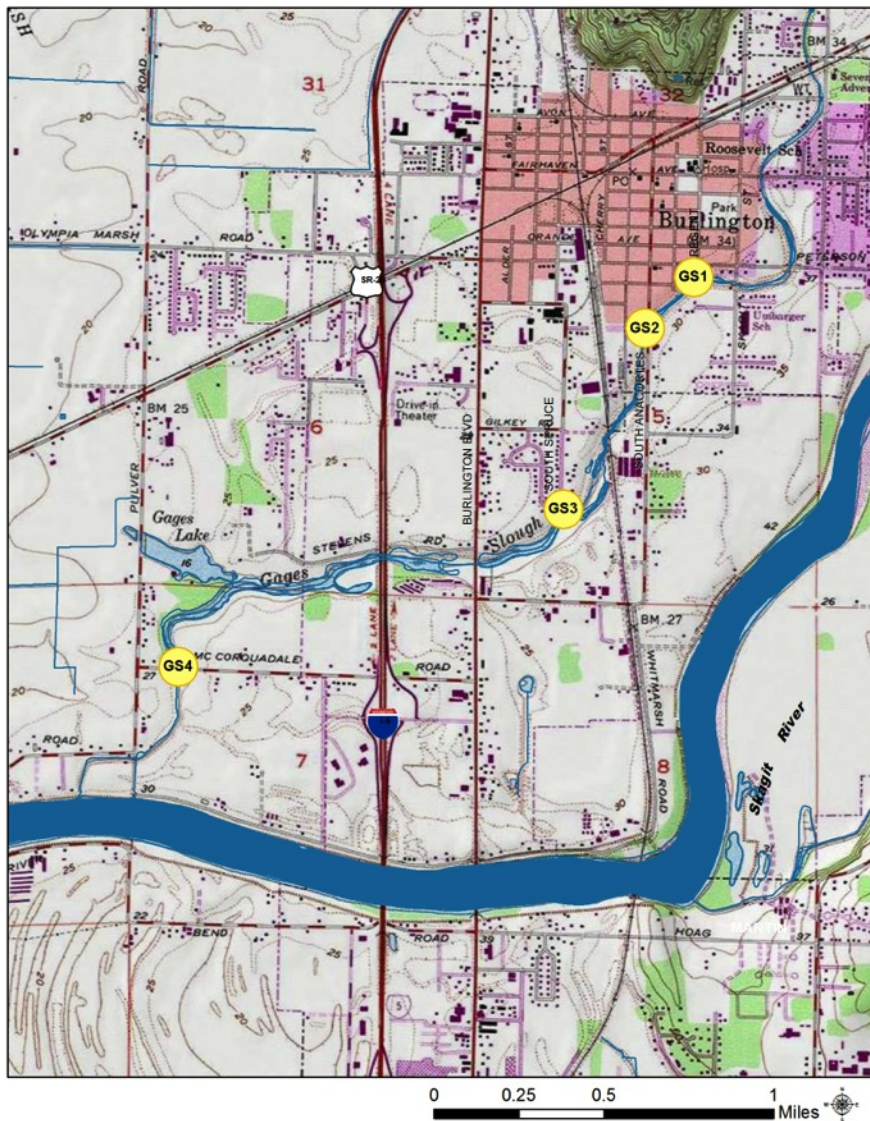


Table 9. Gages Slough Sampling Locations

GS1	Regent and East Rio Vista Streets	N48°28'16 W122°19'19
GS2	South Anacortes Street	N48°28'08 W122°19'30
GS3	South Spruce Street	N48°27'40 W122°19'48
GS4A	McCorquedale Road	N48°27' 33 W122°20' 9

V. Results

This section presents the data collected during the 2015-2016 season. It provides a preliminary overview for each parameter followed by details for each watershed and a comparison of annual site averages for the past six sampling seasons. Complete data for all watersheds are provided in Appendix A.

Dissolved Oxygen Standards

Dissolved oxygen (DO) measurements determine how much oxygen is available in the water for fish and other organisms. The state water quality standards for dissolved oxygen are based on aquatic life uses. Streams in this program fall under two categories based on aquatic life use. For the lowland watercourses, Joe Leary Slough, No Name Slough, Bay View, Gages Slough, Brickyard Creek and all Samish sites except Swede Creek (Upper Samish 2) the minimum standard is 8.0 mg/l for salmon spawning and rearing. For Fisher Creek, Nookachamps Creek, Trumpeter Basin, Kulshan Creek, Clyde Creek and Upper Samish Site 2, the standard is 9.5 mg/l required for core summer salmonid habitat. (Higher dissolved oxygen levels are better.)

Annual averages are presented for the purpose of comparison between sites and between years, but this data cannot determine whether the water body meets the standard. The standard is based on the lowest single-day measurement, not on the annual average. It is important to note that most of the teams do not monitor during the warmer summer months when DO would likely drop with warmer air and water temperatures.

Temperature Standards

Temperature is a water quality concern in part because warm water holds less dissolved oxygen than cool water. Many northwest fish species require cool temperatures and high oxygen levels at various stages in their life cycle. Warm water temperatures can cause stress to animals that lowers resistance to disease and infections. Many factors affect water temperature. These include large fluctuations in air temperature, changes in the shape of stream channel and lake margins, reductions in overhanging vegetation, turbidity, and reductions in water flow.

State standards for temperature are based on the 7-day average of the daily maximum temperatures (7-DADMax). For Fisher Creek, Nookachamps Creek, Trumpeter Basin, Kulshan Creek, Clyde Creek and Upper Samish Site 2, that maximum is 16°C. All other sites must be less than 17.5°C to meet standards. (Lower temperatures are better.)

The average temperatures presented below are used for comparison, but this data cannot determine whether the water body meets the standard. Most sites were not monitored during the critical summer warm periods and none were monitored daily in order to obtain a 7-DADMax.

Turbidity Standards

Turbidity is a measurement of water clarity. Turbidity data in this report are not referenced to a state standard because that standard is relative to naturally occurring background levels and varies for each stream. For streams with background levels less than 50 NTU (all of the Stream Team sites), turbidity should not exceed 5 NTU above the background level. Short-term occurrences of high turbidity are not as harmful to aquatic animals as extended periods of moderately elevated turbidity.

Fecal Coliform Standards

Fecal coliform live in the digestive system of warm blooded animals, including birds, livestock, and humans. They are not directly harmful to humans or aquatic life, but their presence indicates the possible presence of disease-causing microbes. To meet state standards, streams must meet two criteria. Part I:

The geometric mean of fecal coliform bacteria levels cannot exceed 100 colony-forming units (CFU).100 ml. A minimum of five samples in the database is needed to calculate the geometric mean. Part II: No more than 10% of the samples can exceed 200 CFU.100 ml.

State regulations for fecal coliform use the geometric mean, which reduces the weight of occasional extreme results or results that don't fall within a reasonable range of the overall sample database This is helpful when analyzing bacteria concentrations, because levels may vary anywhere from 10 to 10,000 fold over a given period.

Upper Samish Results

Figures 10 through 17 below present results from Upper Samish sampling.

For dissolved oxygen, only Site 1 maintained levels above the state standard. As in past years, Site 4, the Willard Creek site had the lowest levels, with 6 occurrences below the state standard of 8.0 mg/l. Site 2, Swede Creek is considered core summer salmonid habitat, and should maintain DO levels above 9.5 mg/l. It dropped below 9.5mg/l three times.

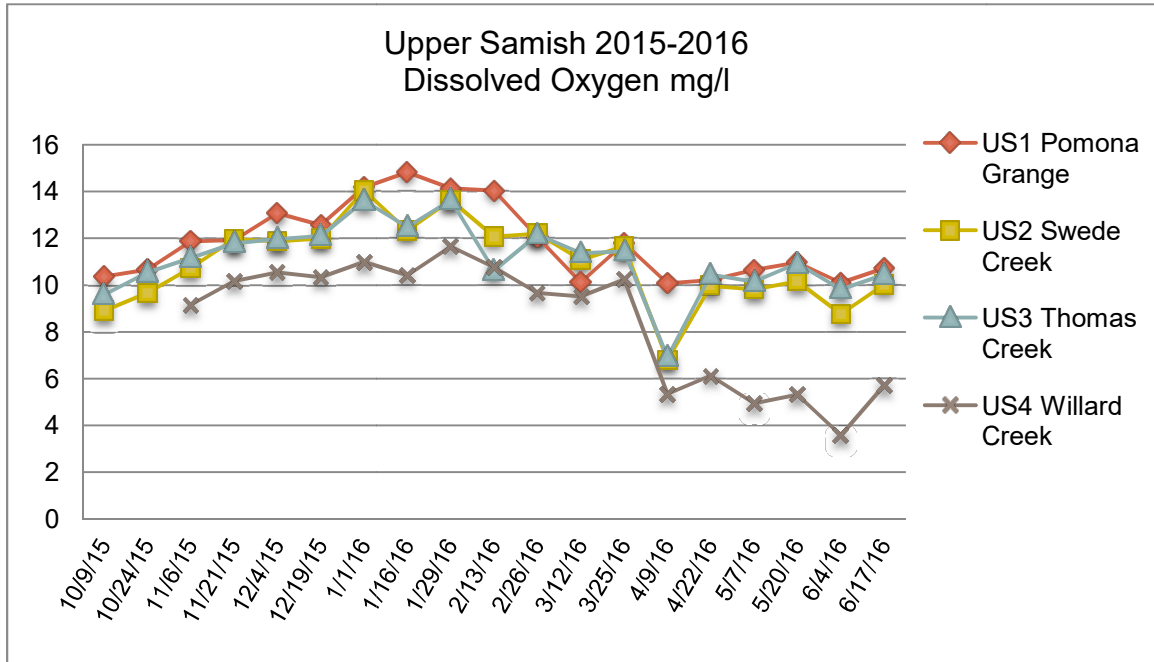


Figure 10. Upper Samish DO: 2015-2016

Figure 11 below shows a comparison of Upper Samish sites over the past 8 years.

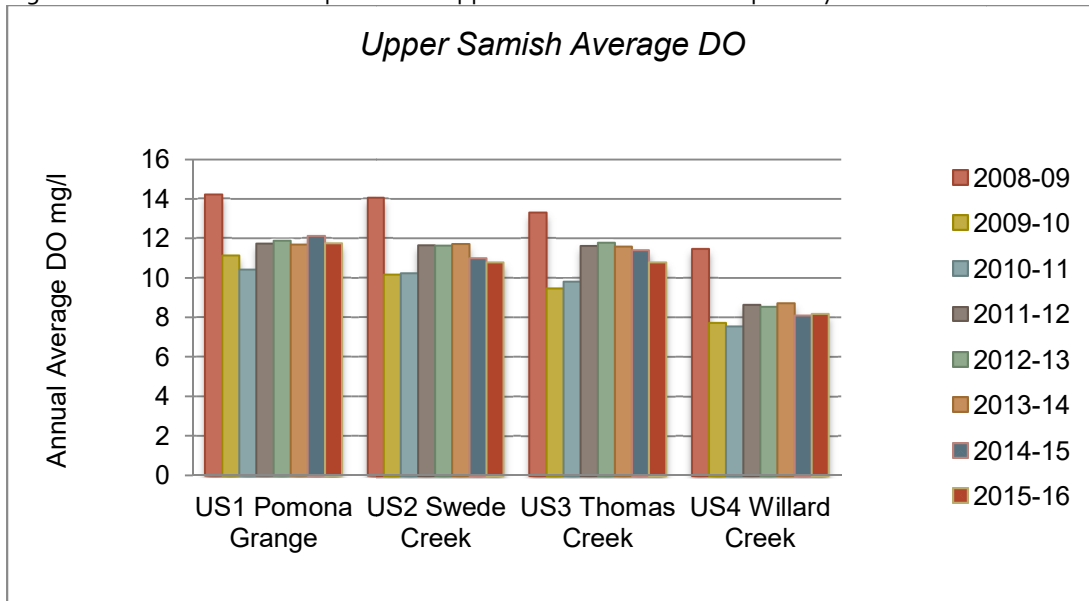


Figure 11. Upper Samish DO: Eight-year comparison

Though all temperature readings during the sampling season fell within state standard temperatures, sampling stopped before the warm season. Temperatures were similar for all Upper Samish sites. Overall, temperatures were slightly lower this year than last.

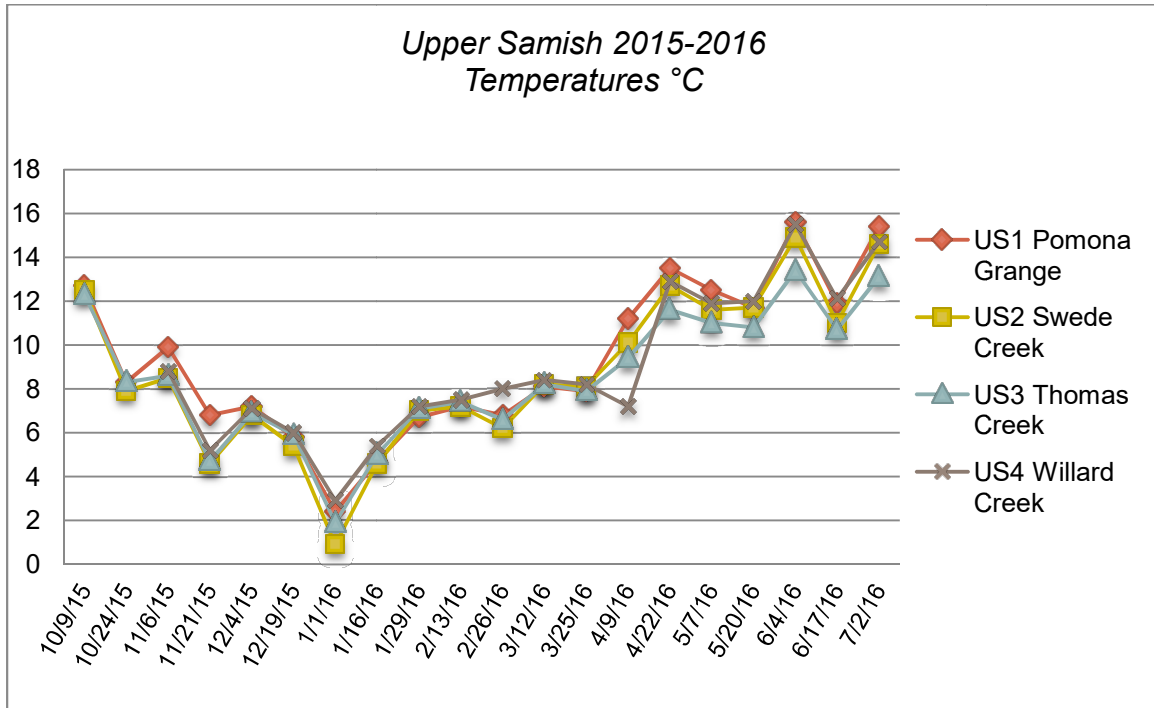


Figure 12. Upper Samish Temperature: 2015-2016

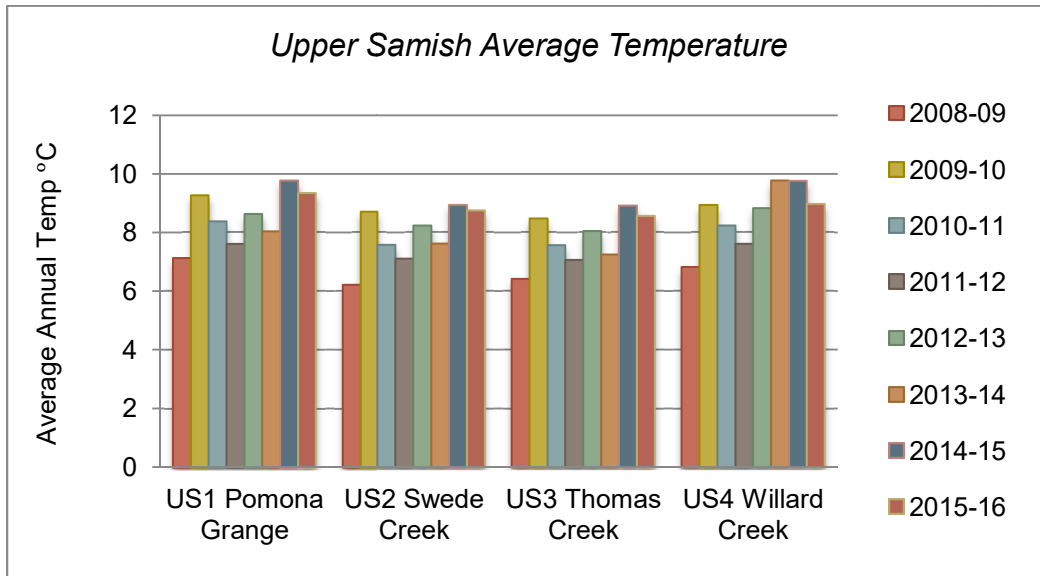


Figure 13. Upper Samish Temperature: Eight -year comparison

Turbidity levels in the Upper Samish (Figure 15) were generally highest at Site 3, Thomas Creek, and lowest at Site 1, Pomona Grange. The high turbidity levels on February 13, 2016 corresponds to high fecal coliform levels. (See figure 17.)

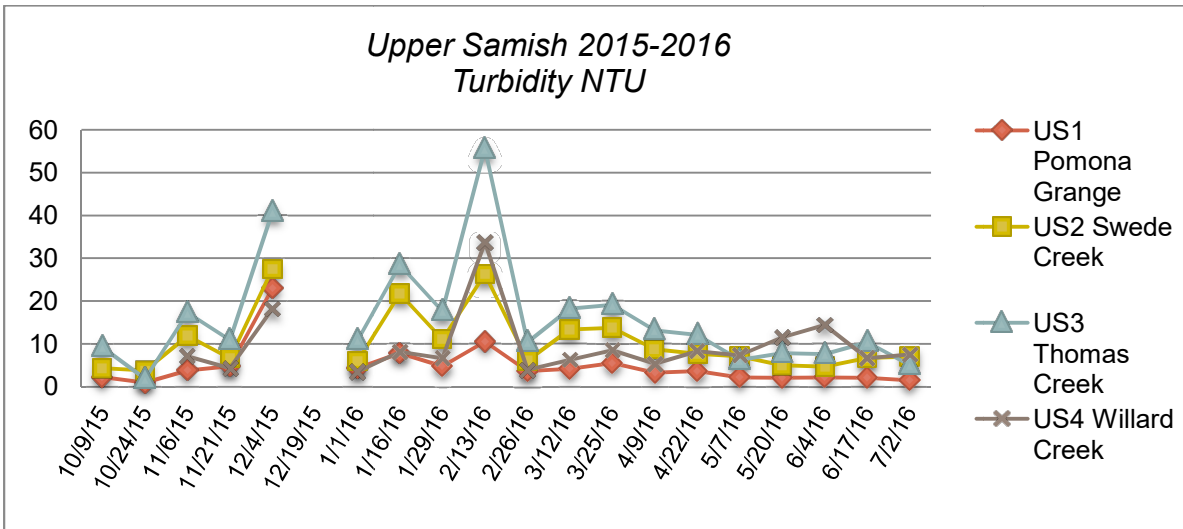


Figure 14. Upper Samish Turbidity: 2015-2016

Site 4, Turbidity levels were lower in 2015-16 than in previous years, Willard Creek has the most annual variability, while Thomas Creek consistently has the highest turbidity of all the Upper Samish sites.

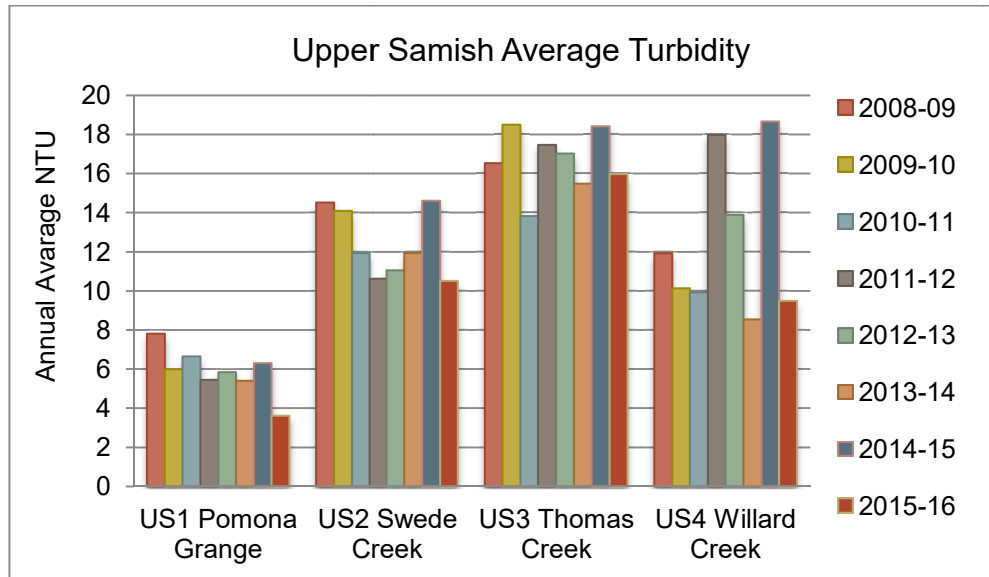


Figure 15. Upper Samish Turbidity: Eight -year comparison

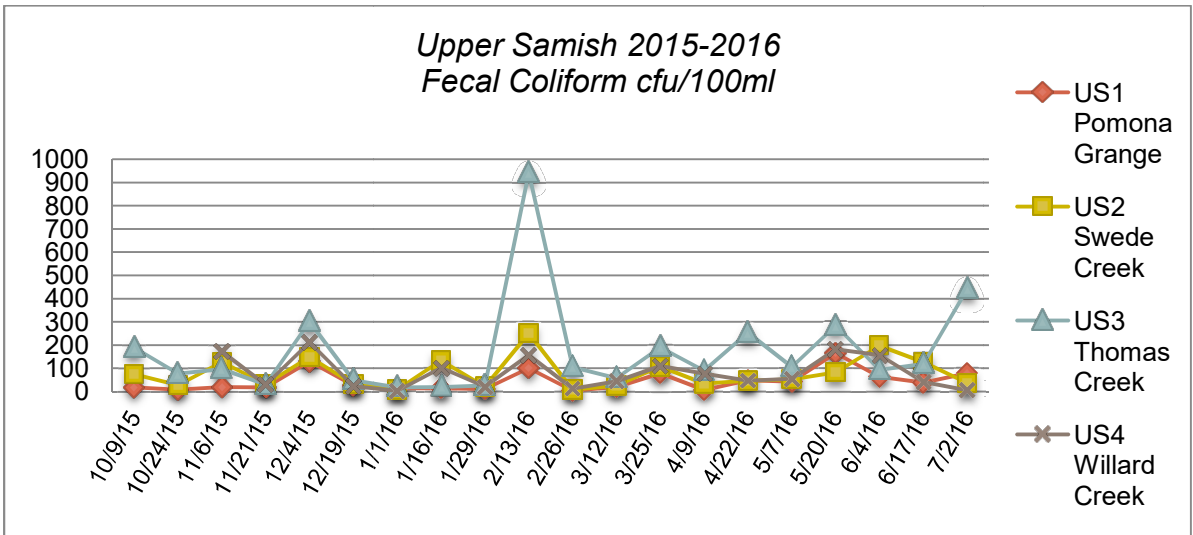


Figure 16. Upper Samish Fecal Coliform: 2015-2016

Fecal coliform levels in the Upper Samish watershed were much lower than last year. Sites 1, 2 and 4 met the state standard of 100CFU/100ml and also had fewer than 10% of the samples over 200 CFU/100ml. Site 3 did not meet either part of the state standard.

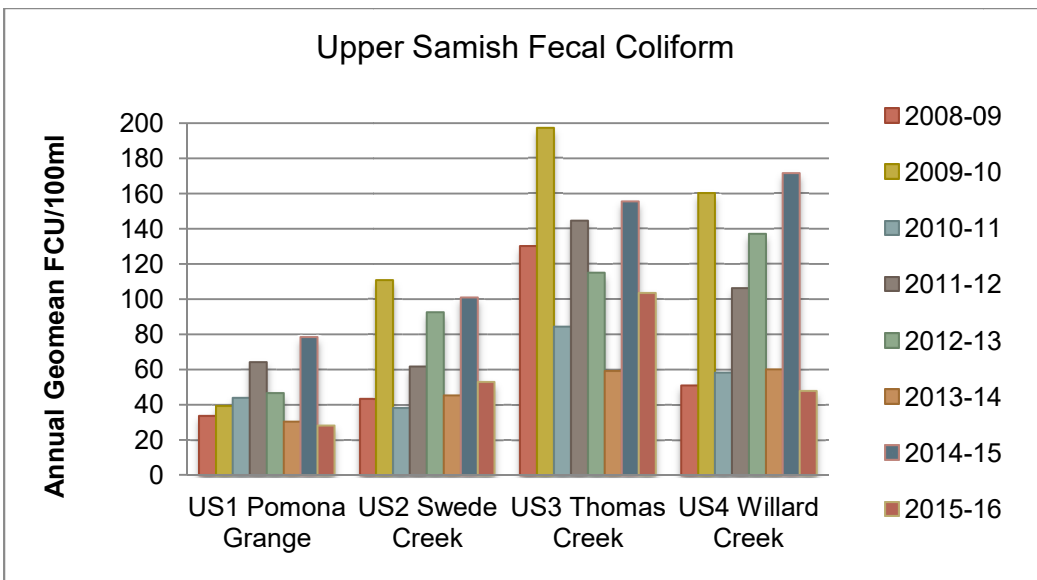


Figure 17. Upper Samish Fecal Coliform: Eight -year comparison

Lower Samish Results

Figures 18 through 25 below present results from Lower Samish sampling.

Dissolved oxygen levels were similar for all sites. Only Site 4 dropped below the standard level of 8mg/l in May, but sites were not sampled during the warmest summer months when dissolved oxygen is likely to be lowest.

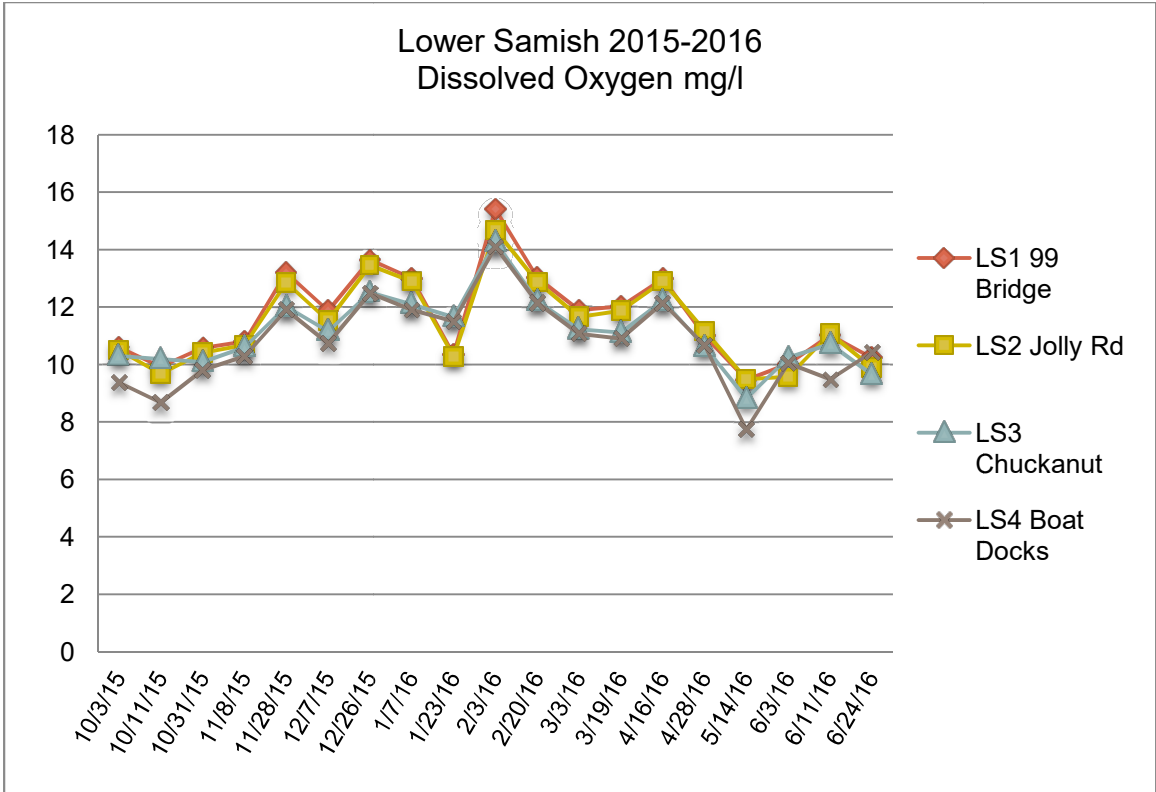


Figure 18. Lower Samish DO: 2015-2016

Average dissolved oxygen levels (Figure 20), have been consistent for four-six years, with most sites in the 10-12mg/l range. The standard is based on the lowest single day, not on an annual average.

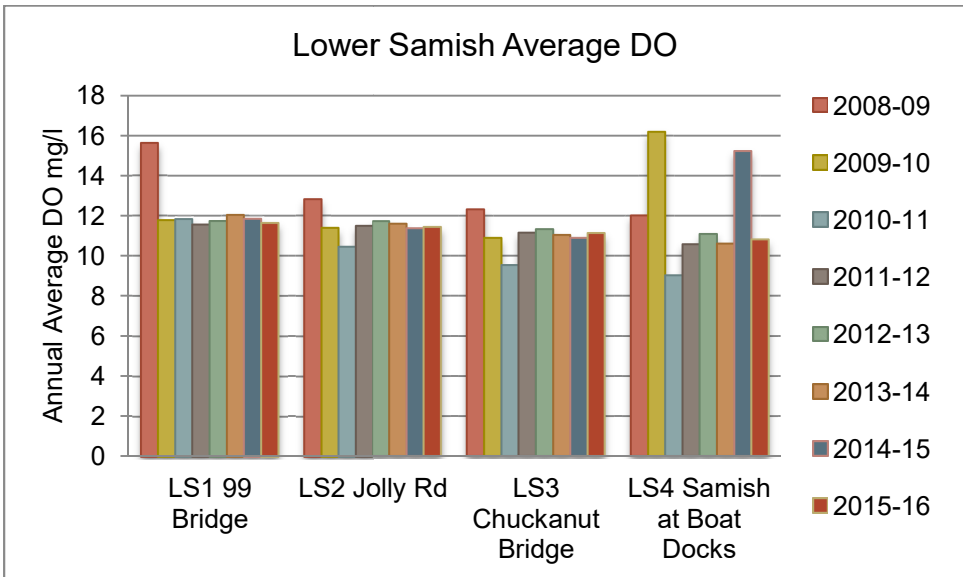


Figure 19. Lower Samish DO: Eight-year comparison

Temperature at Sites 2 and 4 rose above the state standard in June.

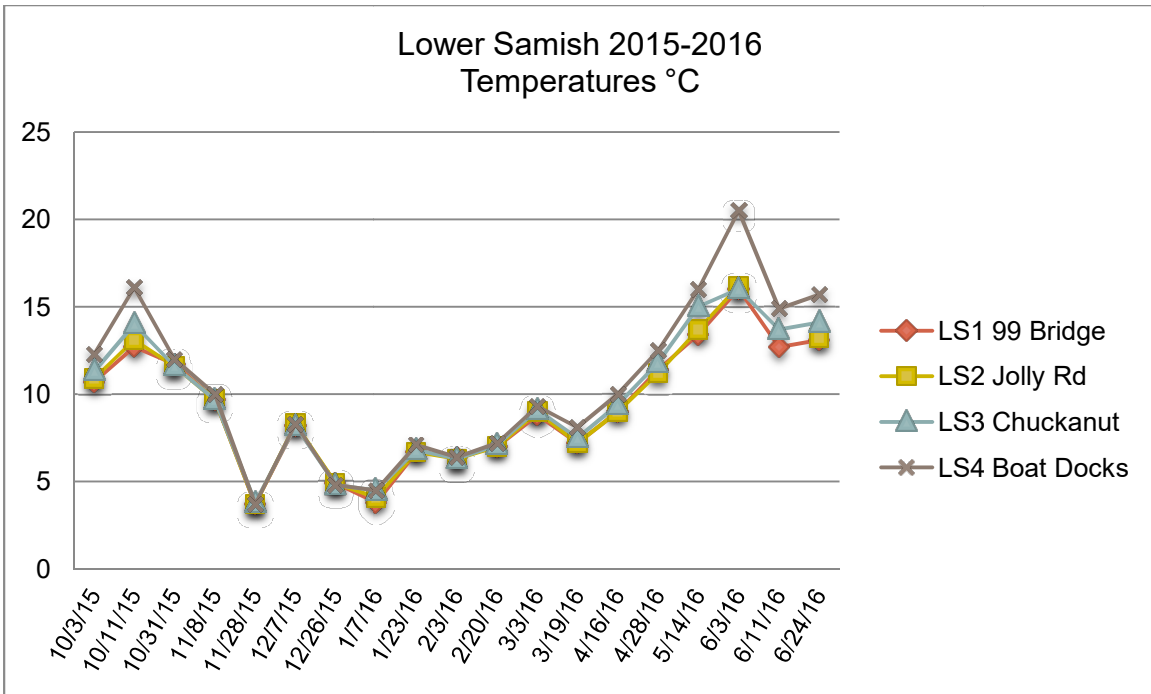


Figure 20. Lower Samish Temperature: 2015-2016

Compared to the previous six years, average annual temperatures were higher for all sites, and similar to last year. Standards are not based on average temperatures.

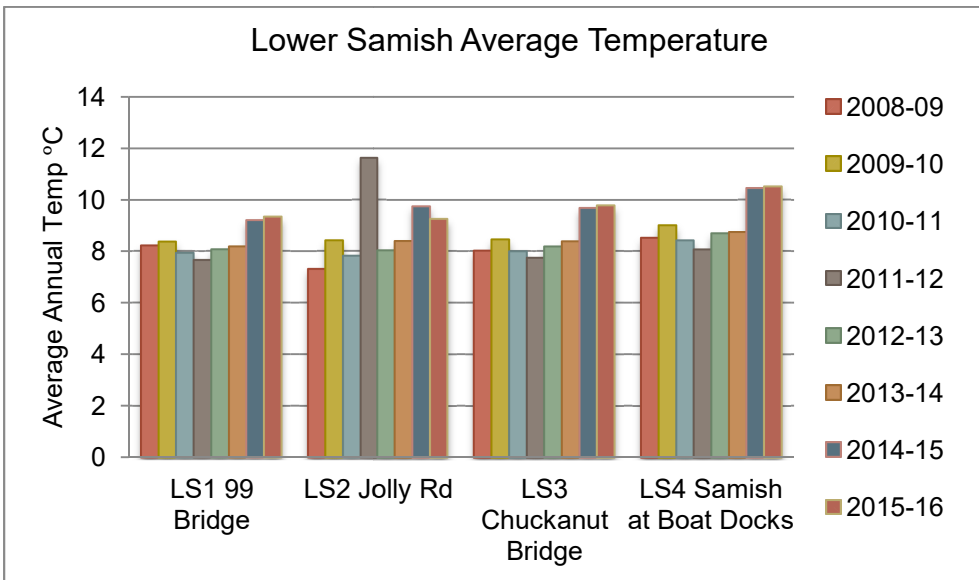


Figure 21. Lower Samish Temperature: Eight-year comparison

Turbidity levels in the Lower Samish were similar at all sites. Readings were generally low with spikes in October and mid-winter, corresponding to rain events.

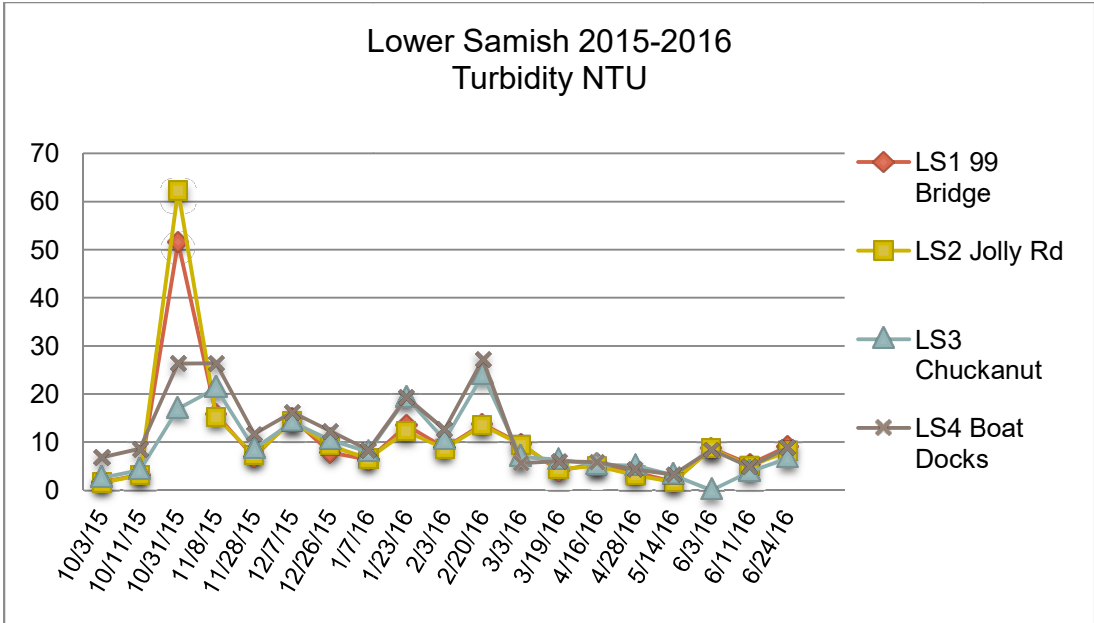


Figure 22. Lower Samish Turbidity: 2015-2016

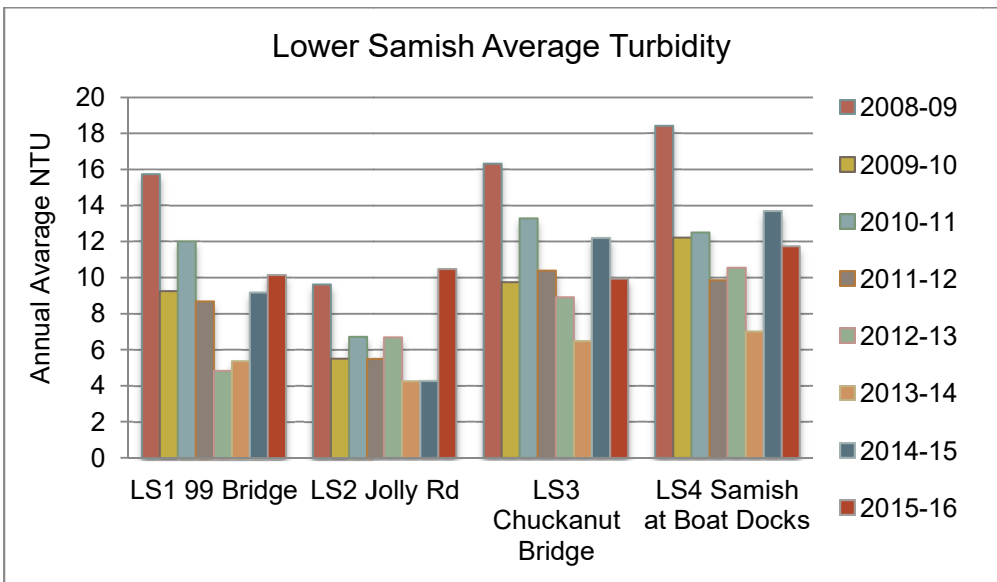


Figure 23. Lower Samish Turbidity: Eight-year comparison

Fecal Coliform levels for the Lower Samish were variable with high counts and with Site 4 generally the highest of the four sites.

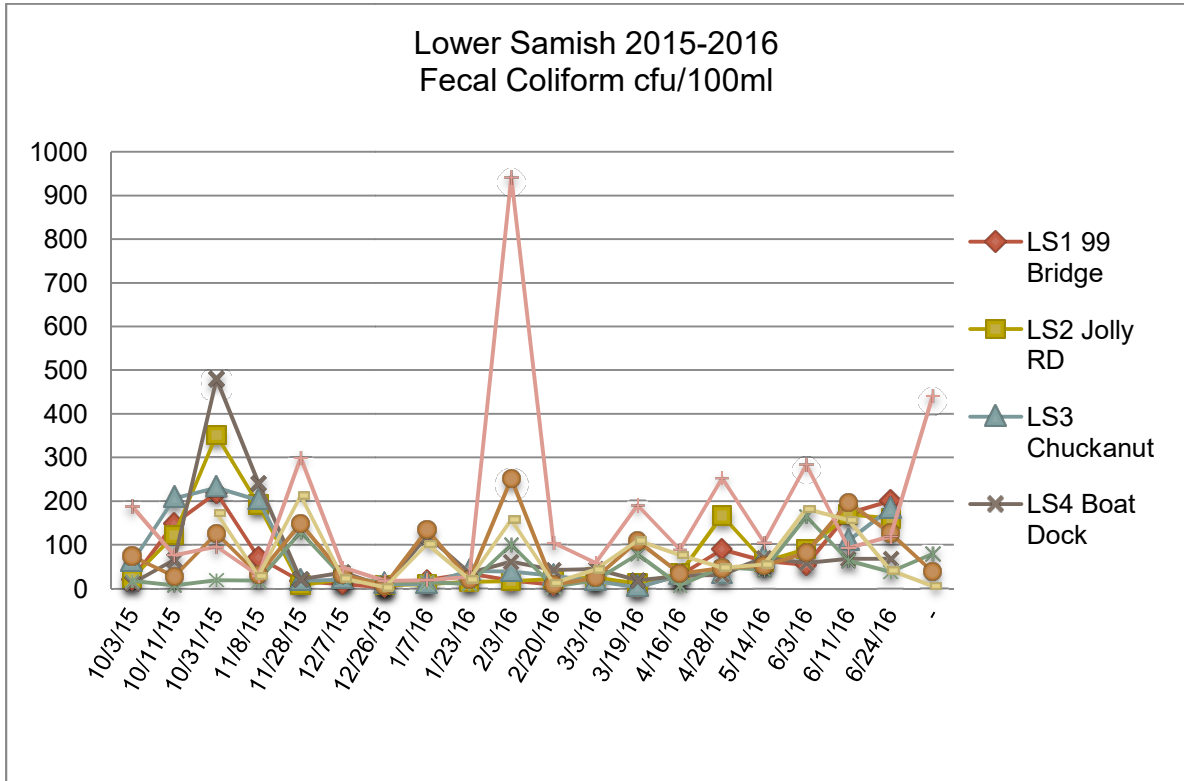


Figure 24. Lower Samish Fecal Coliform: 2015-2016

Geometric mean averages for fecal coliform (Figure 26) for all four sites were below 100 CFU.100 ml. All four sites met Part I of the state standards for fecal coliform. Only Sites 2 and 4 had fewer than 10% of the samples over 200 CFU.100 ml.

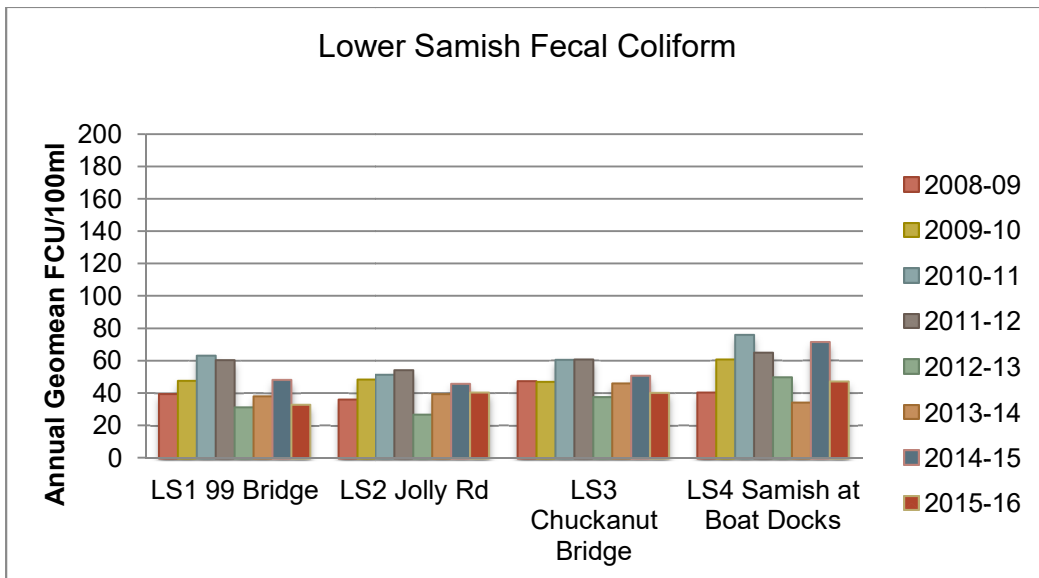


Figure 25. Lower Samish Fecal Coliform: Eight-year comparison

Upper Nookachamps Results

Figures 26 through 33 below present results from Upper Nookachamps Creek sampling.

All four sites had DO levels below 9.5 mg/l multiple times. Once again, Site 1 was below 9.5° most of the season, and was usually the lowest of the four sites.

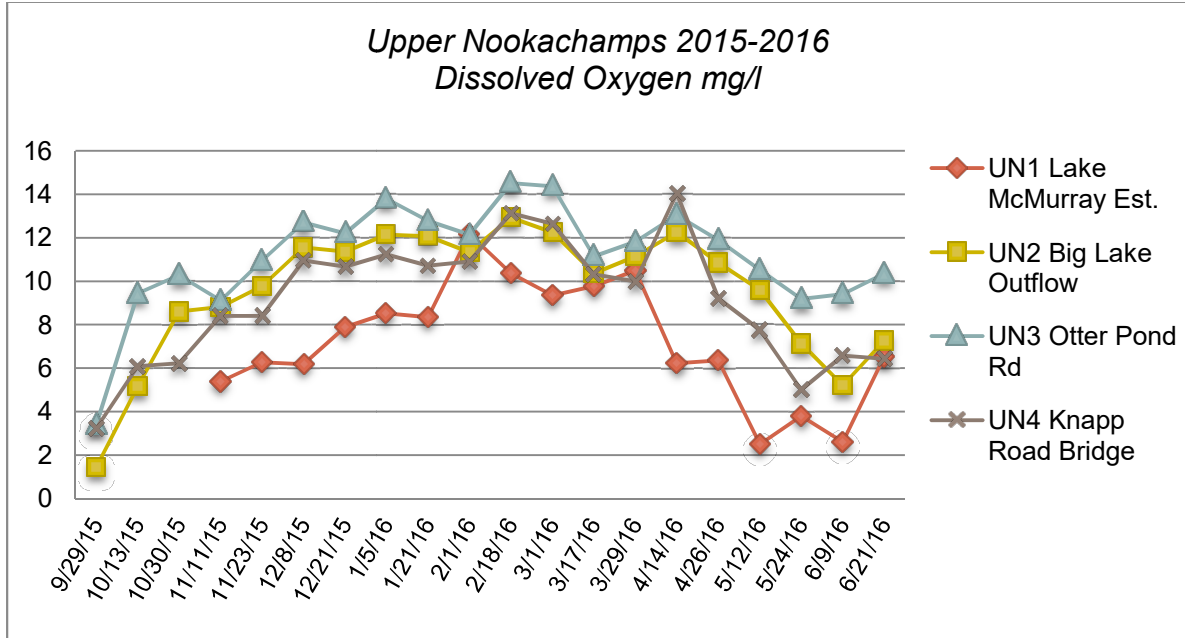


Figure 26. Upper Nookachamps DO: 2015-2016

DO levels at all sites were similar to the past three years. Annual averages were lowest for site 1 and highest for site 3. State standards are based on the single lowest measurement, not on annual averages, so to see averages below 9.5°C indicates a long-term problem.

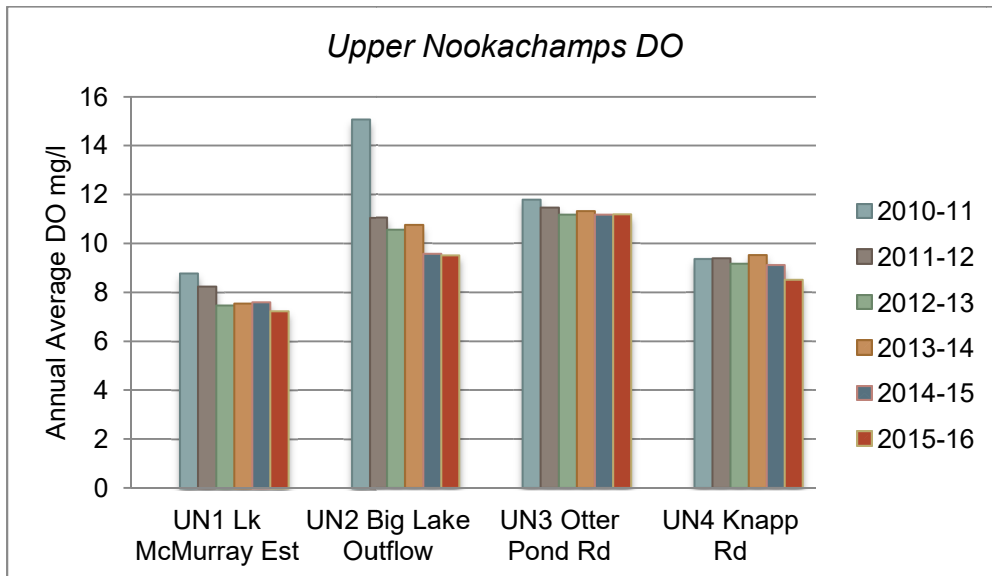


Figure 27. Upper Nookachamps DO: Six-year comparison

Temperatures for all Upper Nookachamps sites went above the standard of 16° in May and June.

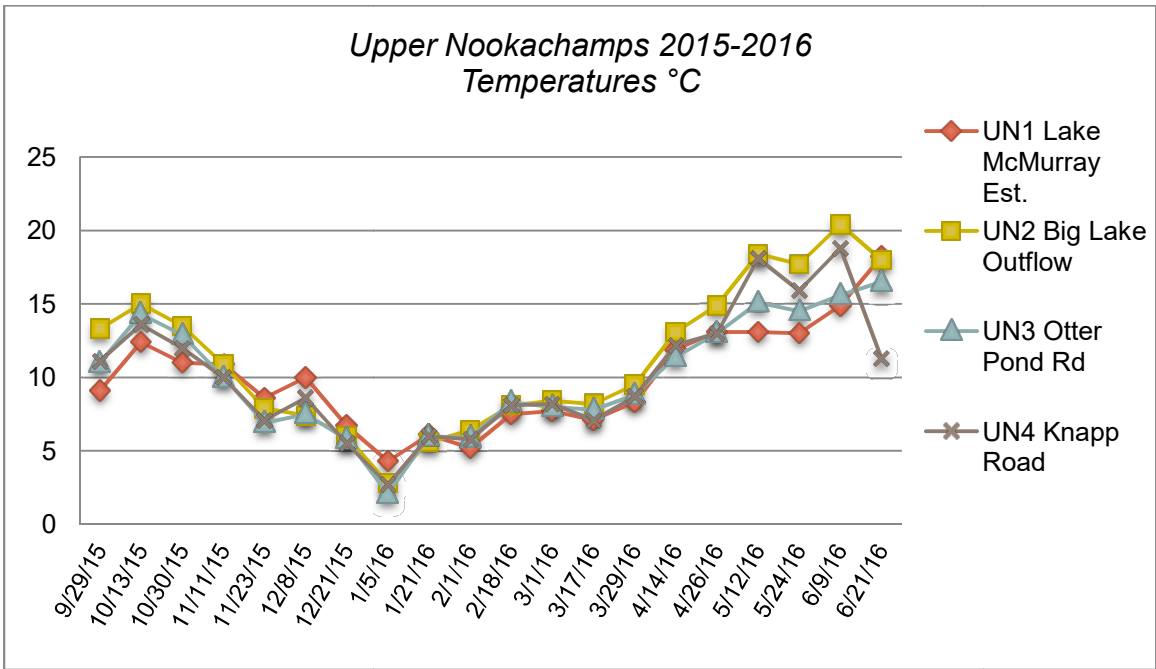


Figure 28. Upper Nookachamps Temperature: 2015-2016

While average temperatures for Upper Nookachamps sites dropped from last year, they still follow an overall warming trend. State standards are not based on average annual temperature.

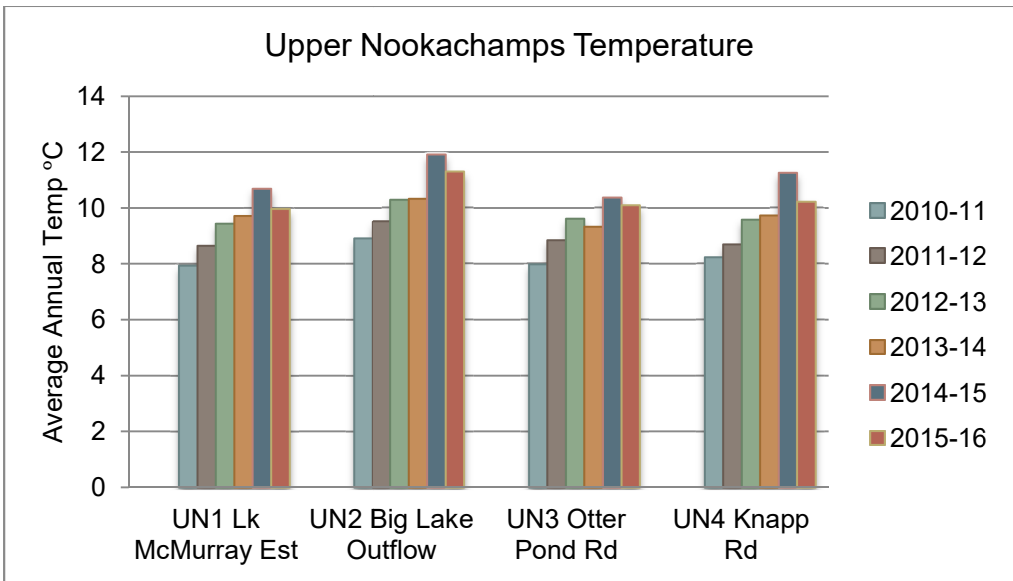


Figure 29. Upper Nookachamps Temperature: Six -year comparison

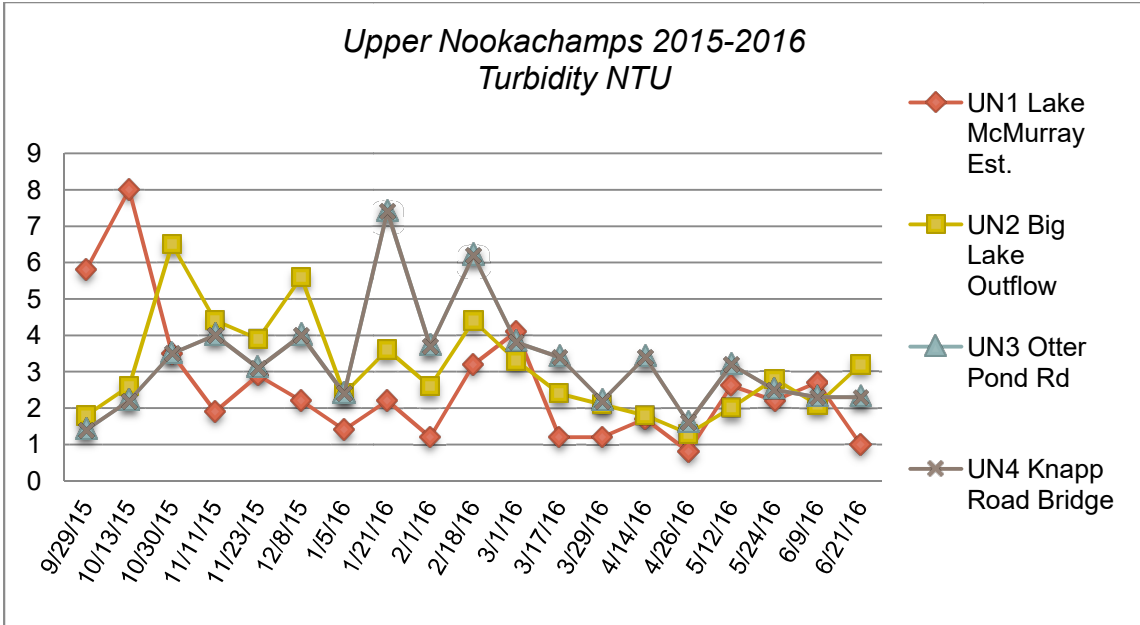


Figure 30. Upper Nookachamps Turbidity: 2015-2016

As in the previous years, turbidity was lowest upstream and highest downstream.

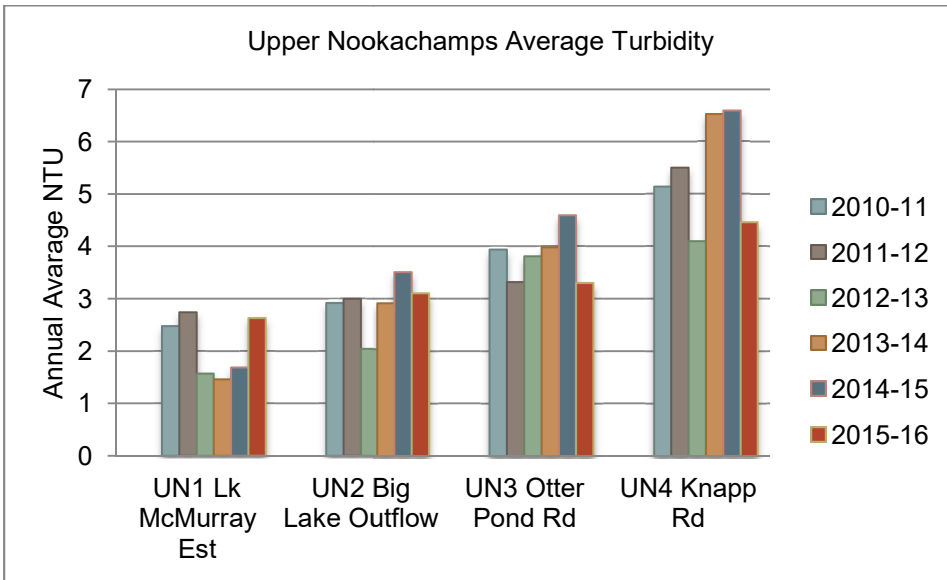


Figure 31. Upper Nookachamps Turbidity: Six -year comparison

Fecal coliform levels (Figure 33 below) stayed relatively low through the season for Sites 1-3. Site 4 was more variable, with several very high counts.

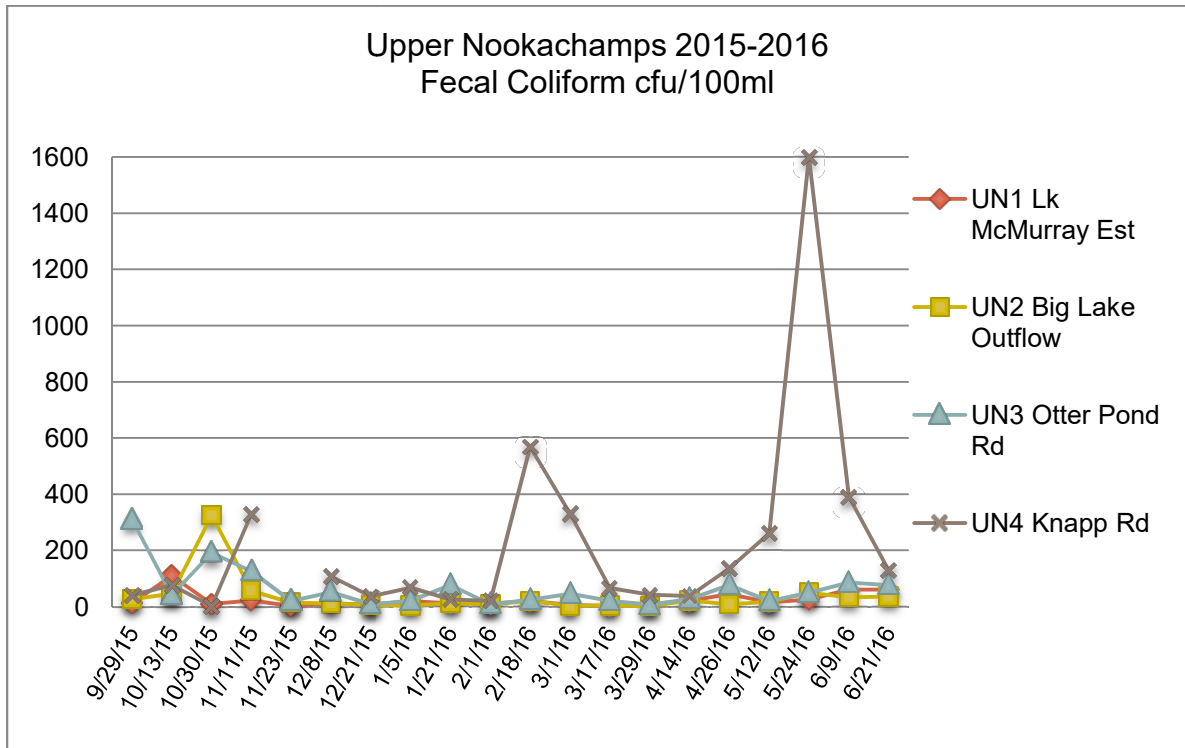


Figure 32. Upper Nookachamps Fecal Coliform: 2015-2016

Annual geometric means for fecal coliform Sites 1-3 (Figure 34 below) met both parts of the state standard (100 CFU/100ml and <10% of samples below 200 CFU/100ml). Site 4 met Part 1 but not Part 2. Nearly a third of the Site 4 samples were over 200 CFU/100ml.

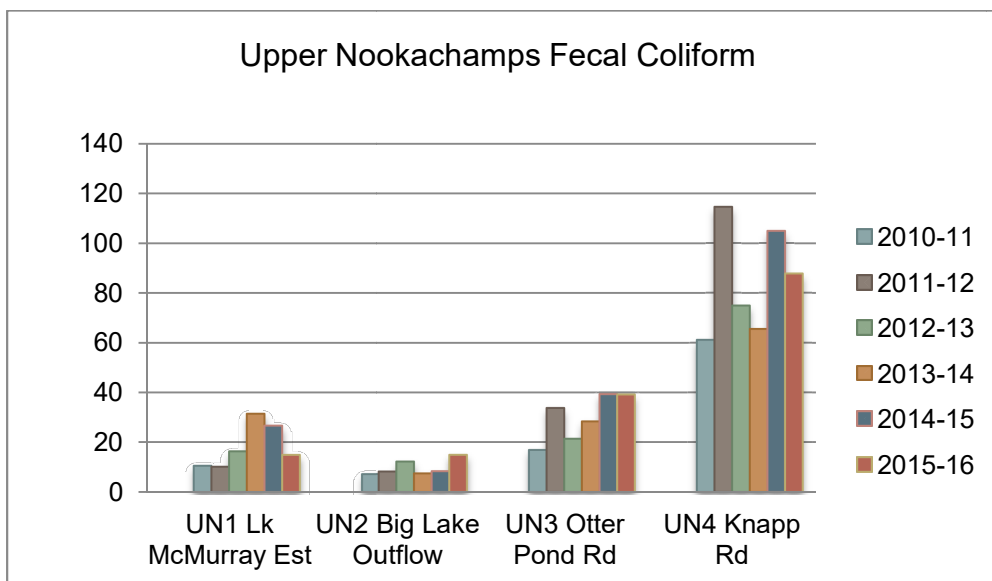


Figure 33. Upper Nookachamps Fecal Coliform: Six -year comparison

Lower Nookachamps Results

Figures 34 through 41 below present results from Lower Nookachamps Creek sampling. This is the seventh year of sampling on the Lower Nookachamps.

All Lower Nookachamps sites had similar dissolved oxygen levels. All sites dropped below the state standard of 9.5°C during the year.

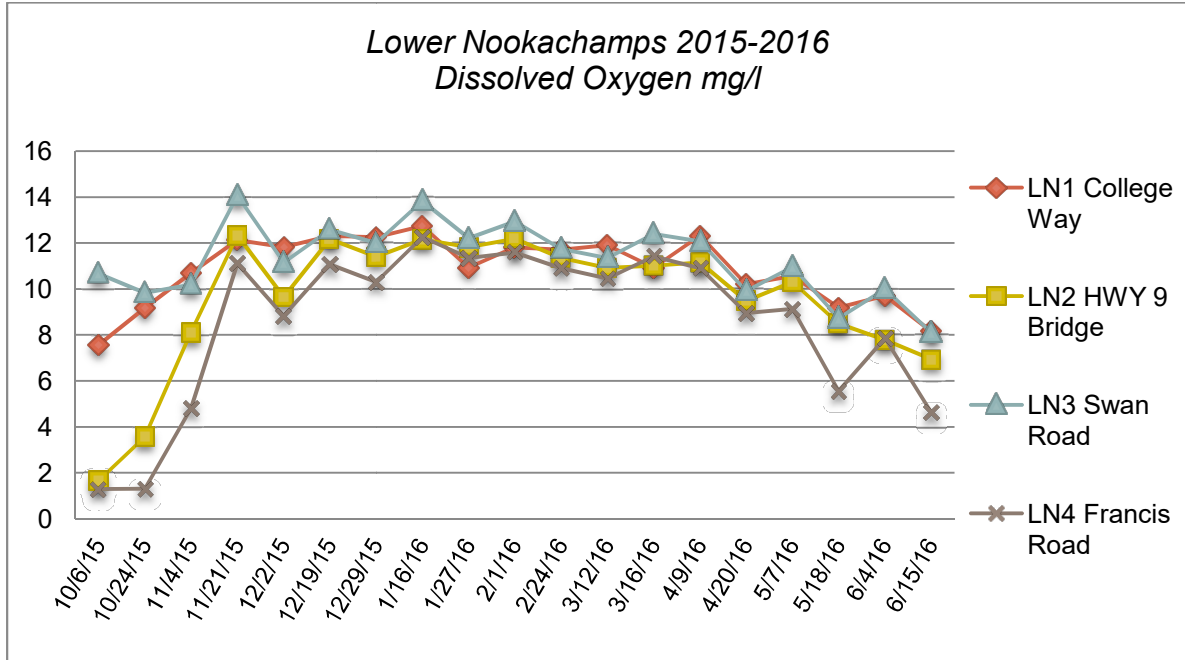


Figure 34. Lower Nookachamps DO: 2015-2016

Dissolved oxygen levels were similar to past years for all sites. Averages are shown below for comparing sites and years, and are not relevant to state standards.

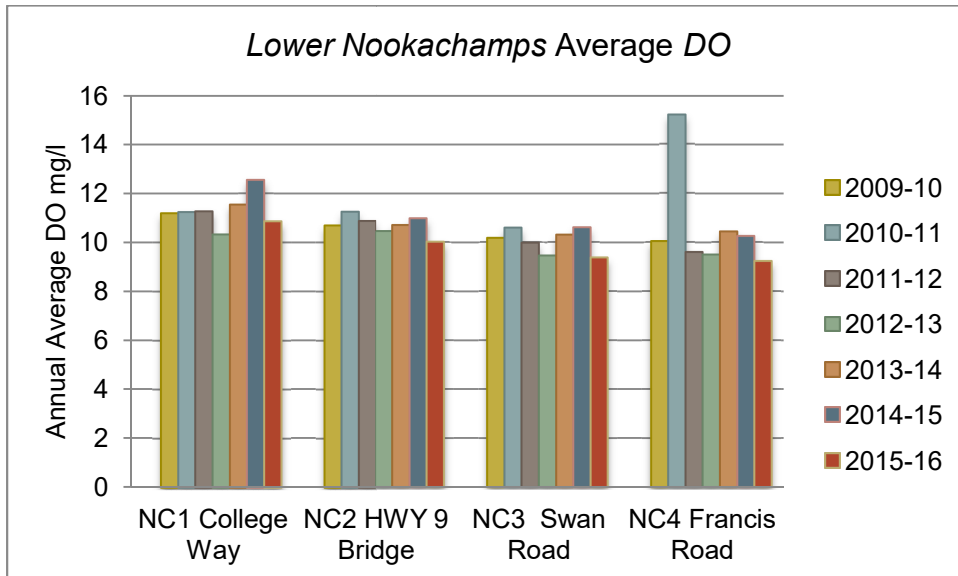


Figure 35. Lower Nookachamps DO: Seven -year comparison

Temperatures for Sites 1, 3 and 4 went above the state standard of 16°C in June. Site 2 stayed cooler than the 16°C maximum. No samples were taken during the warmest summer months.

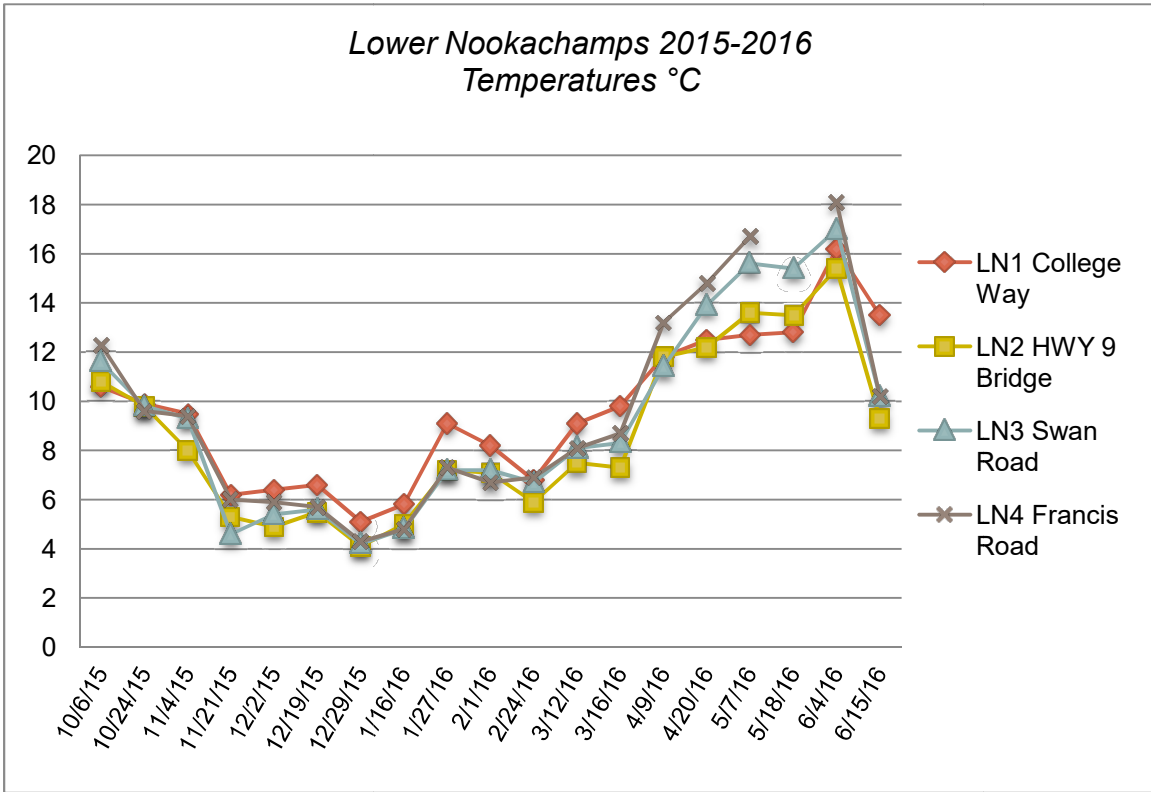


Figure 36. Lower Nookachamps Temperature: 2015-2016

Annual average temperatures for Lower Nookachamps (Figure 38 below) show a warming trend over seven years of sampling. State standards are not based on the annual average

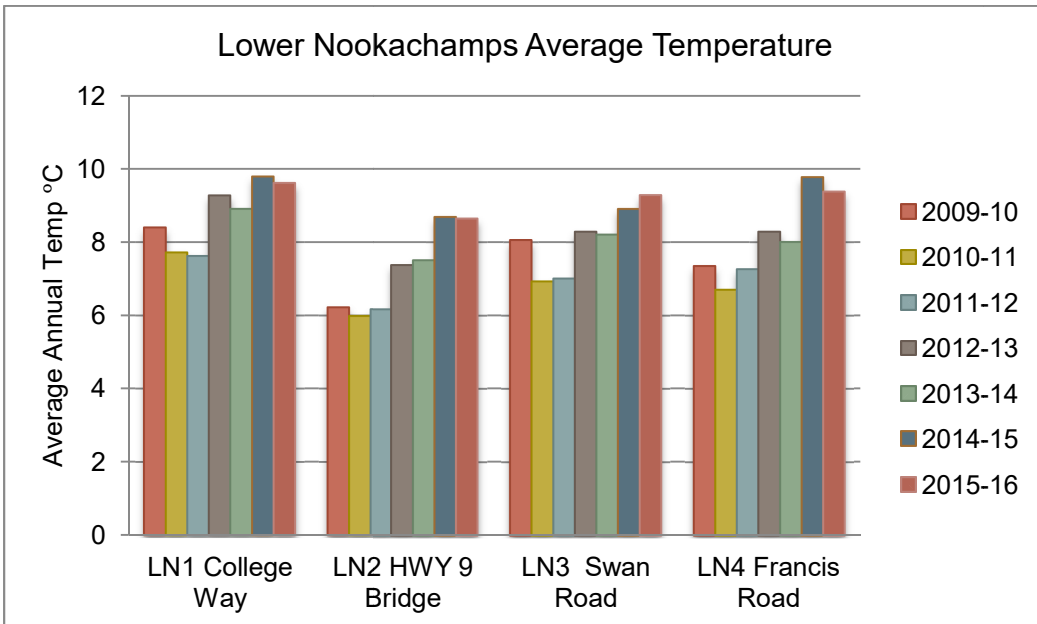


Figure 37. Lower Nookachamps Temperature: Seven -year comparison

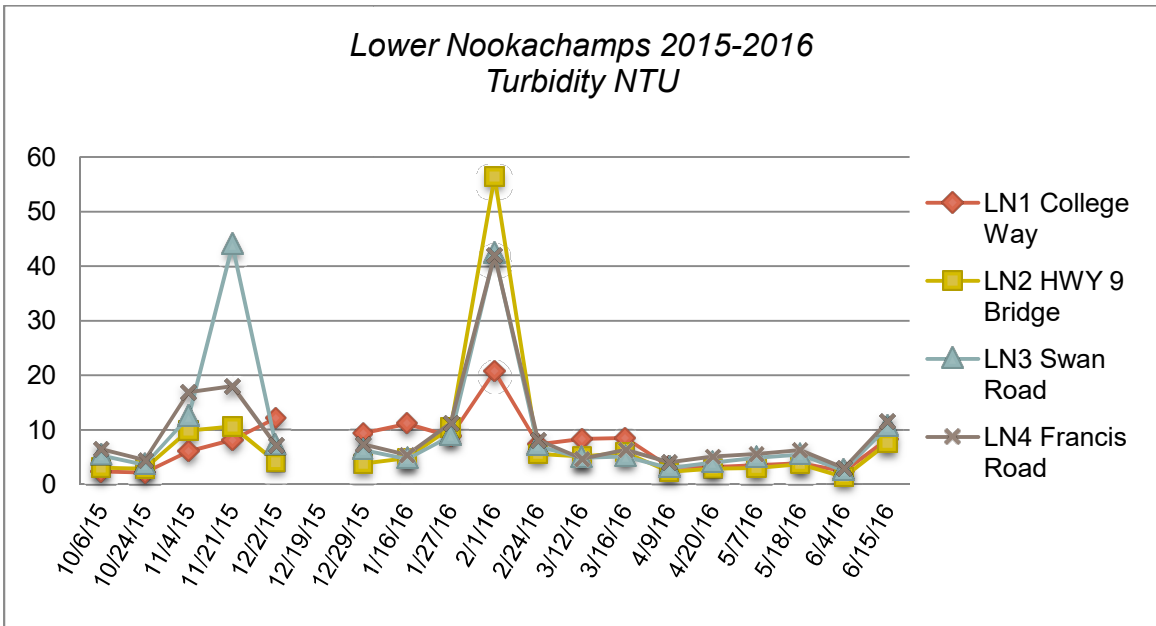


Figure 38. Lower Nookachamps Turbidity: 2015-2016

Turbidity levels in 2015-2016 were generally low, with one anomaly November 21 and one on February 1. Averages at Sites 2 - 4 were the highest in six years.

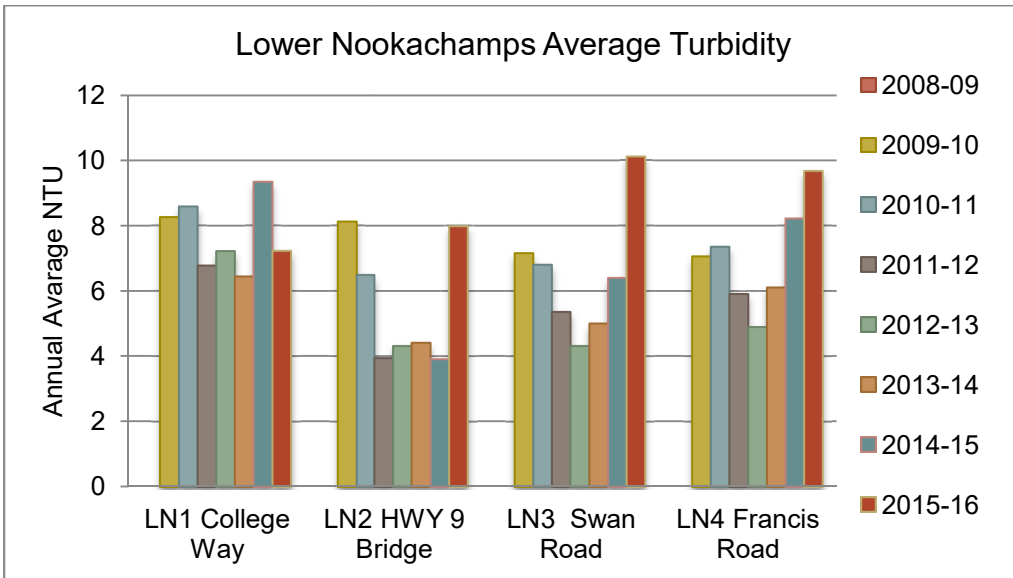


Figure 39. Lower Nookachamps Turbidity: Seven -year comparison

Fecal coliform levels were generally low, with a few spikes that corresponded to rainfall.

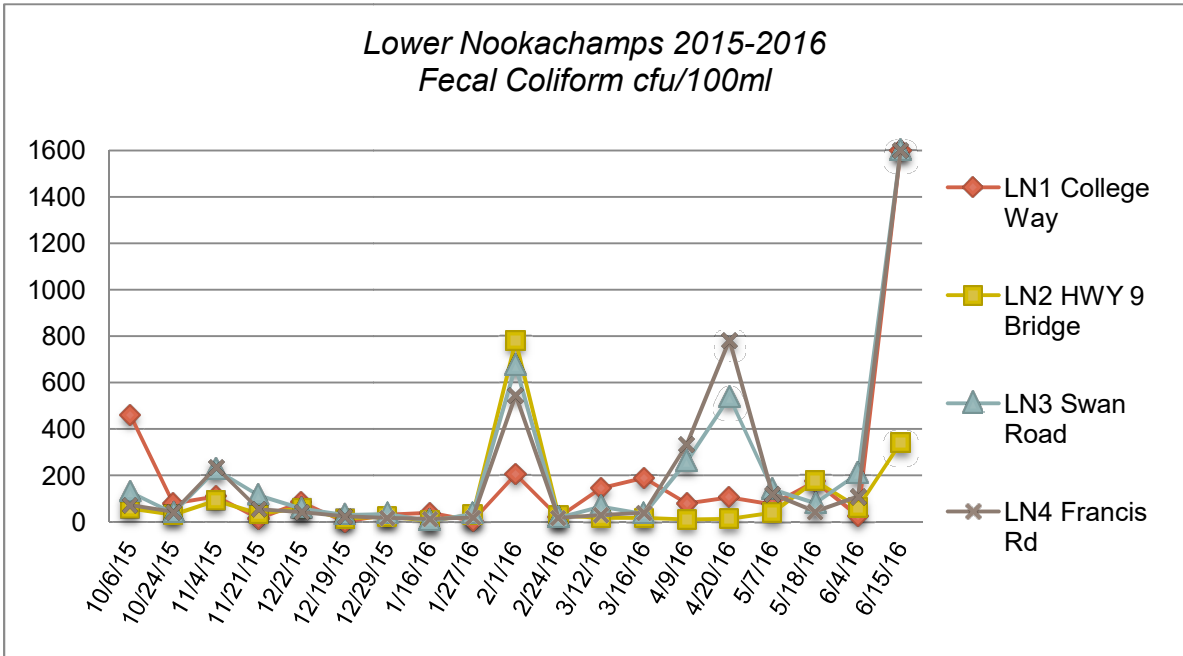


Figure 40. Lower Nookachamps Fecal Coliform: 2015-2016

Site 1 dropped dramatically this year, meeting Part 1 of the standard for the first time. All sites met the first part of the standard (<100 CFU/100ml). None of the sites met the <10% over 200 CFU/100ml standard.

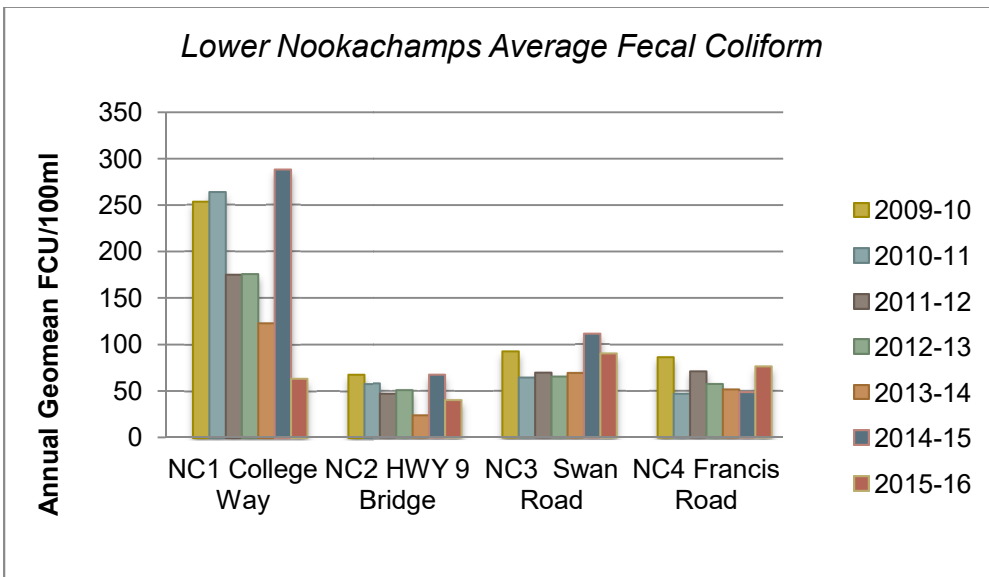


Figure 41. Lower Nookachamps Fecal Coliform: Seven -year comparison

No Name Slough Results

Figures 42 through 49 below present results from No Name Slough sampling.

Dissolved oxygen levels fell below the state standard of 8mg/l for all sites multiple times during the sampling season. The upper stream dries up in early summer.

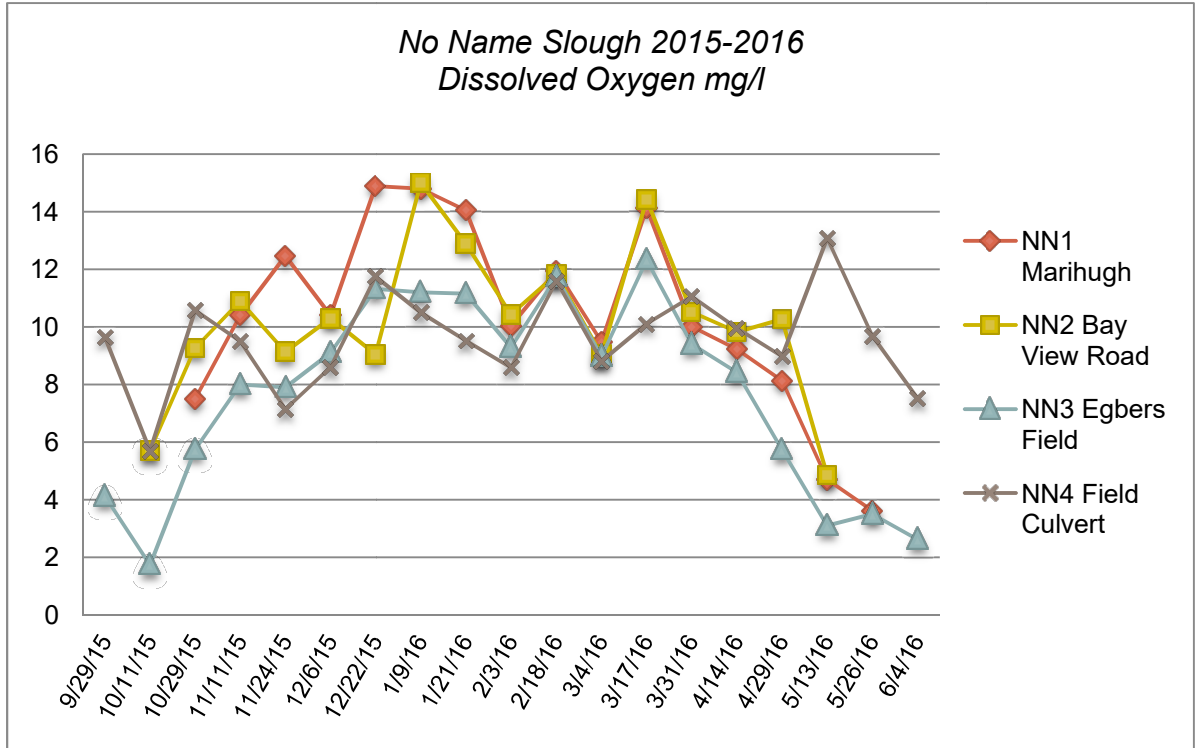


Figure 42. No Name Slough DO: 2015-2016

Average DO dropped to the lowest levels in 8 years for Site 3. State standards are not based on the annual average.

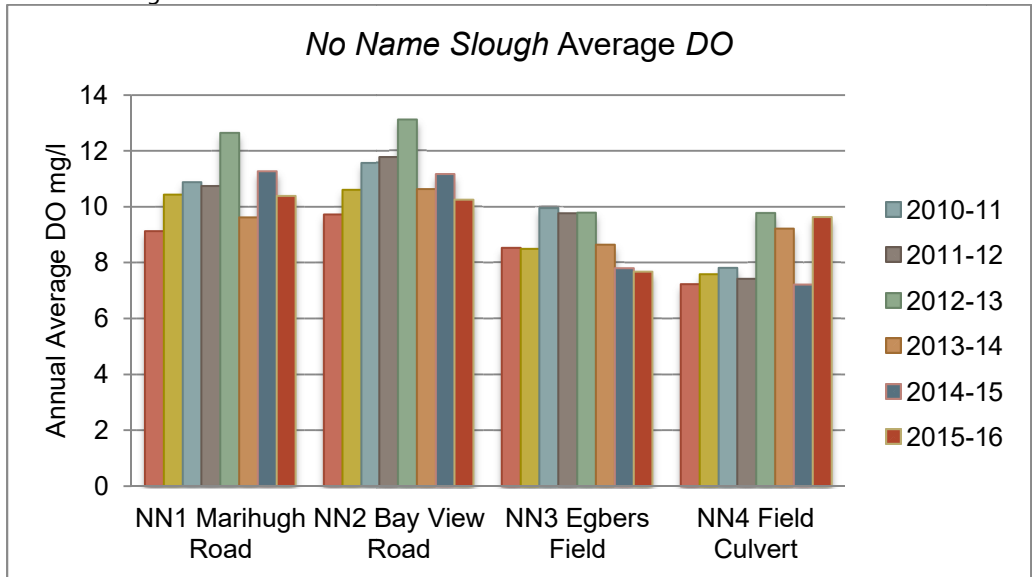


Figure 43. No Name Slough DO: Eight -year comparison

Temperatures at No Name Sites 1-3 were within the optimum range of <math><17.5^{\circ}\text{C}</math> throughout the sampling period. Site 4 was above this temperature in May. No samples were taken during the warmest summer season when temperatures were most likely to be warmer than the state standard.

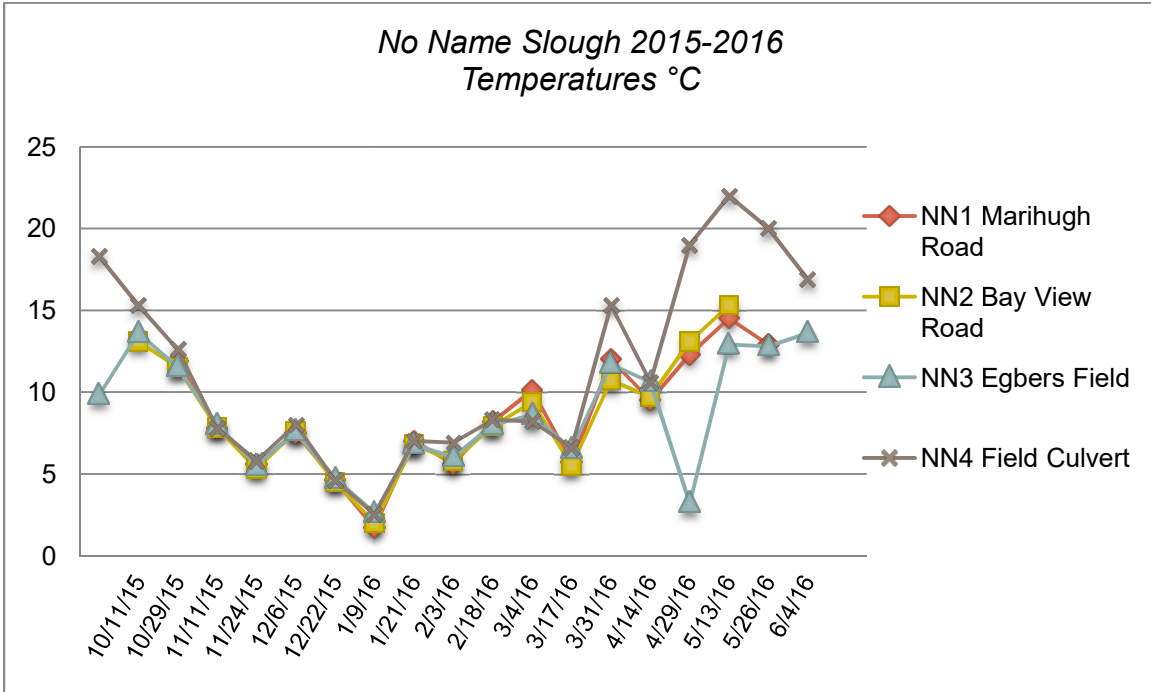


Figure 44 No Name Slough Temperature: 2015-2016

Though lower than last year at Sites 1, 3, and 4, average annual temperatures continued to indicate a warming trend. State standards are not based on the annual average.

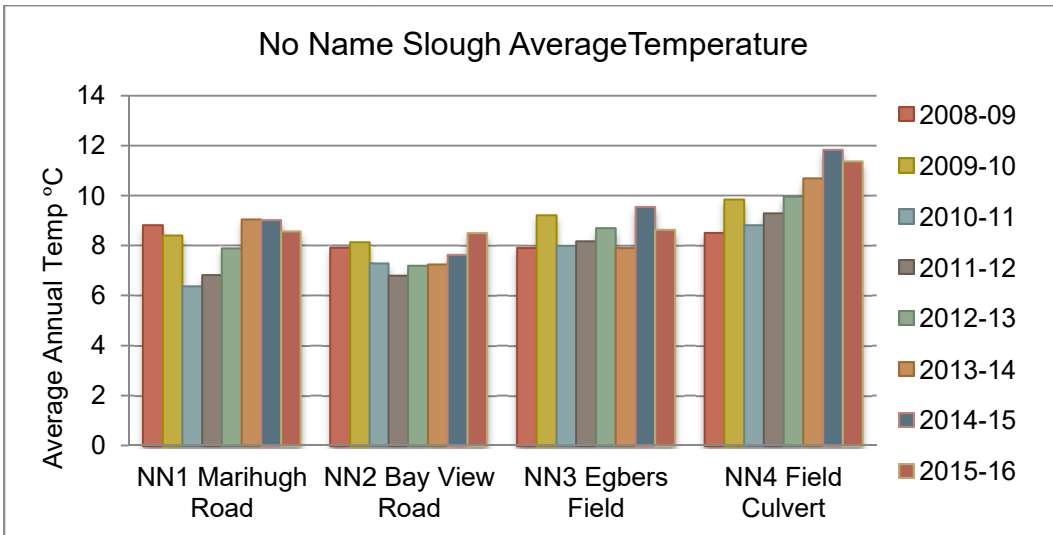


Figure 45. No Name Slough Temperature: Eight -year comparison

No Name Sites 3 and 4 (Figure 47 below) showed high variability in turbidity during 2015-2016.

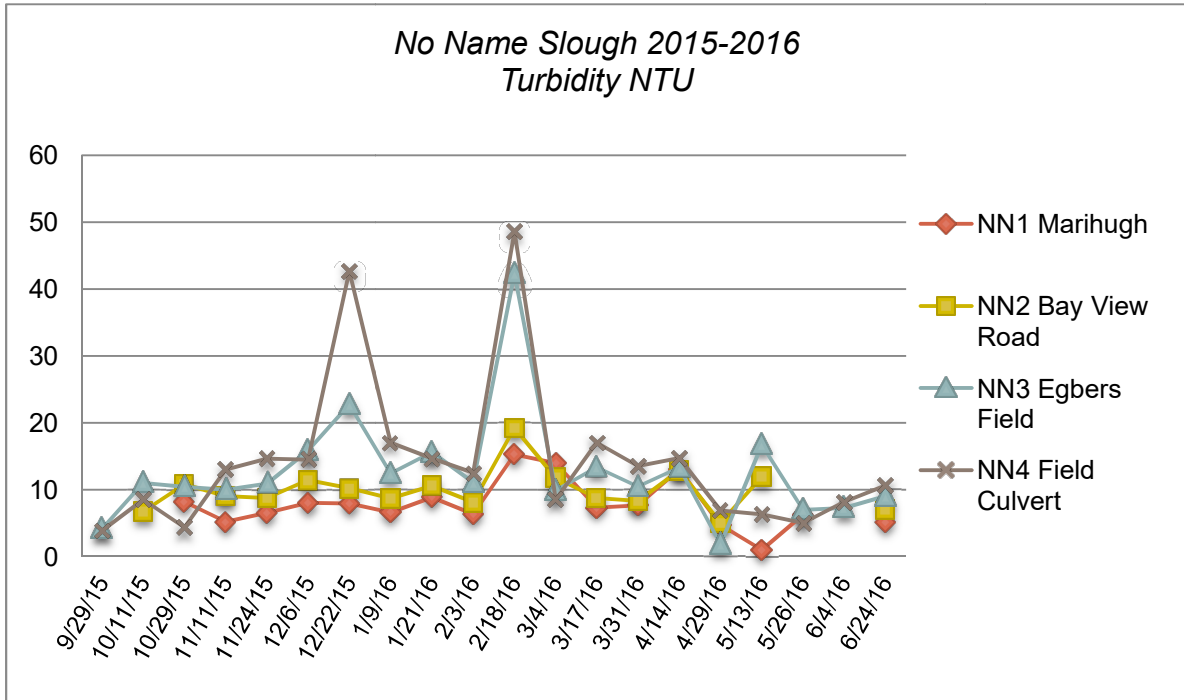


Figure 46. No Name Slough Turbidity: 2015-2016

Figure 48 below shows average turbidity levels that are comparable to past years, with Site 4 higher than the others.

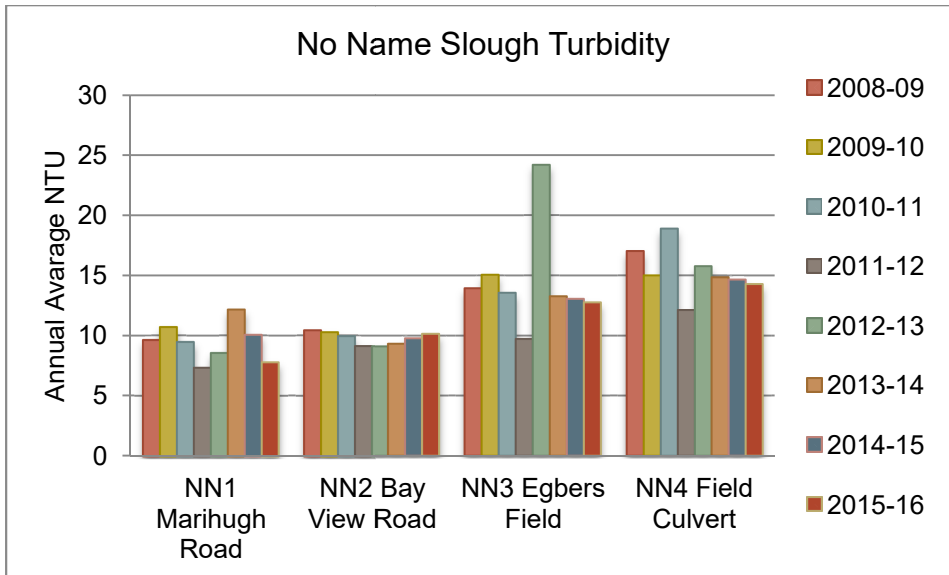


Figure 47. No Name Slough Turbidity: Eight -year comparison

All No Name Slough sites had instances of very high fecal coliform levels in 2015-2016. None of the sites met the <10% over 200 CFU/100ml standard.

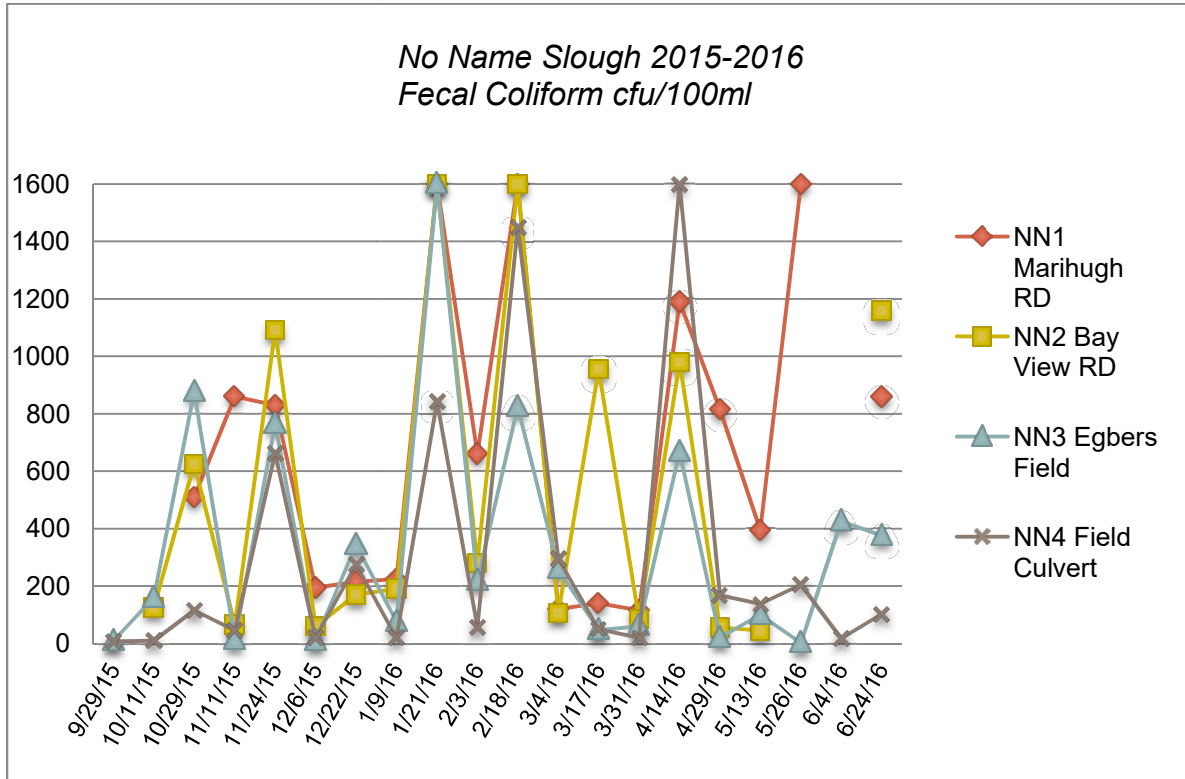


Figure 48. No Name Slough Fecal Coliform: 2015-2016

Average fecal coliform was extremely high this year for Site 1, with Sites 3 and 4 once again meeting the first part of the state standard of 100CFU/100 ml.

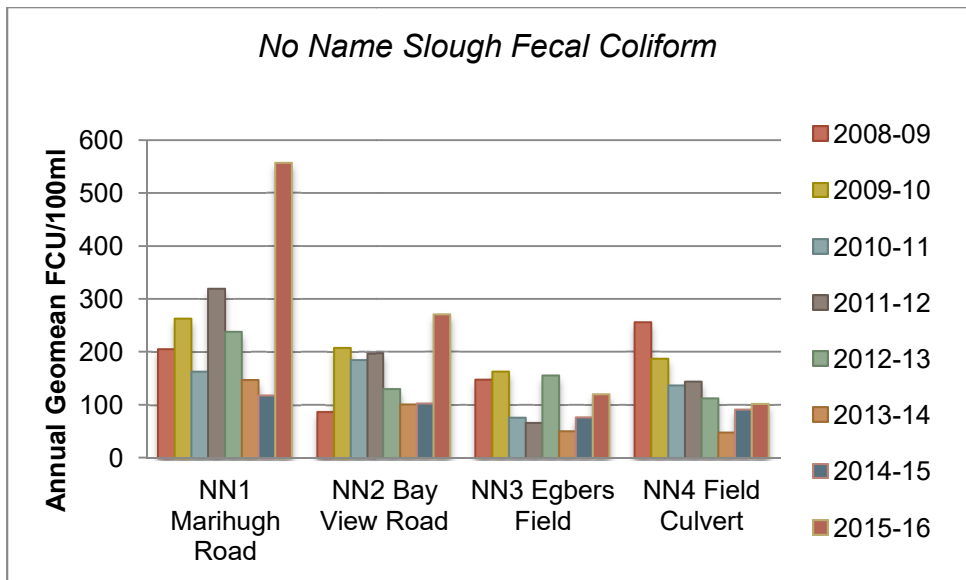


Figure 49. No Name Slough Fecal Coliform: Eight -year comparison

Bay View Drainage Results

Figures 50 through 57 below present results from Bay View Drainage sampling.

Dissolved oxygen measurements were limited for the unusually dry 2015-2016 season. This is a series of roadside ditches that dry up between rainy periods.

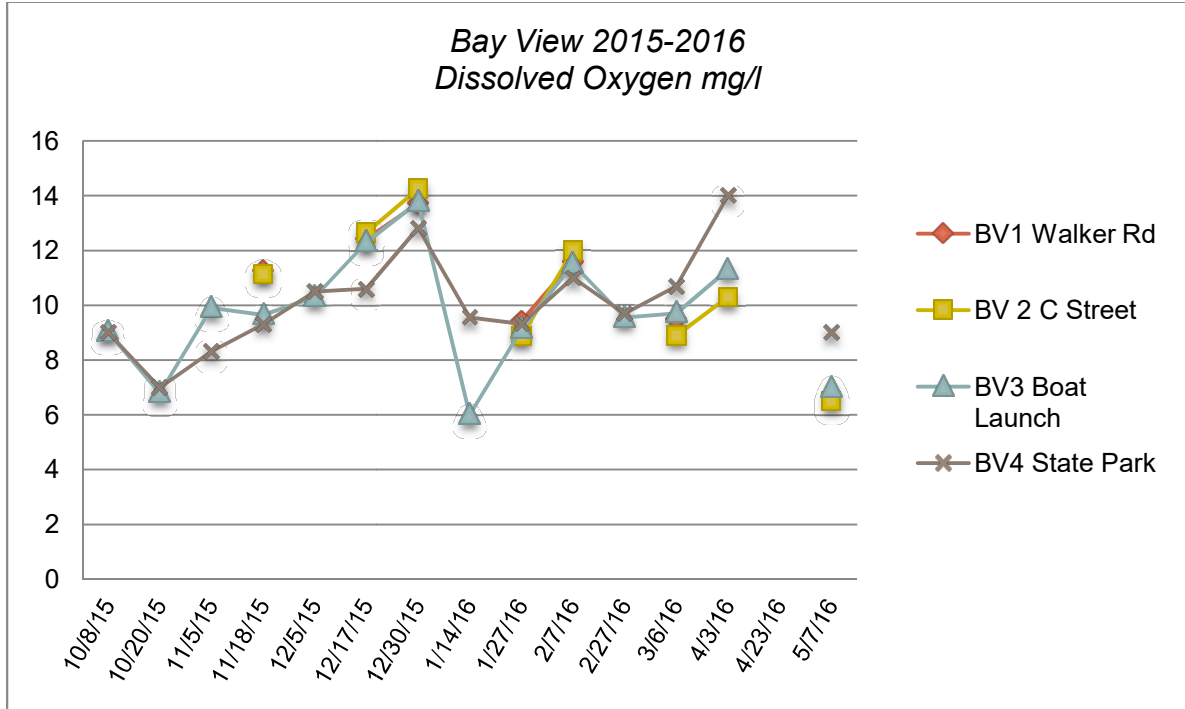


Figure 50. Bay View Drainage DO: 2015-2016

Average dissolved oxygen was similar to last year for all sites. State standards are not based on averages.

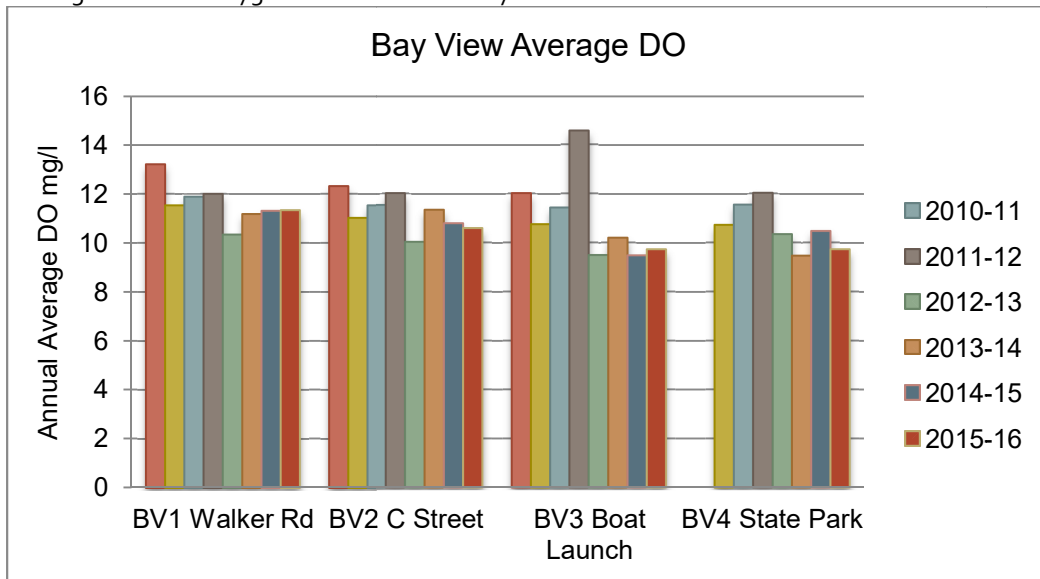


Figure 51. Bay View Drainage DO: Eight - year comparison

Temperatures in 2015-2016 were below the maximum of 17.5C. Sites dry up during the dry season.

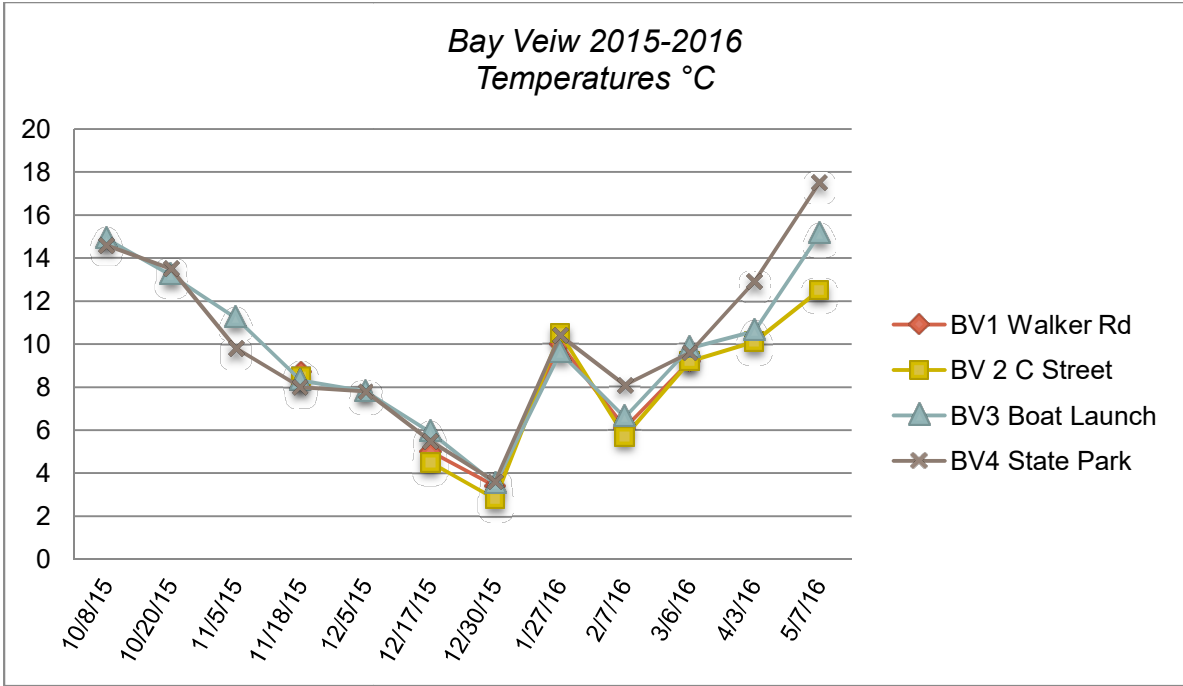


Figure 52. Bay View Drainage Temperature: 2015-2016

Average annual temperatures were consistent with patterns in previous years. Site 4 is a marine site, where low tides can create naturally high temperatures.

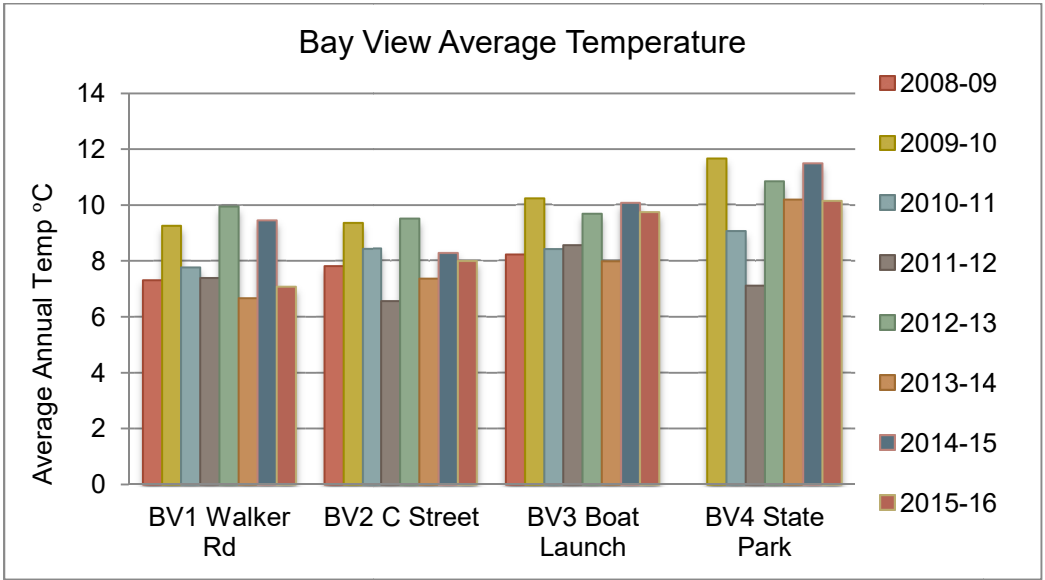


Figure 53. Bay View Drainage Temperature: Eight -year comparison

Weather affects turbidity at Sites 3 and 4 in the bay, when wind and waves stir up the mud and detritus. This is a normal, natural estuarine condition that does not indicate poor water quality.

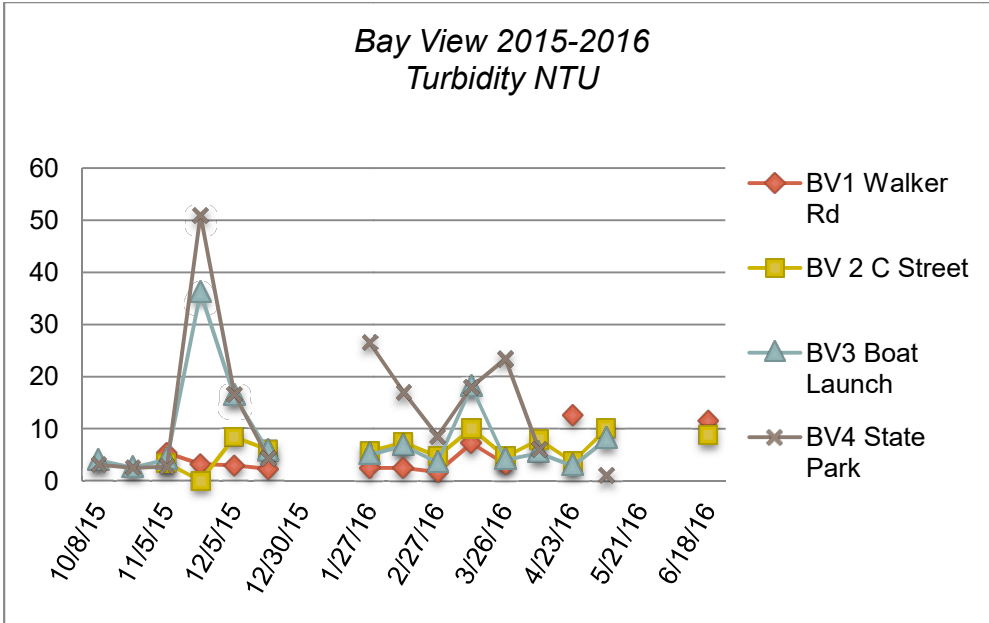


Figure 54. Bay View Turbidity: 2015-2016

Average turbidity levels (Figure 64 below) were fairly low and highest at Site 4.

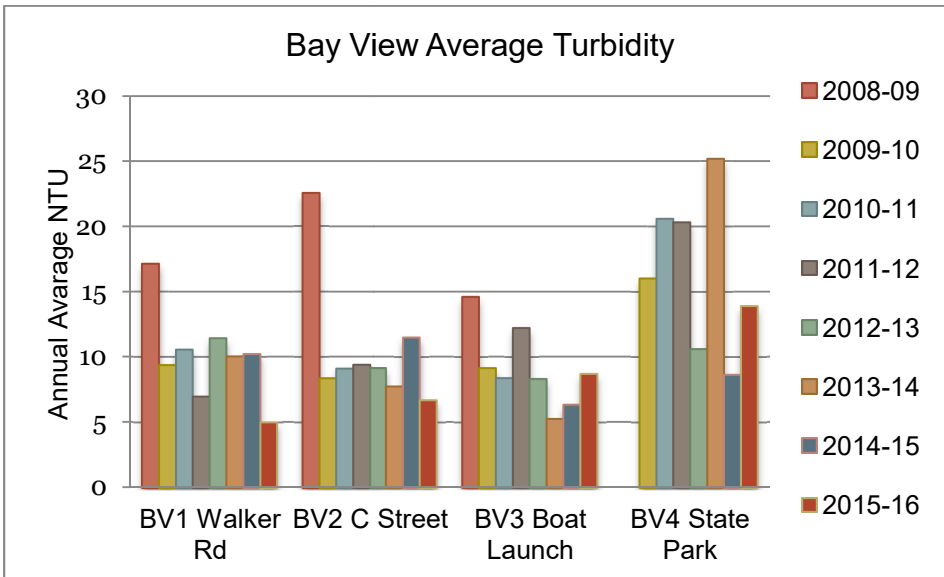


Figure 55. Bay View Drainage Turbidity: Eight -year comparison

More than 10% of fecal coliform counts at Sites 1 and 2 had higher than 200CFU/100ml (Figure 57 on next page). Sites 1 and 2 met Part II of the state standard of <10% above 200CFU/100ml.

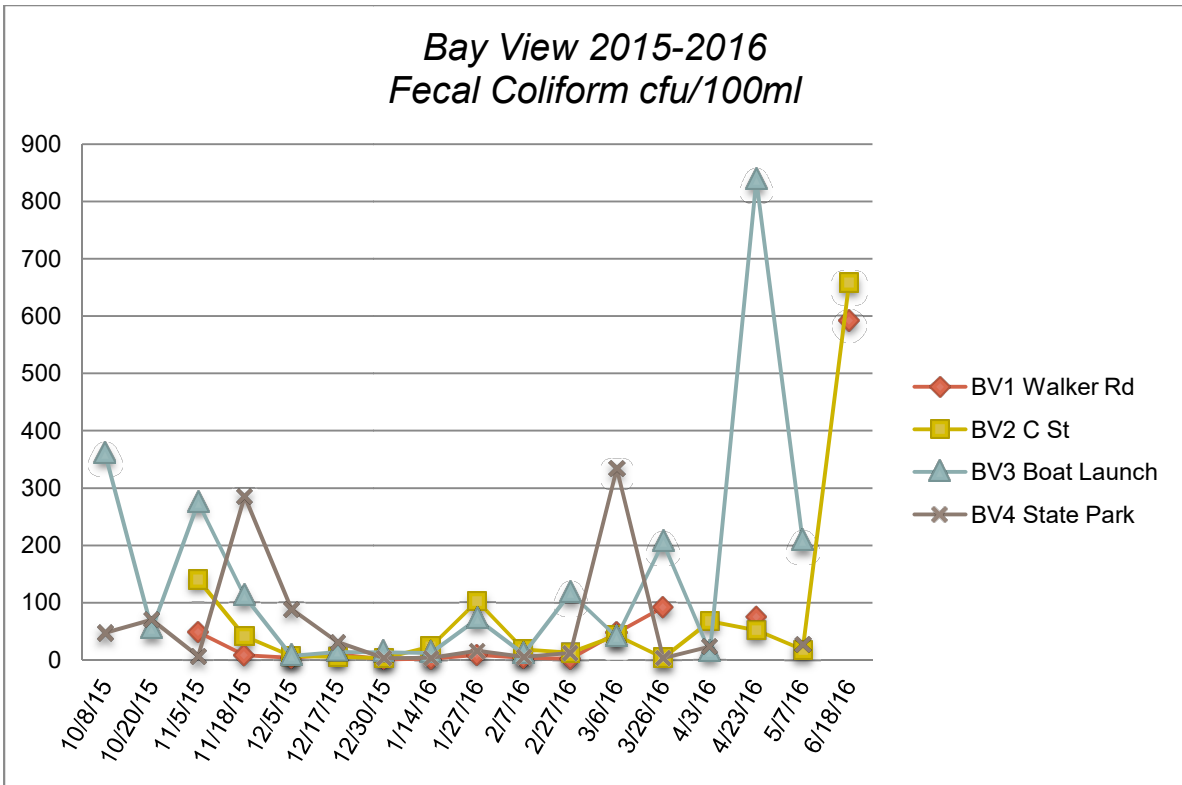


Figure 56. Bay View Drainage Fecal Coliform: 2015-2016

Annual geometric means for Bay View fecal coliform (Figure 66 below) were very low. All sites met Part I of the state standard (100CFU/100ml).

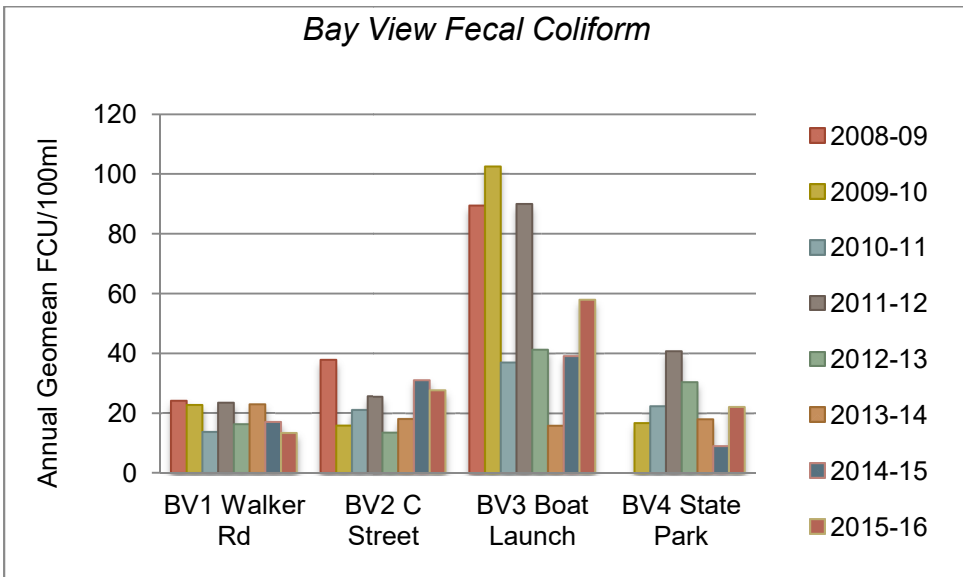


Figure 57. Bay View Drainage Fecal Coliform: Eight-year comparison

Joe Leary Slough Results

Figures 58 through 65 below present results from Joe Leary Slough sampling.

Once again, dissolved oxygen levels were consistently below standards for all sites, even during the cold winter months.

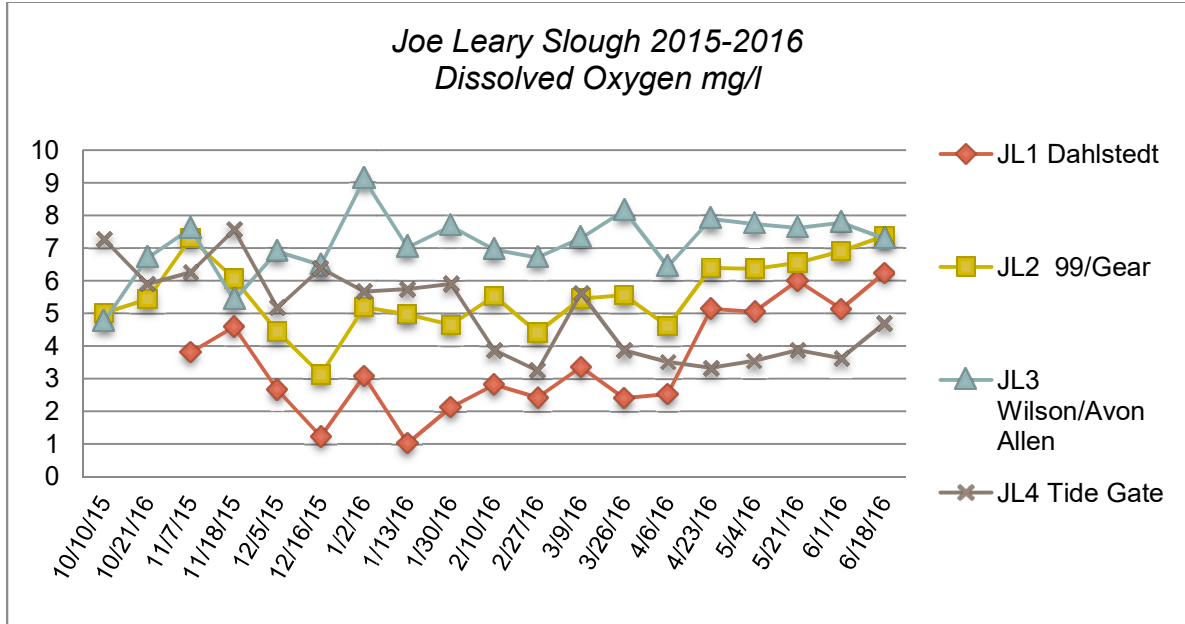


Figure 58. Joe Leary Slough DO: 2015-2016

Dissolved oxygen levels for all sites over the past seven years have been very low, with averages below the state standard of 8mg/l. Standards are not based on average levels.

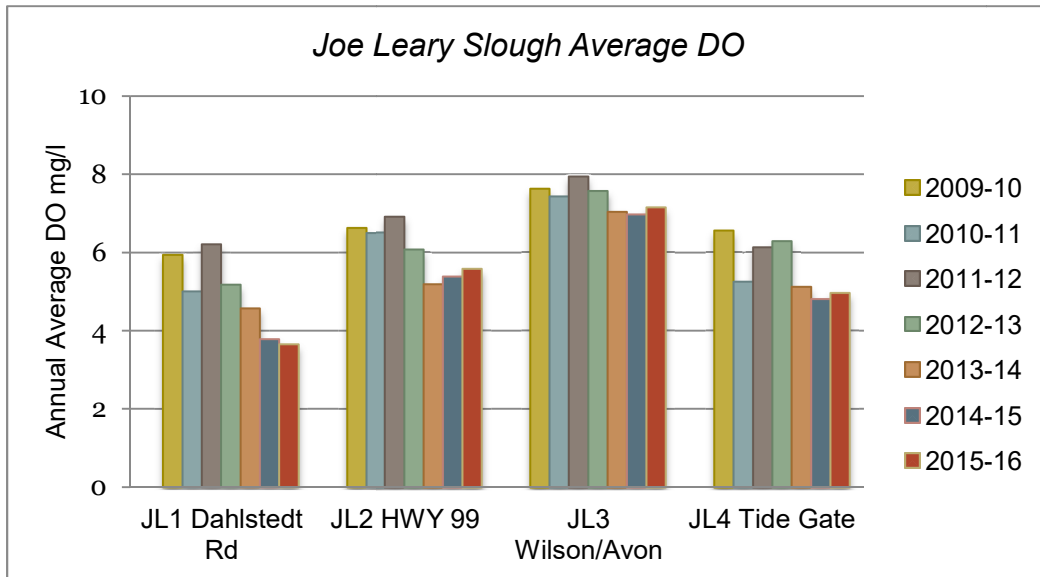


Figure 59. Joe Leary Slough DO: Seven-year comparison

The temperature at Site 4 rose above the maximum level of 17.5°C in June. All other samples were below 17.5 °C. No samples were taken during the warmest summer season when temperatures may have risen above the standard.

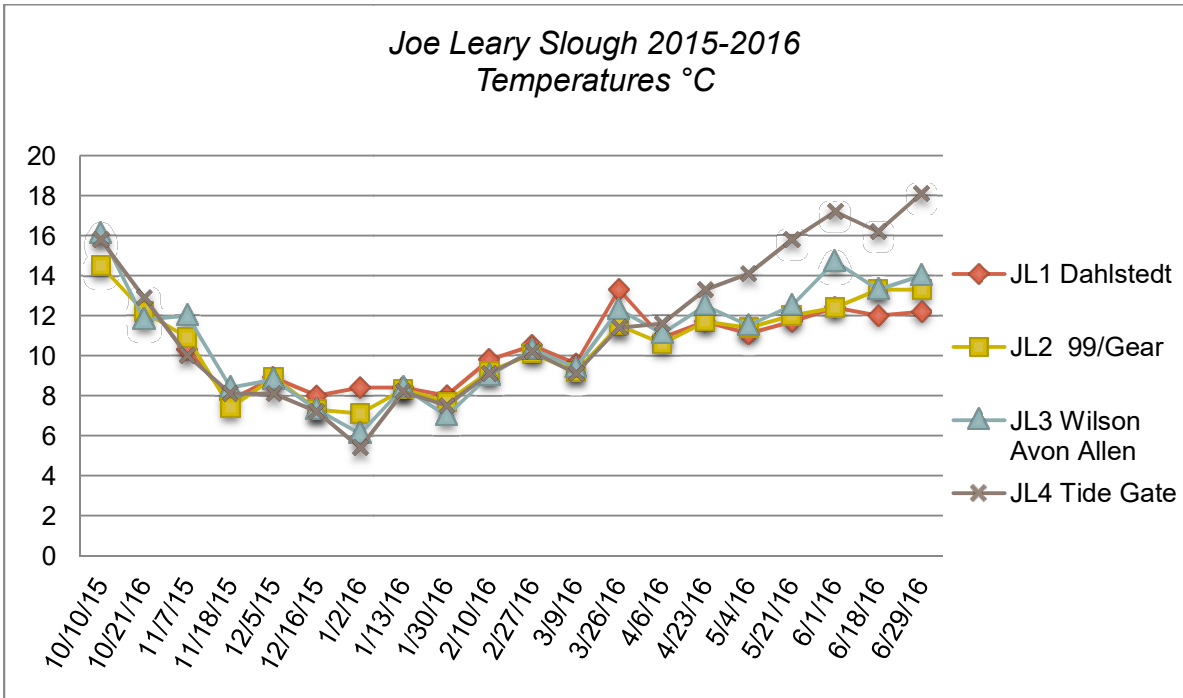


Figure 60. Joe Leary Slough Temperature: 2015-2016

Compared to past years, average annual temperatures (Figure 62 below) for all sites were lower than last year. Standards are not based on average temperature.

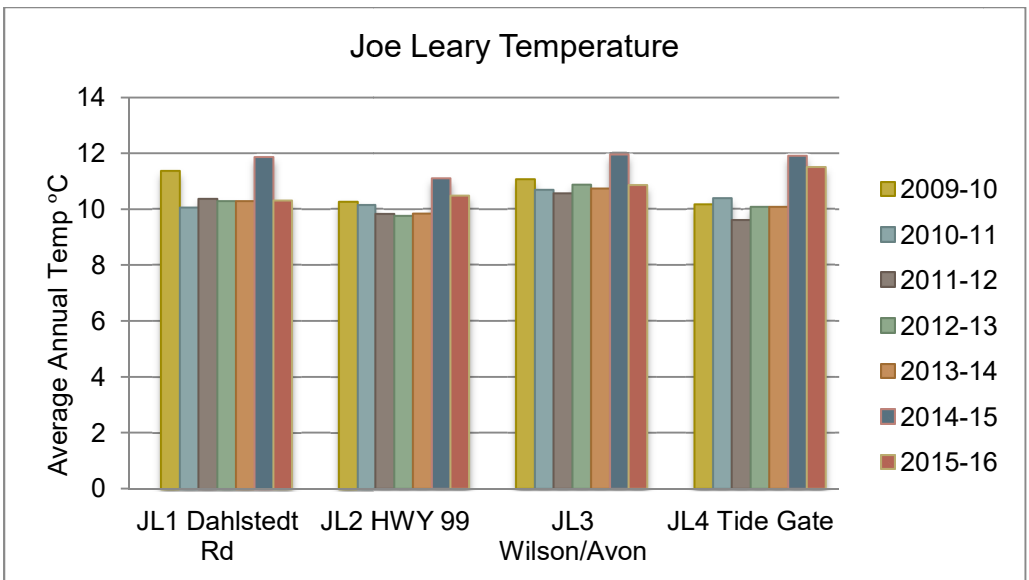


Figure 61. Joe Leary Slough Temperature: Seven-year comparison

Joe Leary Slough holds the distinction of having the highest turbidity of all the stream team sites.

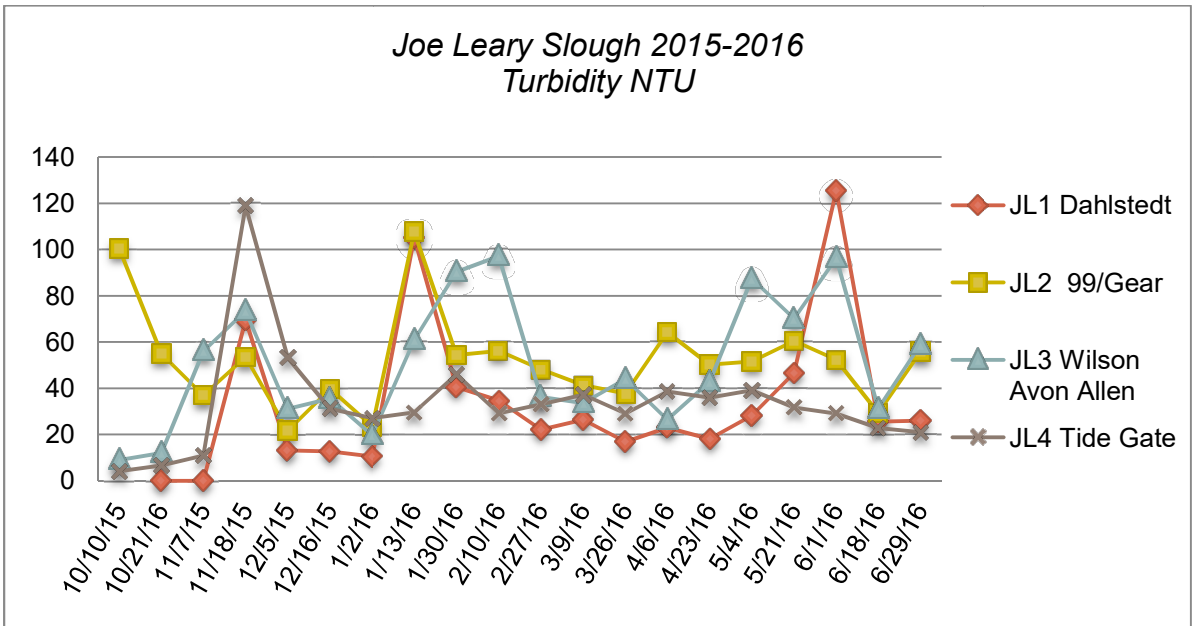


Figure 62. Joe Leary Slough Turbidity: 2015-2016

Average turbidity in Joe Leary Slough was the highest in seven years at Sites 1 and 2.

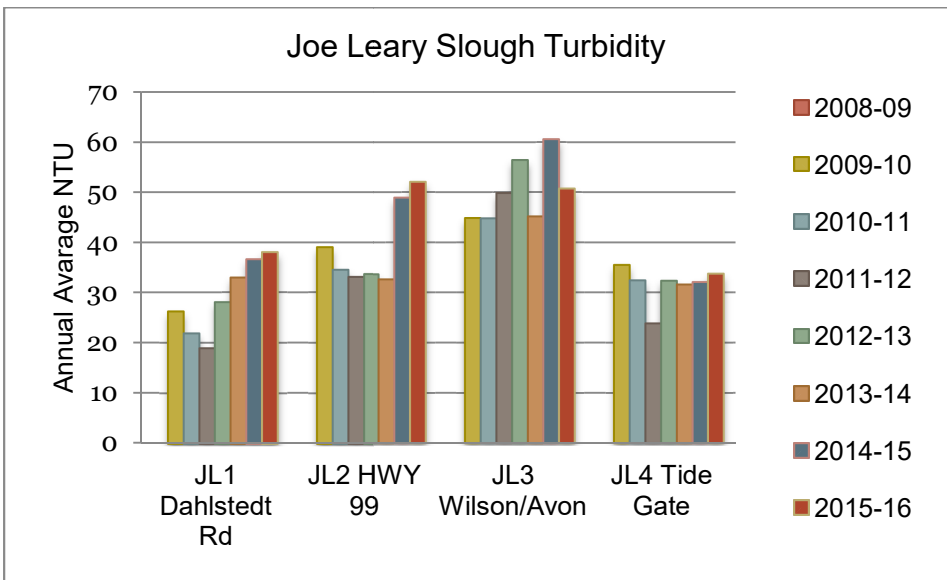


Figure 63. Joe Leary Slough Turbidity: Seven-year comparison

In 2015-2016, as in the previous year, none of the Joe Leary Slough sites met Part II of the state standard for fecal coliform: more than 10% of the samples were higher than 200CFU/100ml.

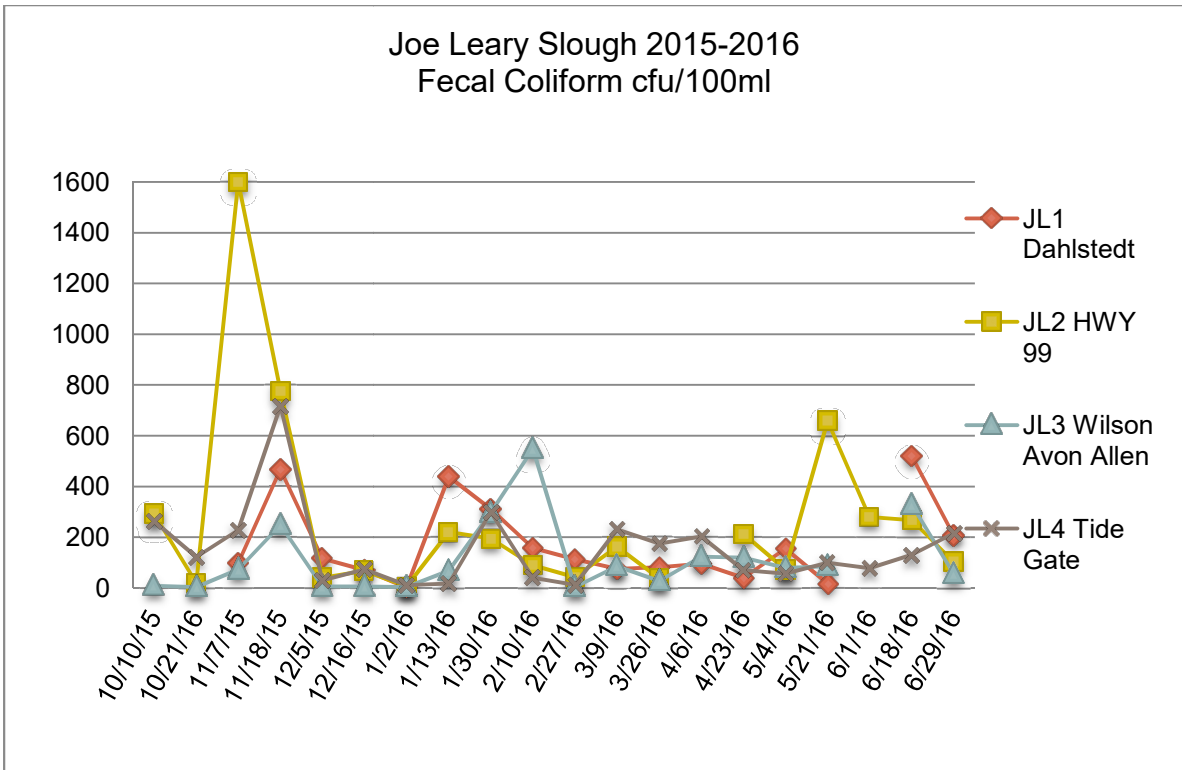


Figure 64. Joe Leary Slough Fecal Coliform: 2015-2016

Sites 3 and 4 met Part I of the standard of geometric mean <100 CFU100ml. None of the sites met both requirements.

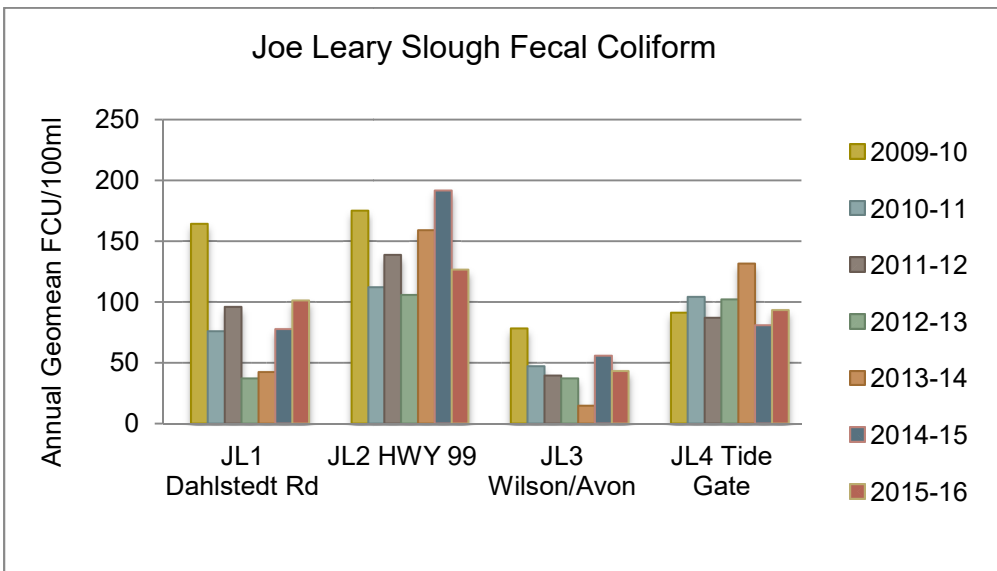


Figure 65. Joe Leary Slough Fecal Coliform: Seven-year comparison

Trumpeter Basin Results

Figures 66 through 73 below present results from Trumpeter Basin sampling.

Dissolved oxygen levels dropped below the standard of 9.5mg/l at Sites 2, 3 and 5.

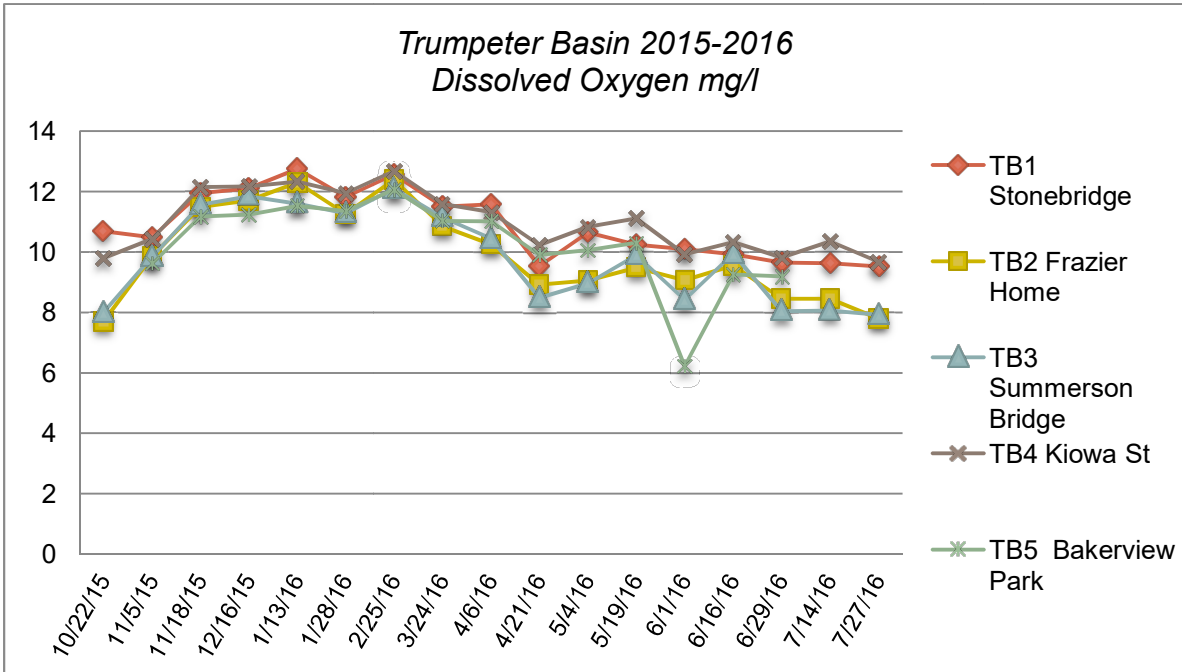


Figure 66. Trumpeter Basin DO: 2015-2016

Average annual dissolved oxygen levels (Figure 68 below) were lower than last year for Sites 1, 3, 4 and 5. State standards are not based on annual averages.

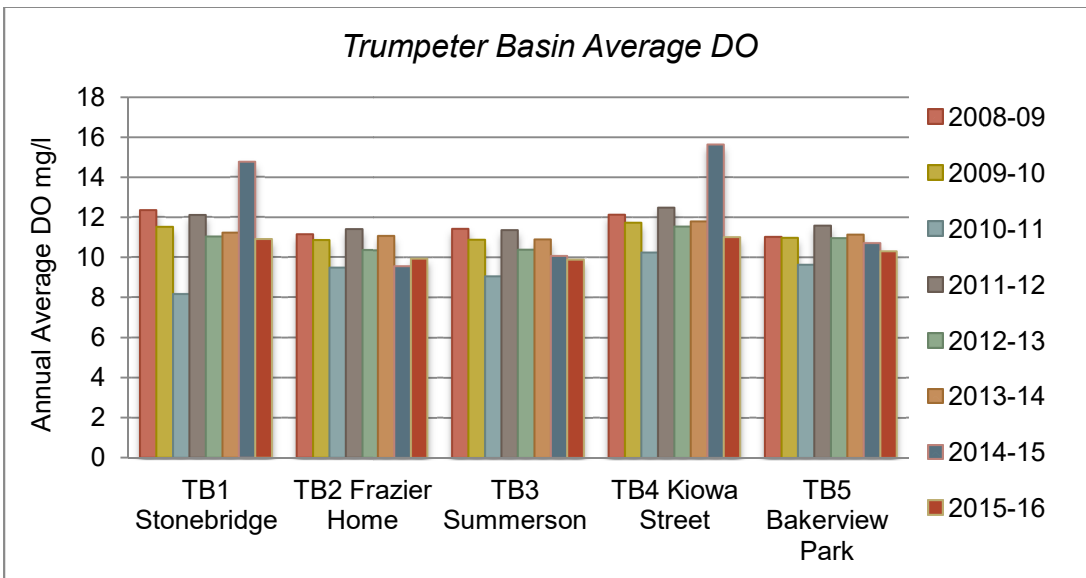


Figure 67. Trumpeter Basin DO: Eight -year comparison

Temperature at Sites 2 went above the standard of 16°C in July.

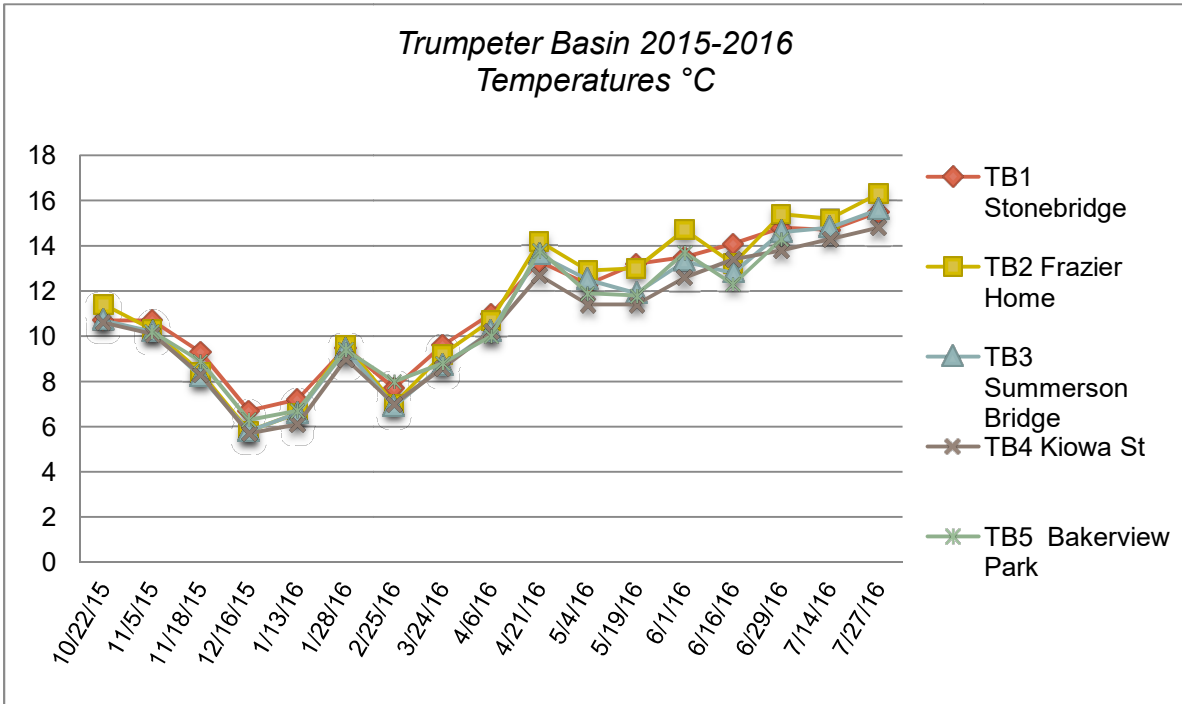


Figure 68. Trumpeter Basin Temperature: 2015-2016

Trumpeter Basin average annual temperatures (Figure 70 below) in 2015-2016 were the highest in the past eight years, with on exception in 2009-10. State standards are not based on the annual averages.

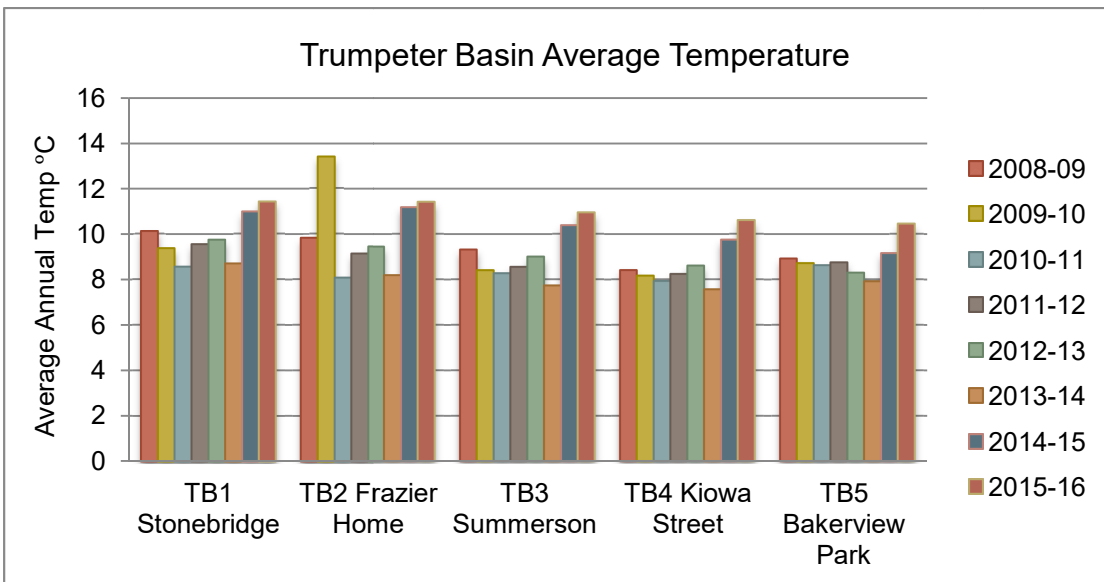


Figure 69. Trumpeter Basin Temperature: Eight -year comparison

Turbidity levels for Trumpeter Basin spiked in January at all sites. Site 2 was usually the most turbid site.

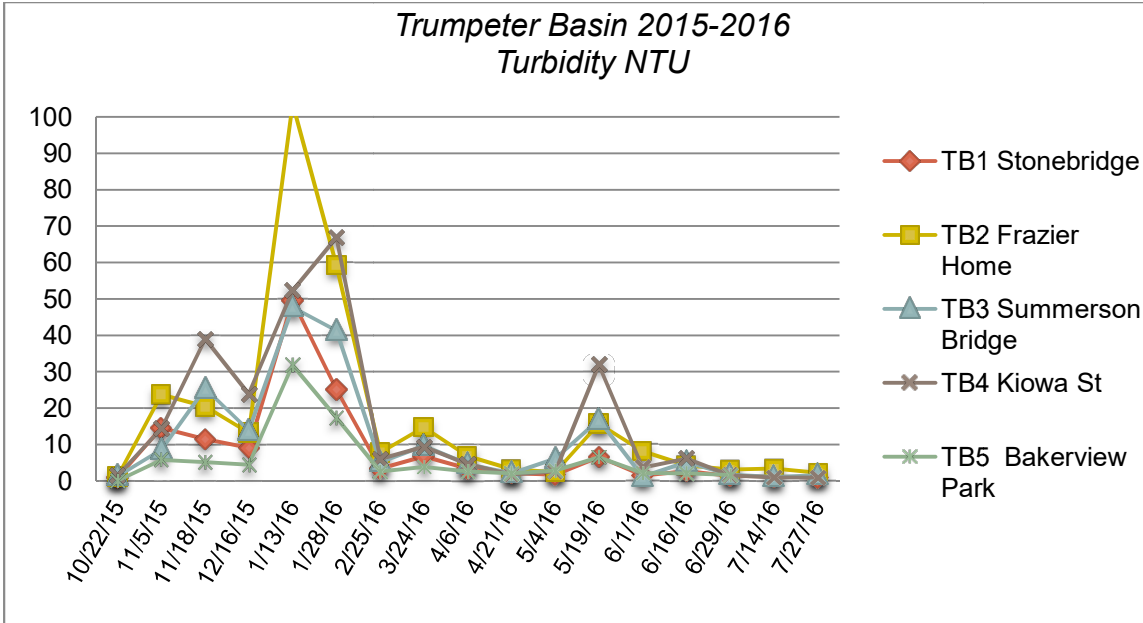


Figure 70. Trumpeter Basin Turbidity: 2015-2016

Average turbidity levels in Trumpeter Basin (Figure 72 below) were highest again at site 2, and all sites were the highest in eight years..

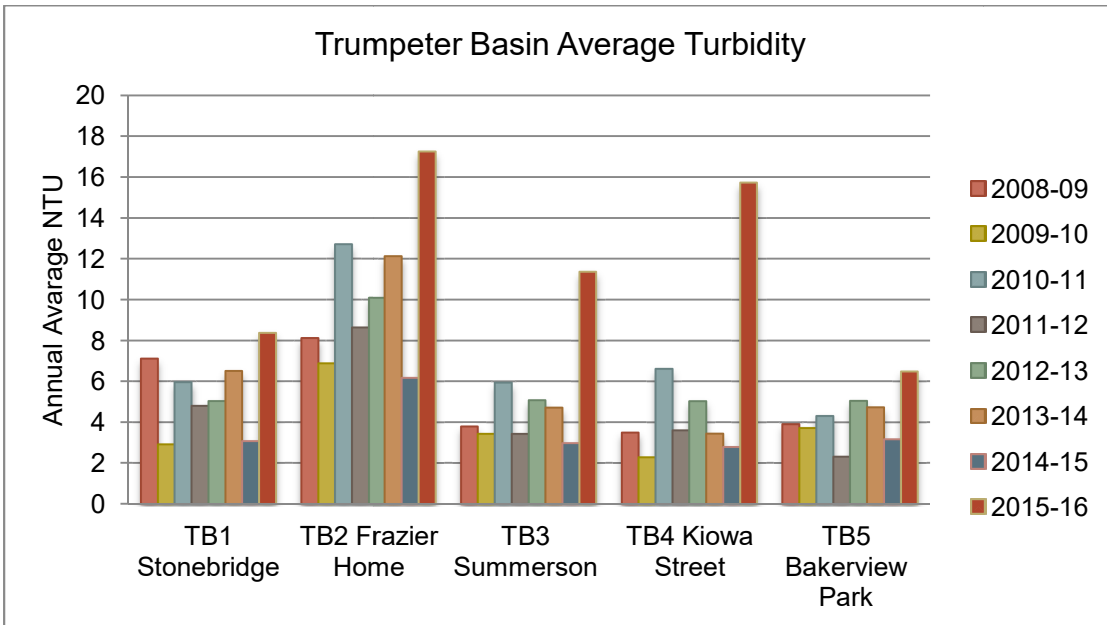


Figure 71. Trumpeter Basin Turbidity: Eight -year comparison

All sites had high spikes of fecal coliform throughout the season. None of the sites passed the standard of <10% of counts under 200 CFU/100ml.

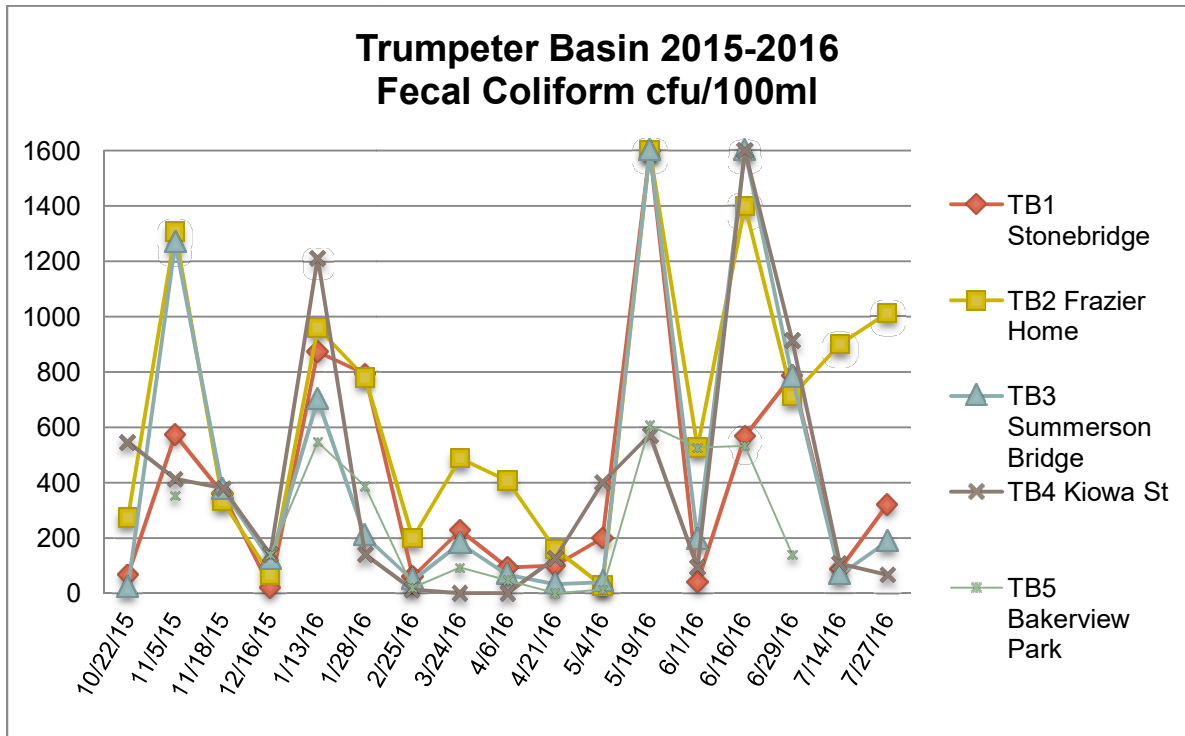


Figure 72. Trumpeter Basin Fecal Coliform: 2015-2016

Looking at the annual average, (Figure 74 below) all sites had the highest geometric mean for fecal coliform for the past eight years with the exception of Site 4 last year. Site 2 was more than double previous years. None of the sites met Part I of the state standard: geometric mean <100CFU/100ml.

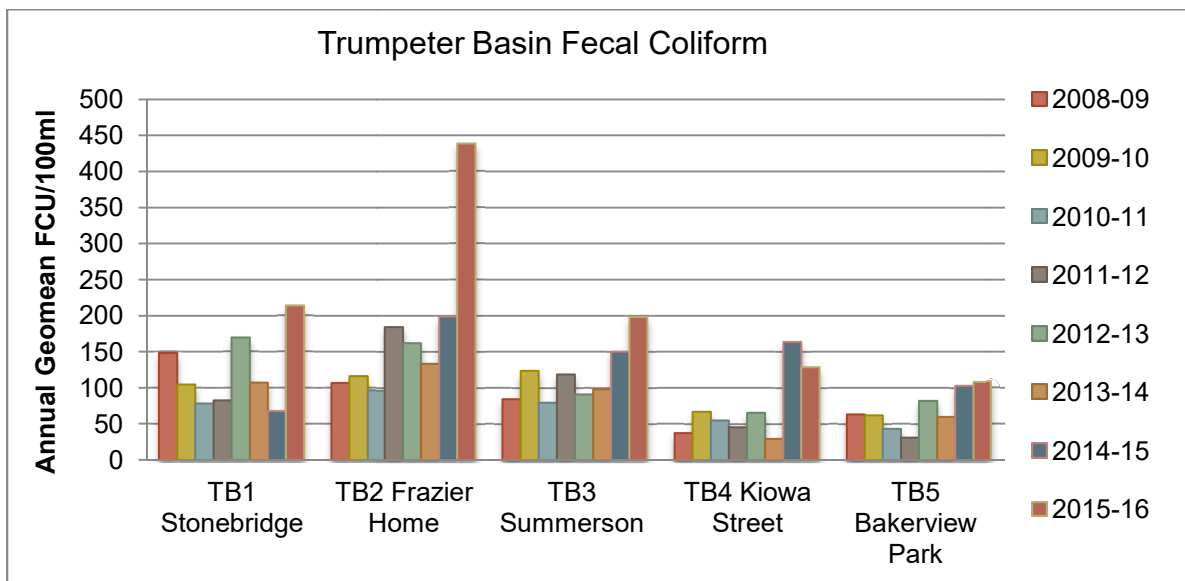


Figure 73. Trumpeter Basin Fecal Coliform: Eight -year comparison

Kulshan Creek Results

Figures 74 through 81 below present results from Kulshan Creek sampling.

Dissolved oxygen in all Kulshan Creek sites went below the state standard of 9.5mg/l during this sampling season. Site 3 was never above the standard.

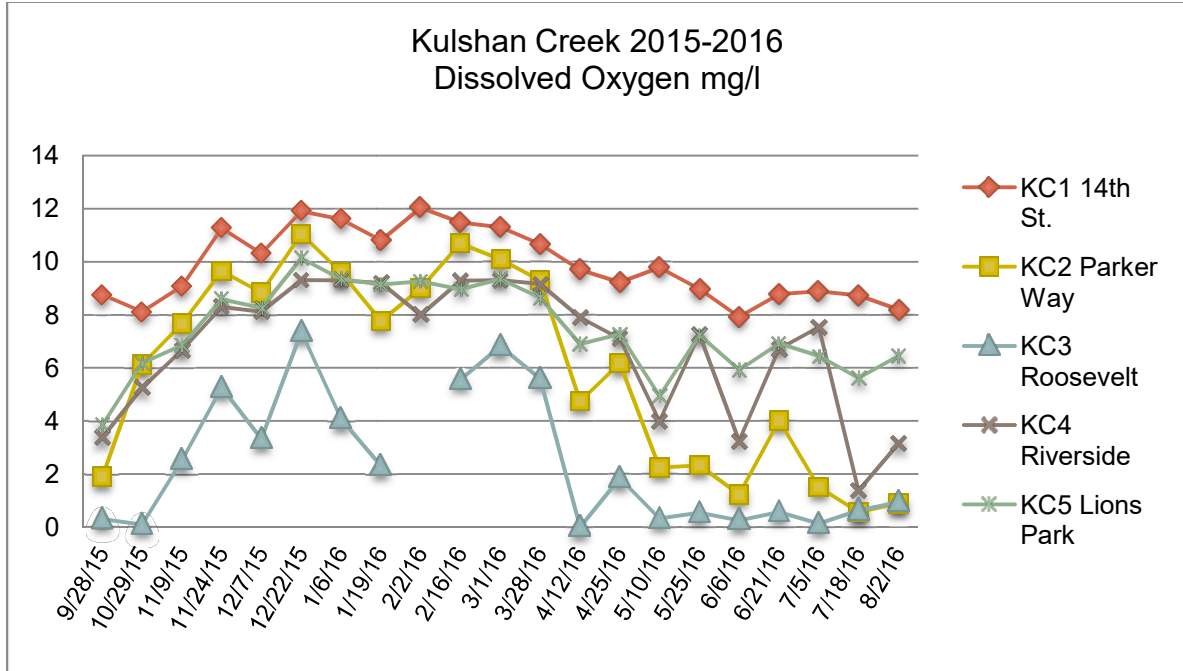


Figure 74. Kulshan Creek DO: 2015-2016

Average dissolved oxygen levels for all sites were lower than the past four years and the lowest in eight years for Sites 2-4. Standards are not based on annual average measurements.

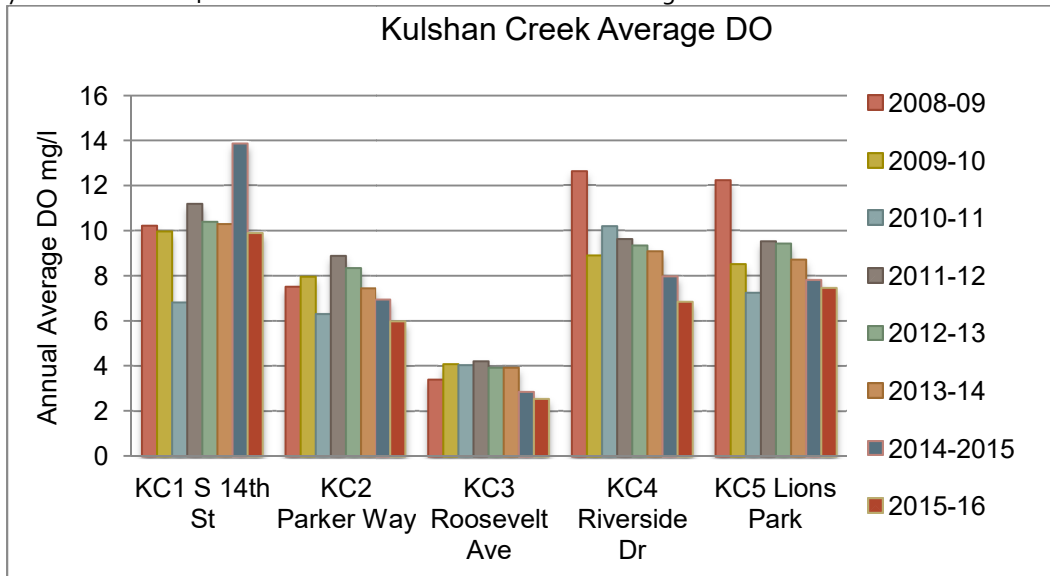


Figure 75. Kulshan Creek DO: Eight-year comparison

Sites 2-5 rose above 16°C in the summer months. Kulshan Creek was not monitored after August 2 when temperatures may have been even warmer.

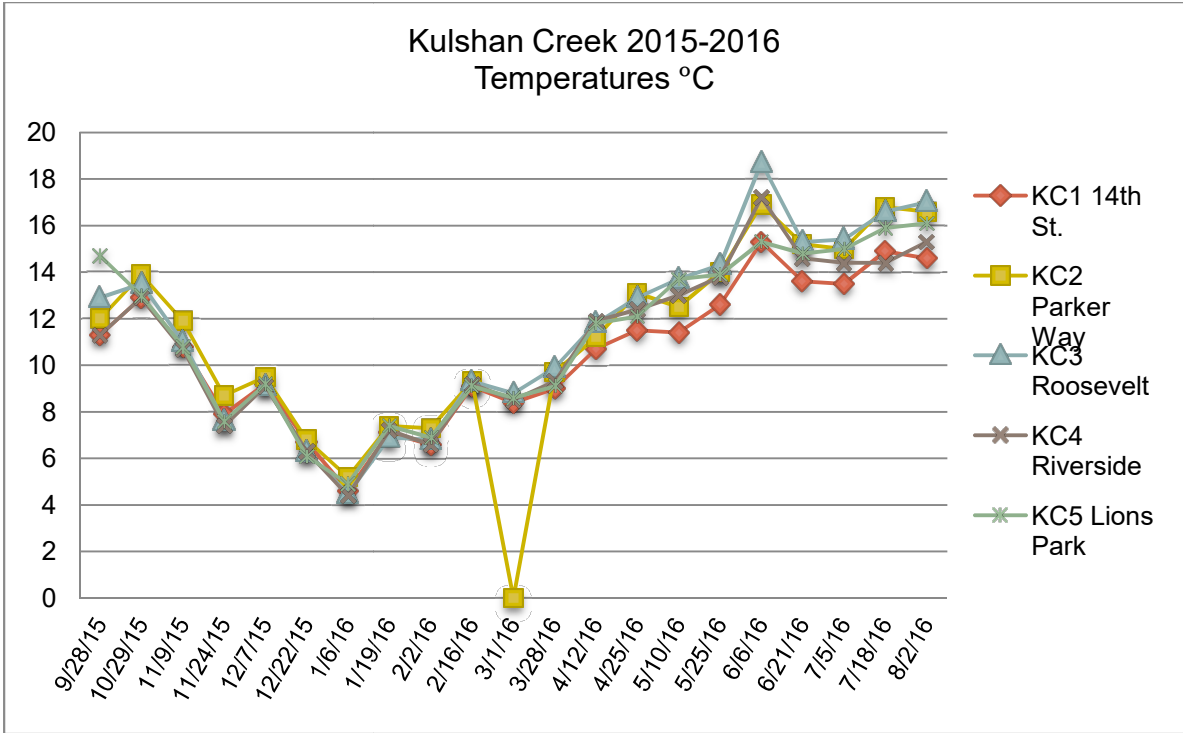


Figure 76. Kulshan Creek Temperature: 2015-2016

All Kulshan Creek sites had average temperatures lower than last year but higher than the previous six years. Standards are not based on average temperature.

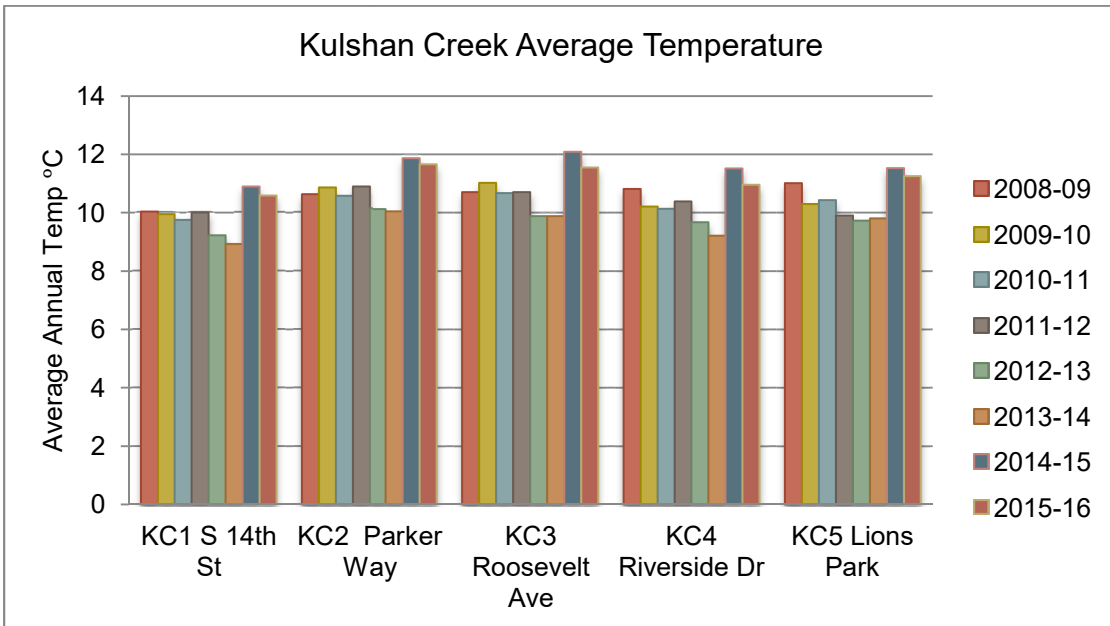


Figure 77. Kulshan Creek Temperature: Eight -year comparison

Turbidity for Kulshan Creek was generally lower than most streams, with a few spikes corresponding to rain events.

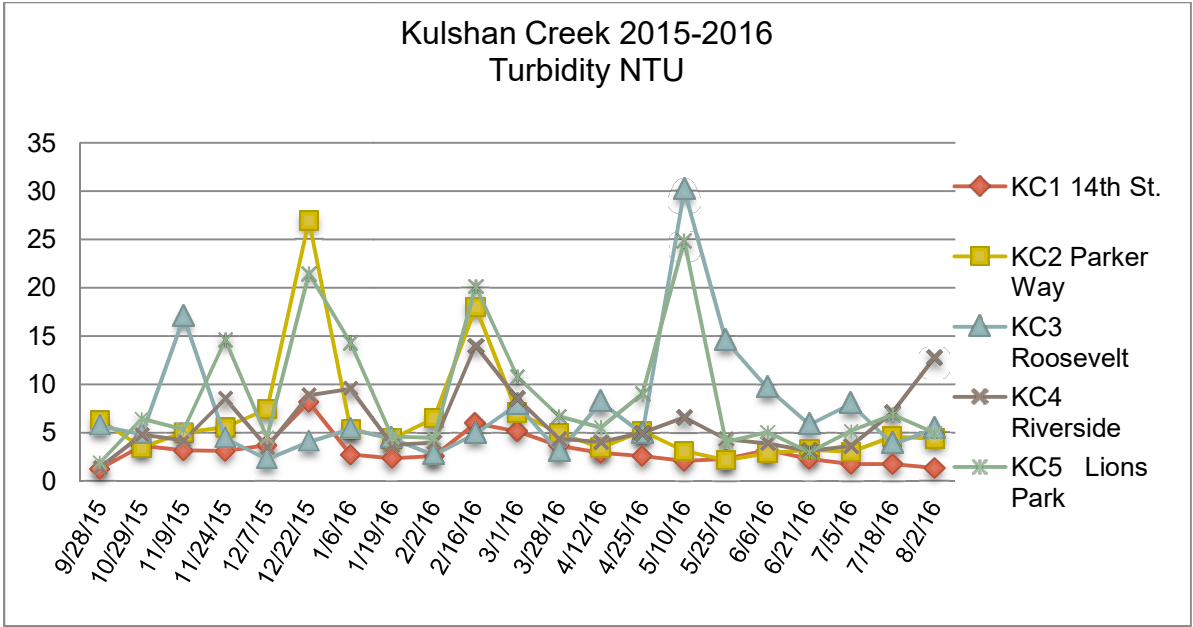


Figure 78. Kulshan Creek Turbidity: 2015-2016

Average turbidity in Kulshan Creek (Figure 80 below) for Sites 1-4 was lower than the previous five years.

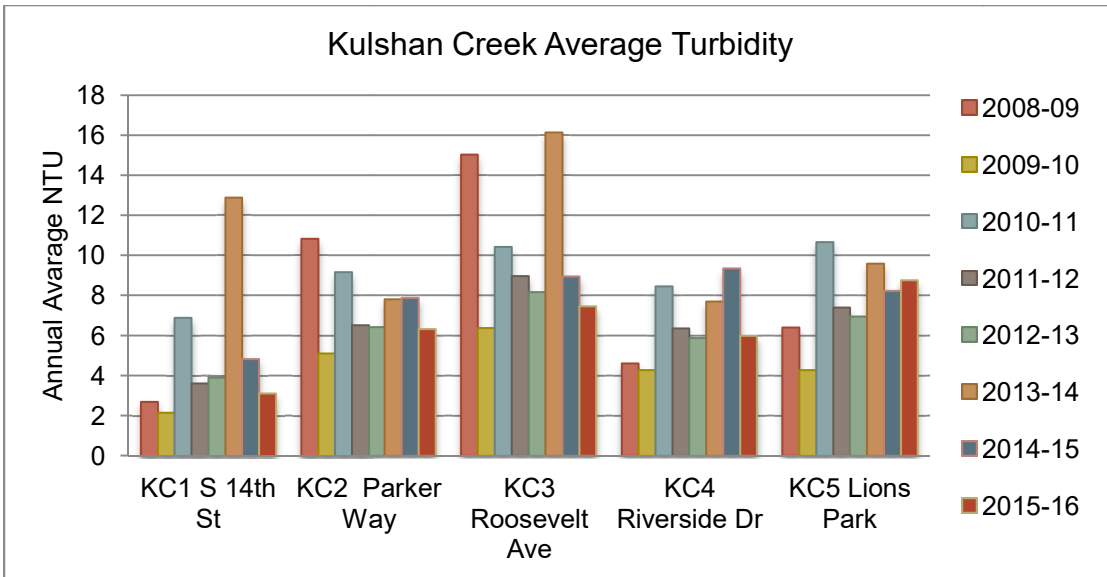


Figure 79. Kulshan Creek Turbidity: Eight -year comparison

As in previous years, fecal coliform counts in Kulshan Creek were highly variable throughout the year. None of the sites had fewer than 10% of the samples over 200 CFU/100ml.

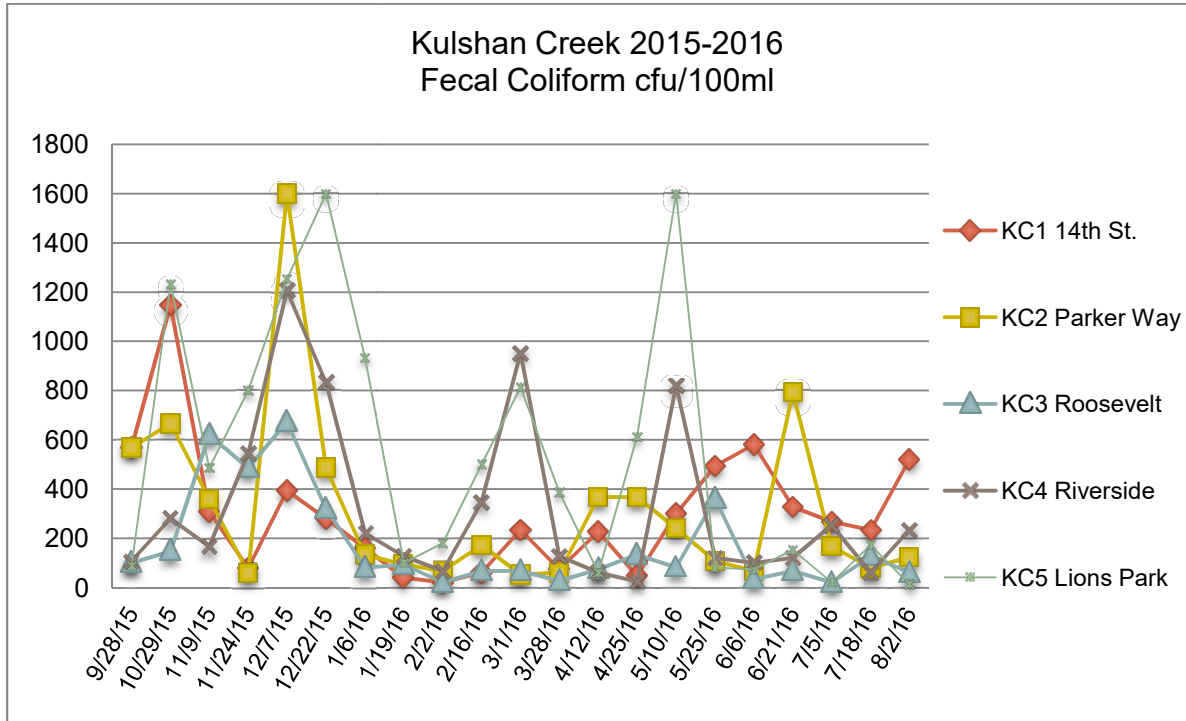


Figure 80. Kulshan Creek Fecal Coliform: 2015-2016

All Kulshan Creek sites had annual geometric means over the standard of 100 CFU/100ml. Geomeans at Sites 3-5 were higher than any of the previous seven years, with Site 5 more than double last year.

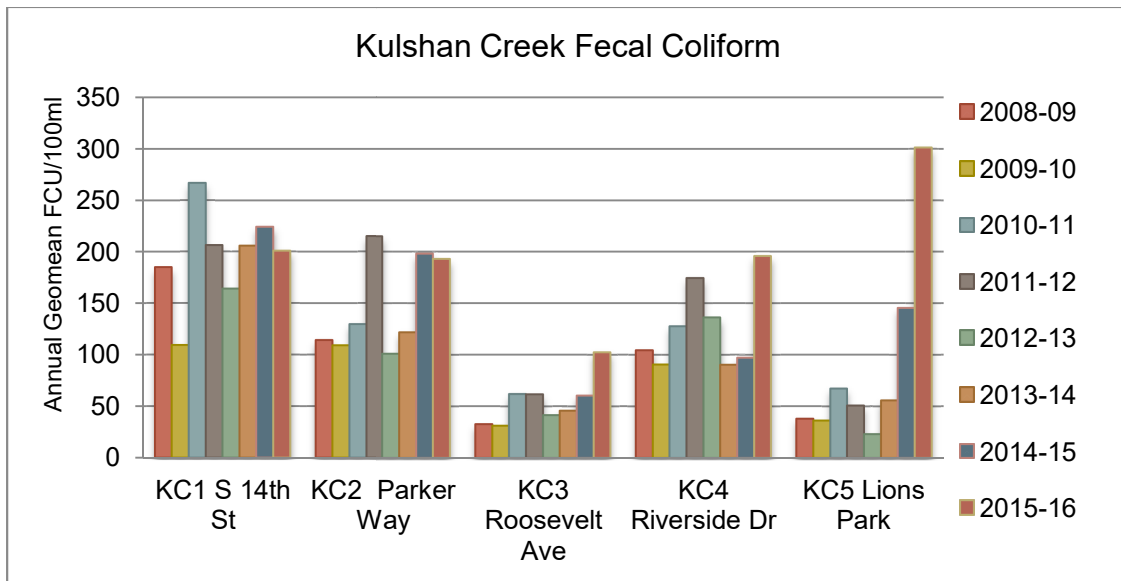


Figure 81. Kulshan Creek Fecal Coliform: Eight -year comparison

Clyde Creek Results

Figures 82 through 91 below present results from Clyde Creek sampling. This was the fifth and last year of sampling these sites.

Dissolved oxygen for Sites 1, 2 and 3 dropped below 9.5mg/l at some point during the year. Site 4 was above the standard throughout the sampling season, but was not monitored during the warmest months.

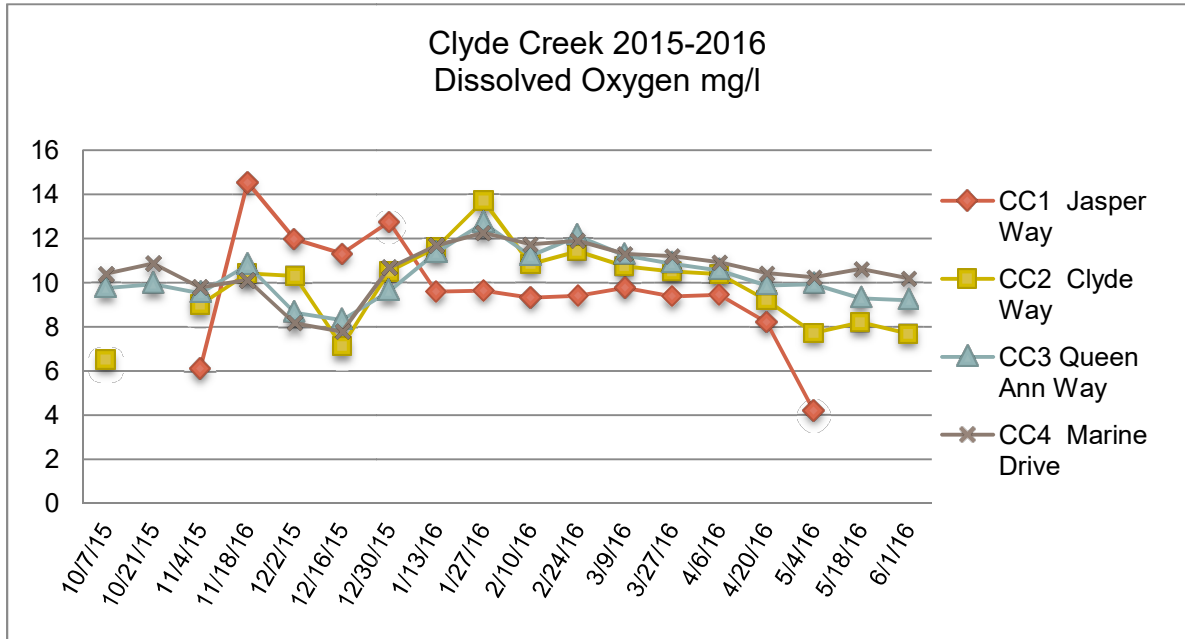


Figure 82. Clyde Creek DO: 2015-2016

Average dissolved oxygen levels were lower than past years. State standards for DO are not based on the annual average.

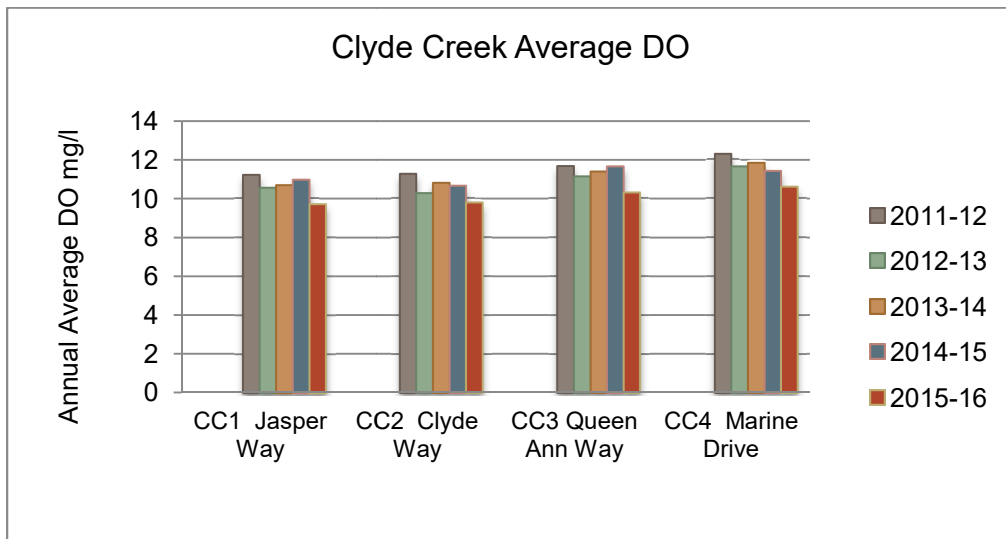


Figure 83. Clyde Creek DO: five-year comparison

Temperatures for all Clyde Creek samples were below the maximum level of 16°C. Clyde Creek was not sampled in summer months because water dries up completely.

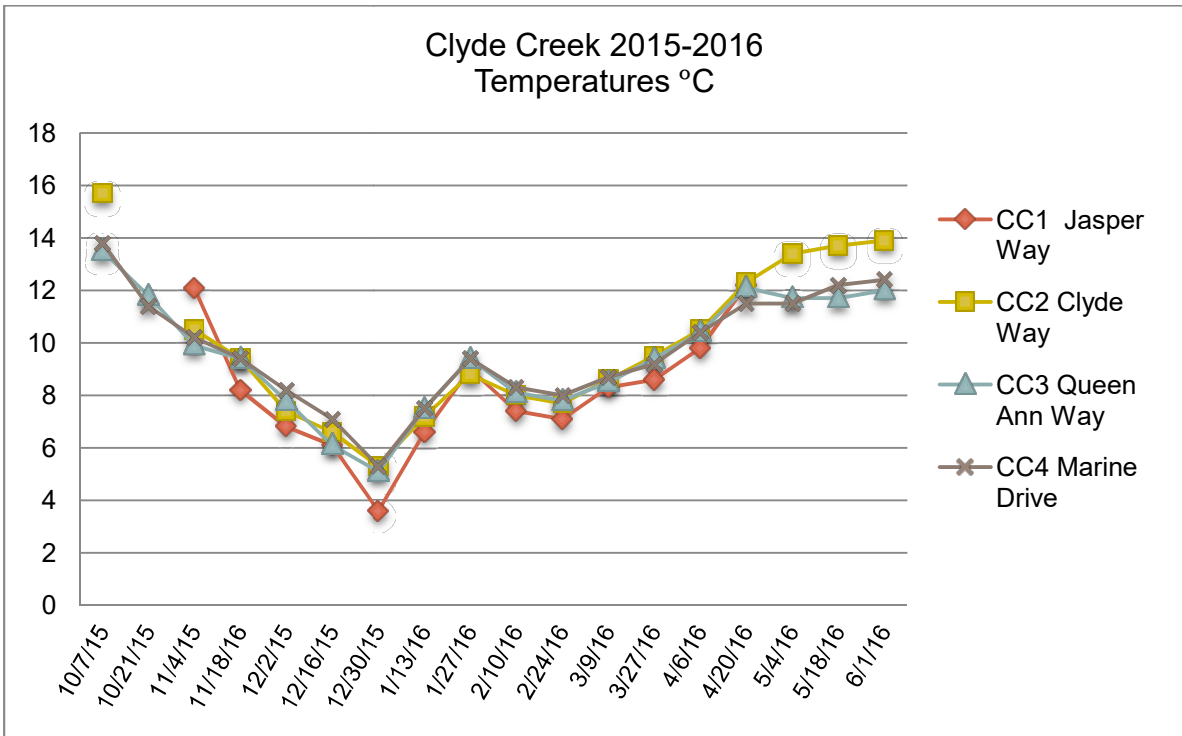


Figure 84. Clyde Creek Temperature: 2015-2016

Average annual temperatures (Figure 94 below) were higher for Sites 2 and 3 this year. State standards are not based on the annual averages.

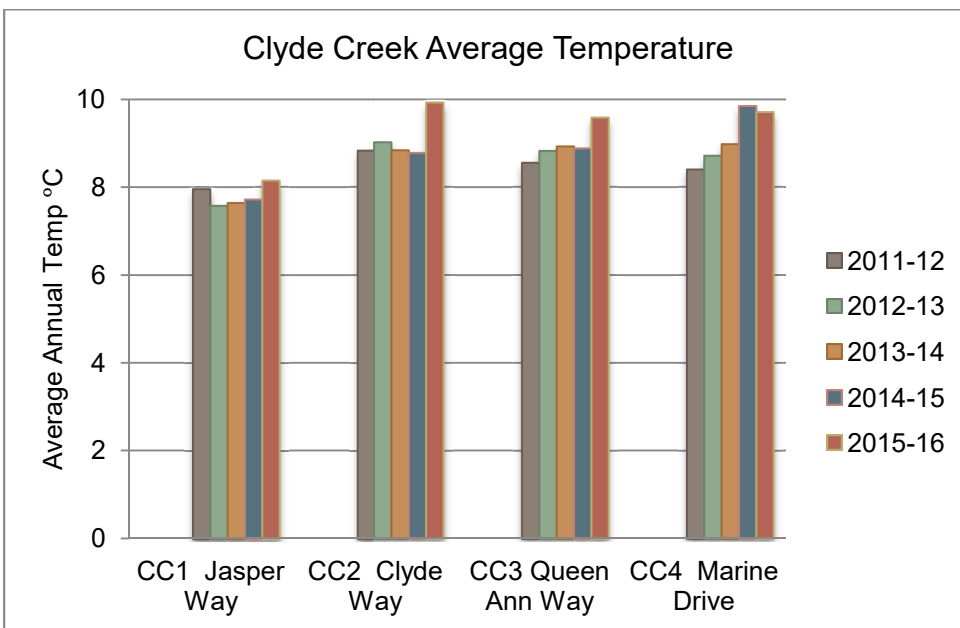


Figure 85. Clyde Creek Temperature: Five-year comparison

Turbidity levels for Clyde Creek were relatively low. The hand held turbidimeter malfunctioned and finally failed, so data is incomplete.

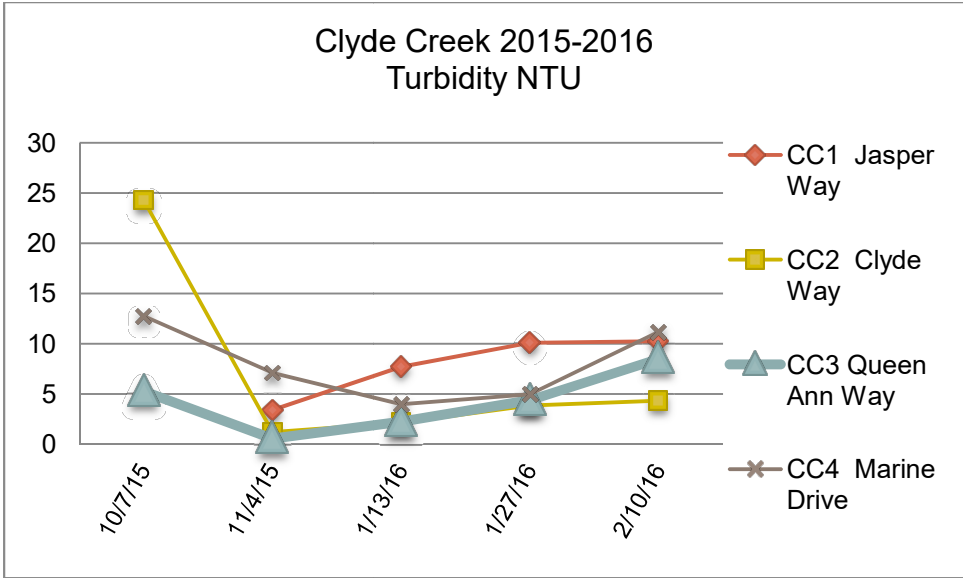


Figure 86. Clyde Creek Turbidity: 2015-2016

Clyde Creek Sites 2 and 3 (Figure 96 below) showed variable trends, though there were only half the usual number of samples taken.

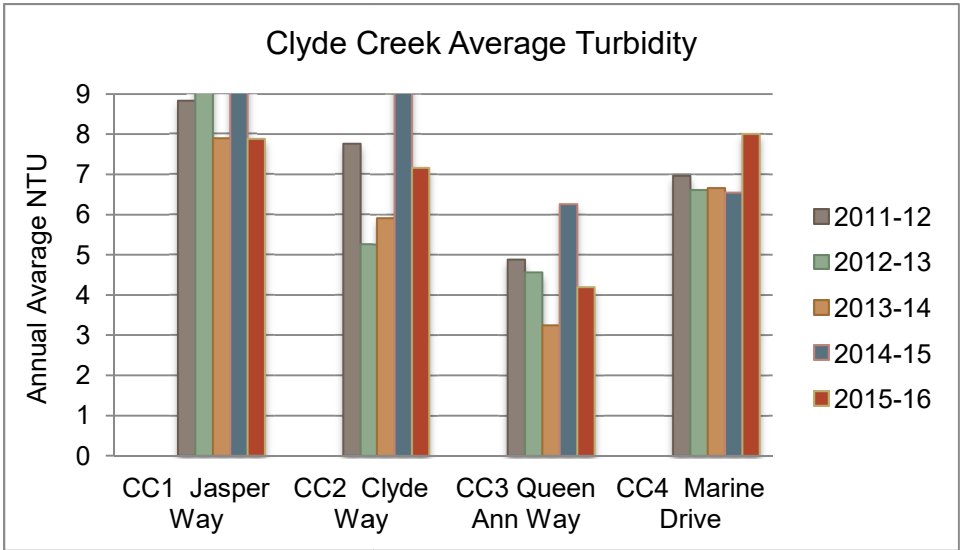


Figure 87. Clyde Creek Turbidity: Five -year comparison

Though fecal coliform counts in Clyde Creek have generally been low compared to other streams, this year had a few instances of very high counts. Sites 1 and 3 met Part II of the standard, with fewer than 10% of the counts higher than 200CFU/100ml.

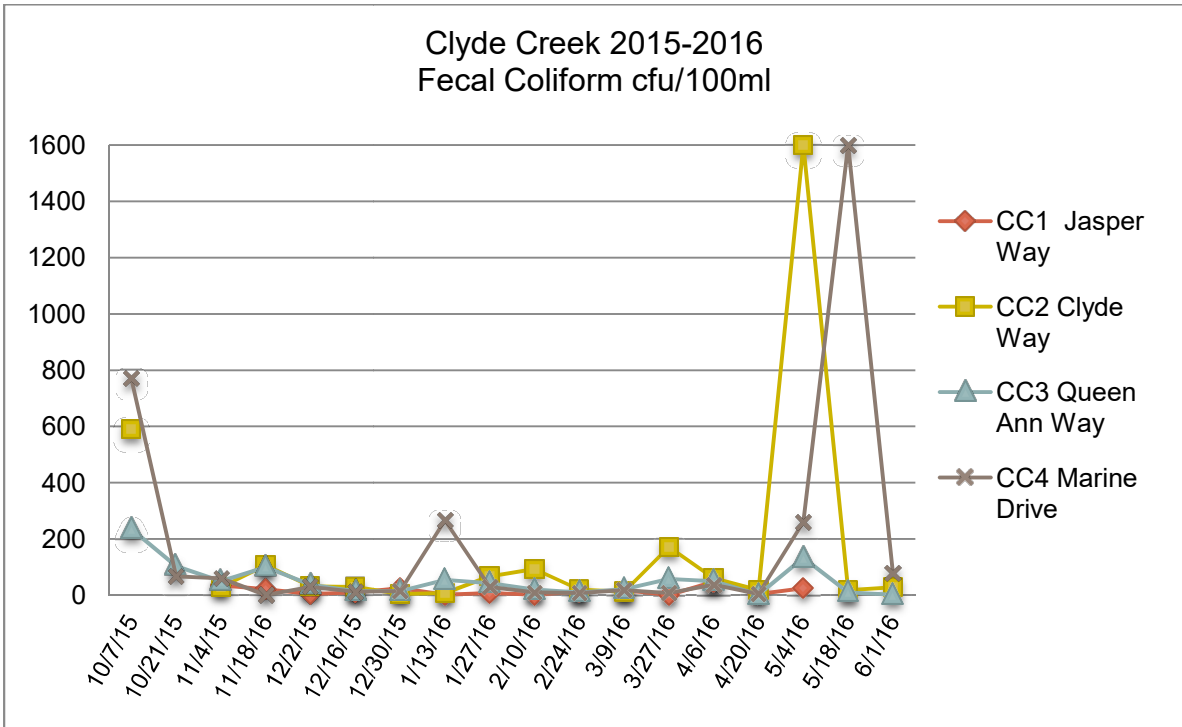


Figure 88. Clyde Creek Fecal Coliform: 2015-2016

Geometric means (Figure 98 below) for all Clyde Creek sites were lower than the 100 CFU/100ml standard, but Site 2 was much higher than four previous years.

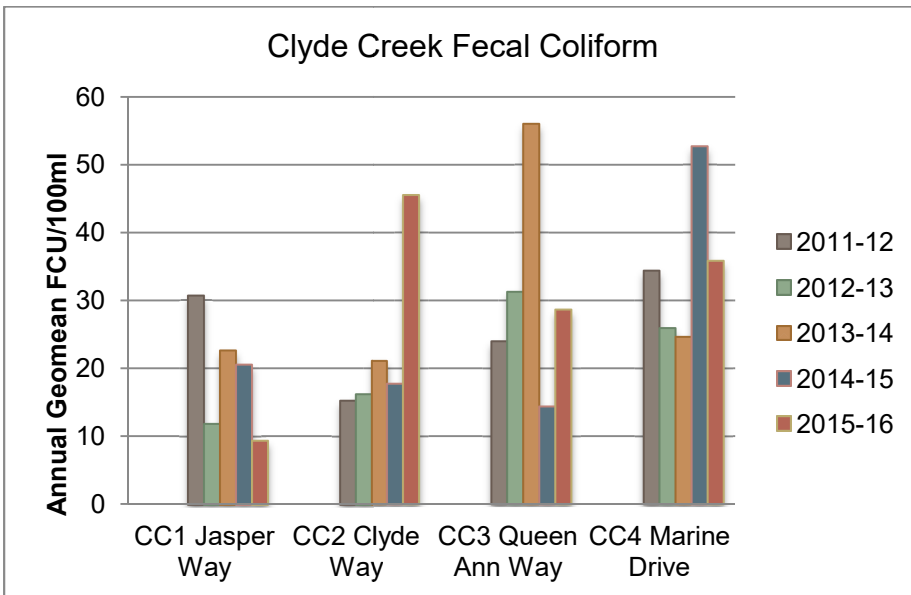


Figure 89. Clyde Creek Fecal Coliform: Five-year comparison

Gages Slough Results

Figures 90 through 104 below present results from Gages Slough sampling. Site GS4 was moved in 2013-14 because of changes to public access, and was renamed GS4A. This stream is monitored every four weeks.

Dissolved oxygen at all Gages Slough sites was below the standard throughout the year, including December and January when cold water temperatures usually increase DO.

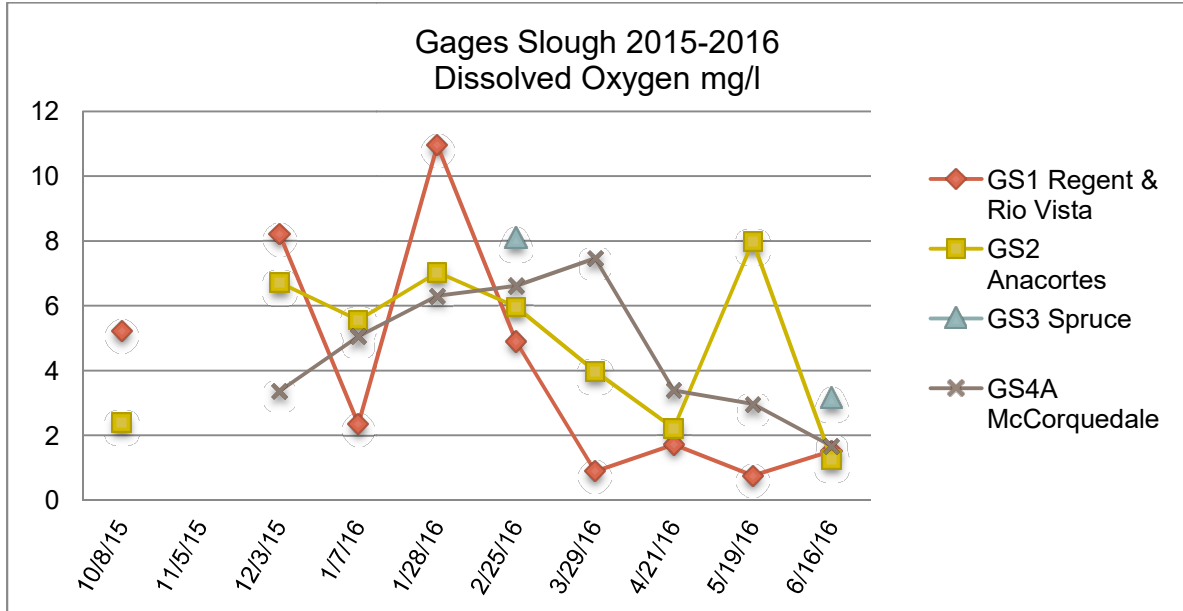


Figure 90. Gages Slough DO: 2015-2016

Dissolved oxygen levels have been decreasing steadily in the eight years of monitoring, and are well below the standard. This is a slow moving stream that dries up completely in summer.

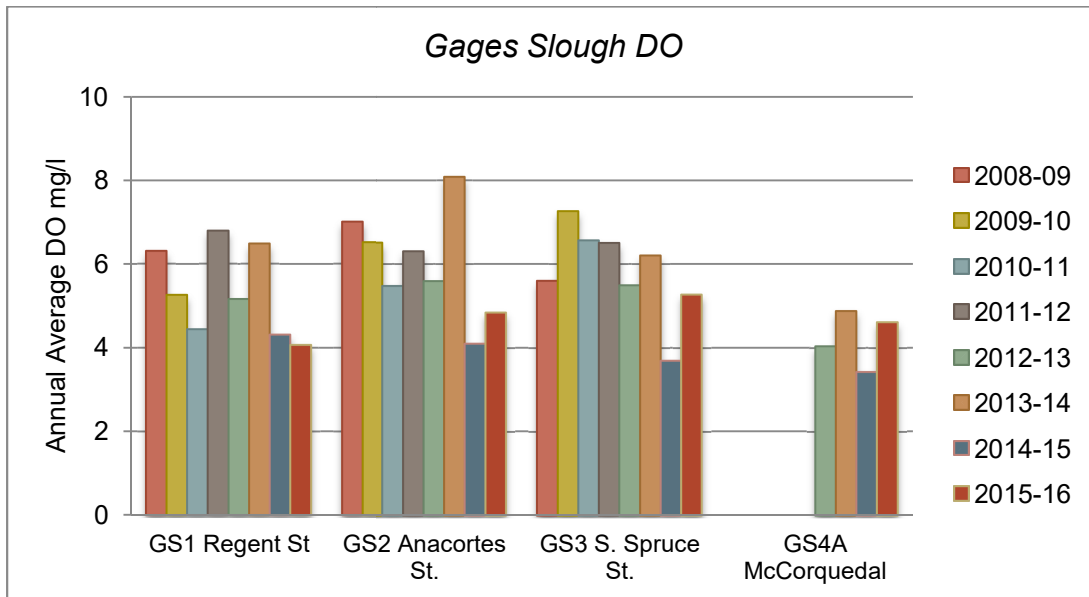


Figure 91. Gages Slough DO: Eight-year comparison

Gages Slough Site 4 was warmer than 17.5°C in April. Sites were not sampled in the warmest months.

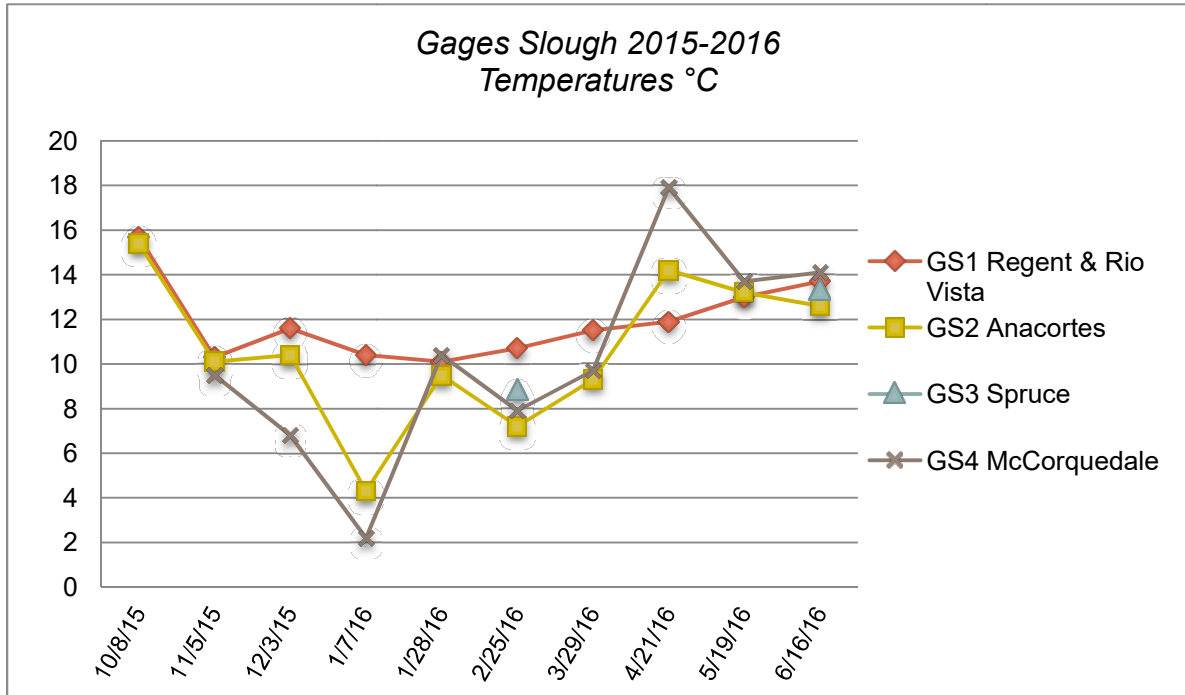


Figure 92. Gages Slough Temperature: 2015-2016

Average temperatures in Gages Slough were similar to past years. The state standard is not based on average temperature.

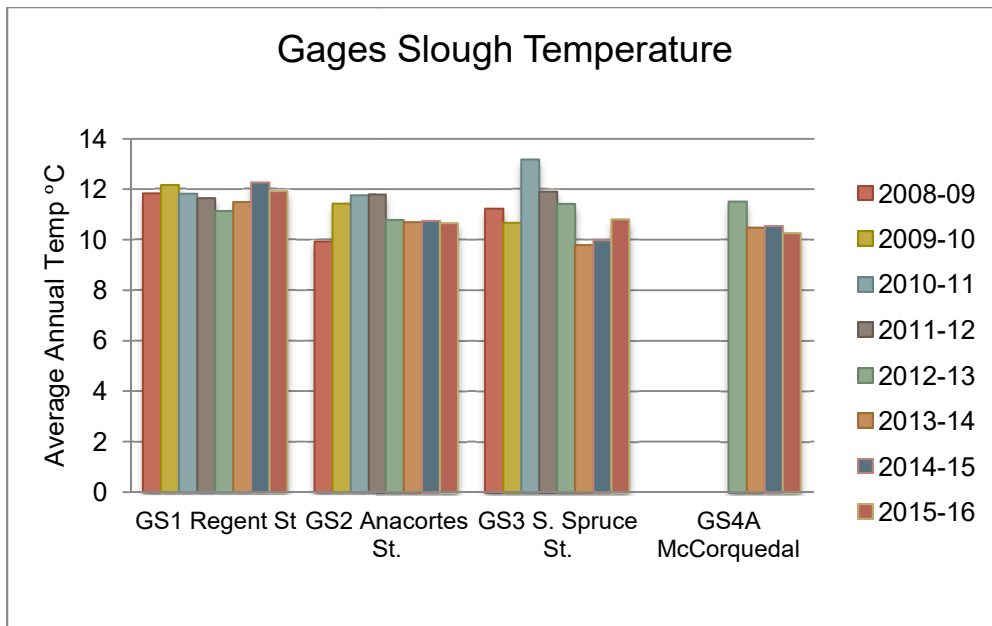


Figure 93. Gages Slough Temperature: Eight-year comparison

Sits 1 and 2 had extremely high turbidity levels this year.

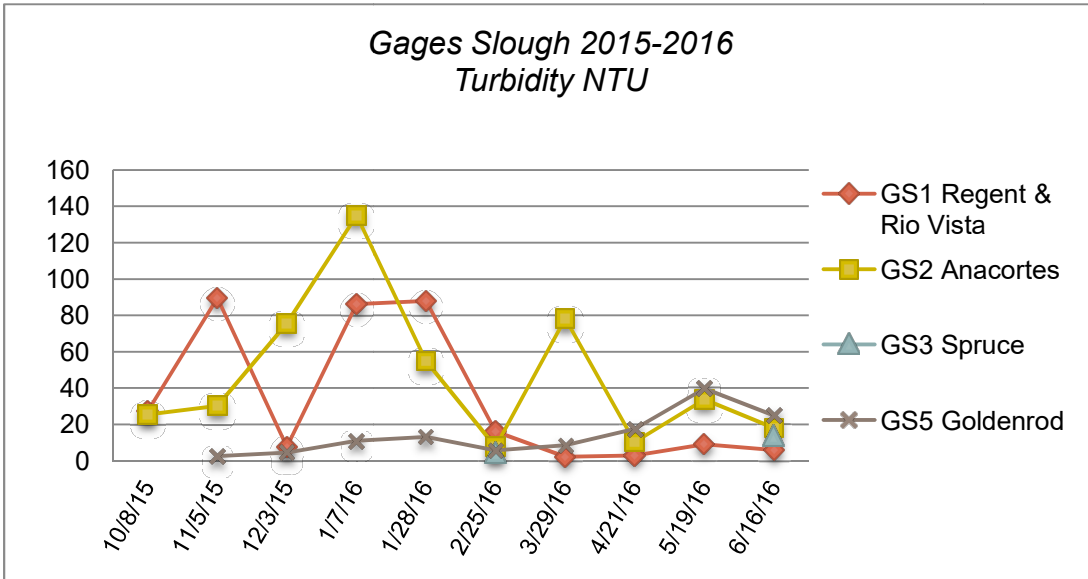


Figure 94. Gages Slough Turbidity: 2015-2016

2015-2016 showed unusually high turbidity at Sites 1 and 2.

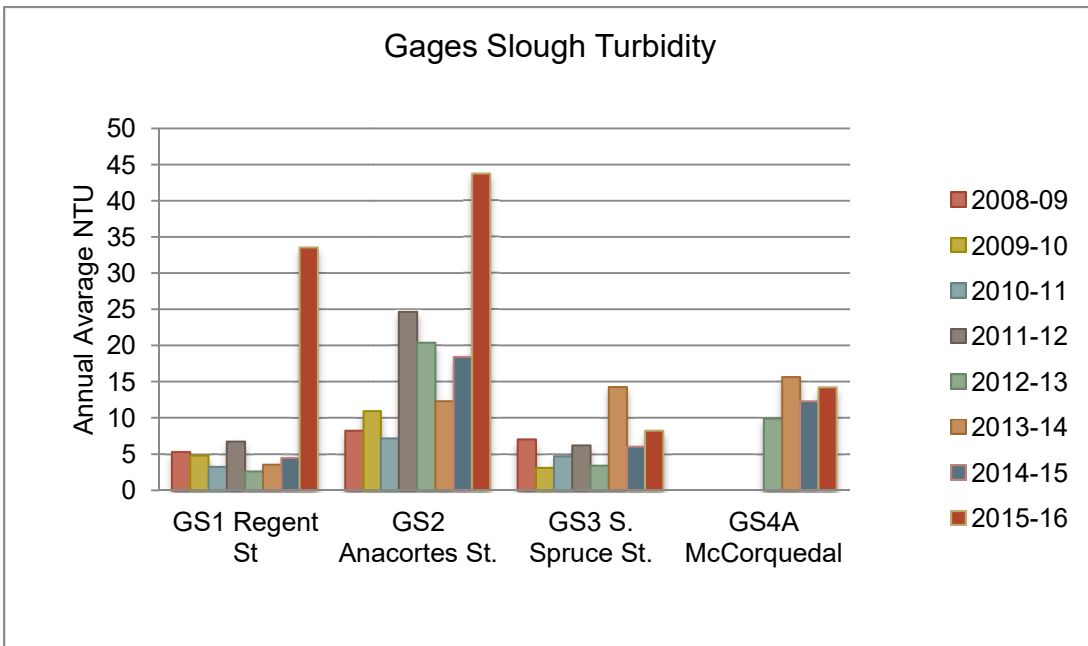


Figure 95. Gages Slough Turbidity: Eight -year comparison

Fecal coliform numbers were often too numerous to count for Site 1. The City of Burlington Sewage Treatment Plant performed the FC tests, and used >200. To maintain consistency, data included in this section considers too numerous to count as >1600. Sites 2-4 met Part II of the state standard with fewer than 10% of the samples >200CFU.100 ml.

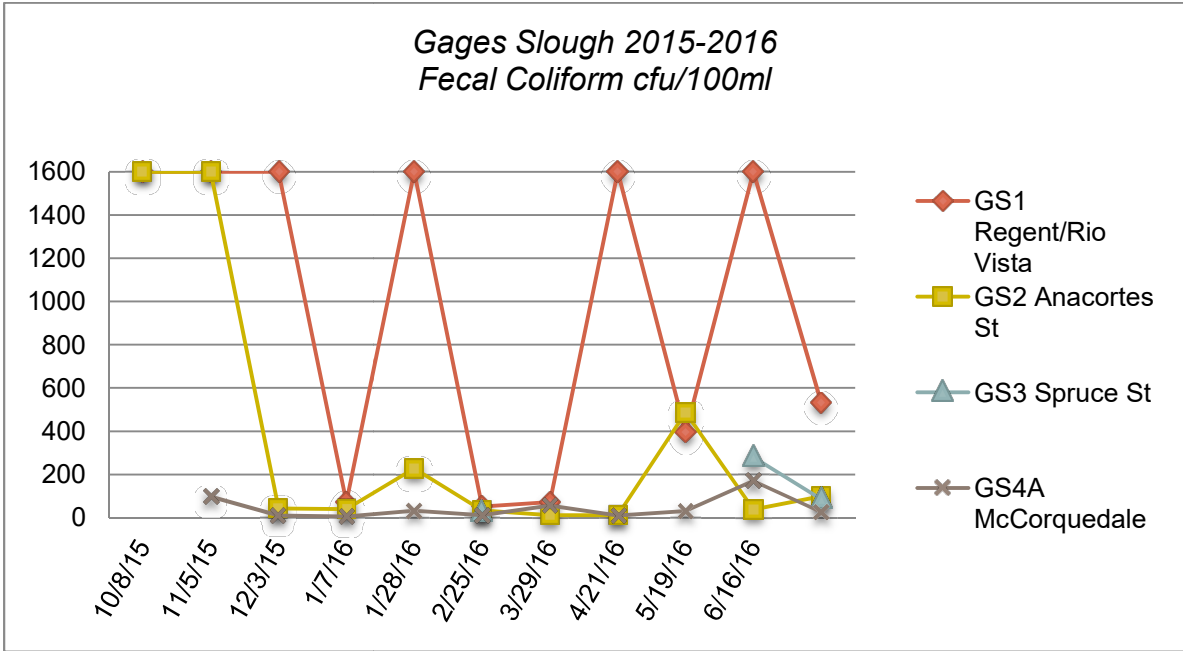


Figure 96. Gages Slough Fecal Coliform: 2015-2016

Site 1 did not meet Part I of the standard with annual geometric mean less than 100CFU. 100ml. Sites 2-4 met both parts of the standard.

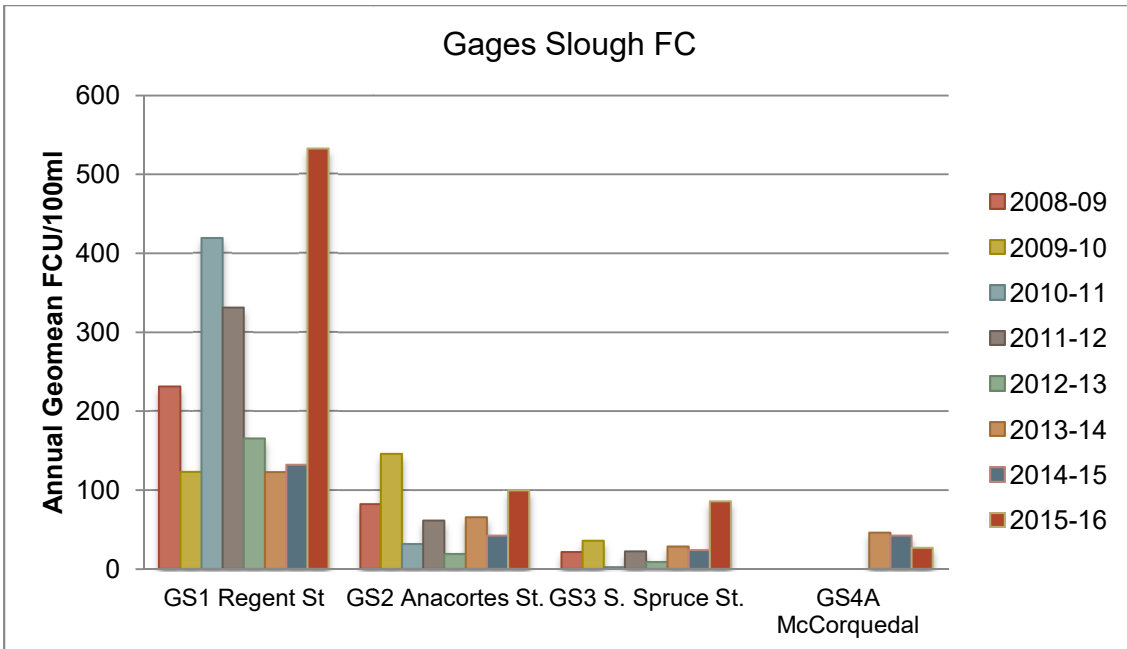


Figure 97. Gages Slough Fecal Coliform: Eight -year comparison

Stream Team 2015-2016 Summary

Figures 98-101 below show annual averages for each parameter at all sites. While it is interesting to compare watersheds, it is important to note that each water body has unique characteristics that naturally influence water quality. Variation is normal, and what might be considered "healthy" for water backed up behind a tide gate might not be healthy for a small wooded stream in the Upper Nookachamps.

For dissolved oxygen, (Figure 99) a number of sites have annual averages below 8mg/l. Considering regulations do not allow even one occurrence of levels below the standard, it is clear that these sites are in need of attention. Upper Samish 4, Upper Nookachamps 1, No Name 4, all Joe Leary sites, Kulshan Creek 2-5 and all Gages Slough sites have low DO levels.

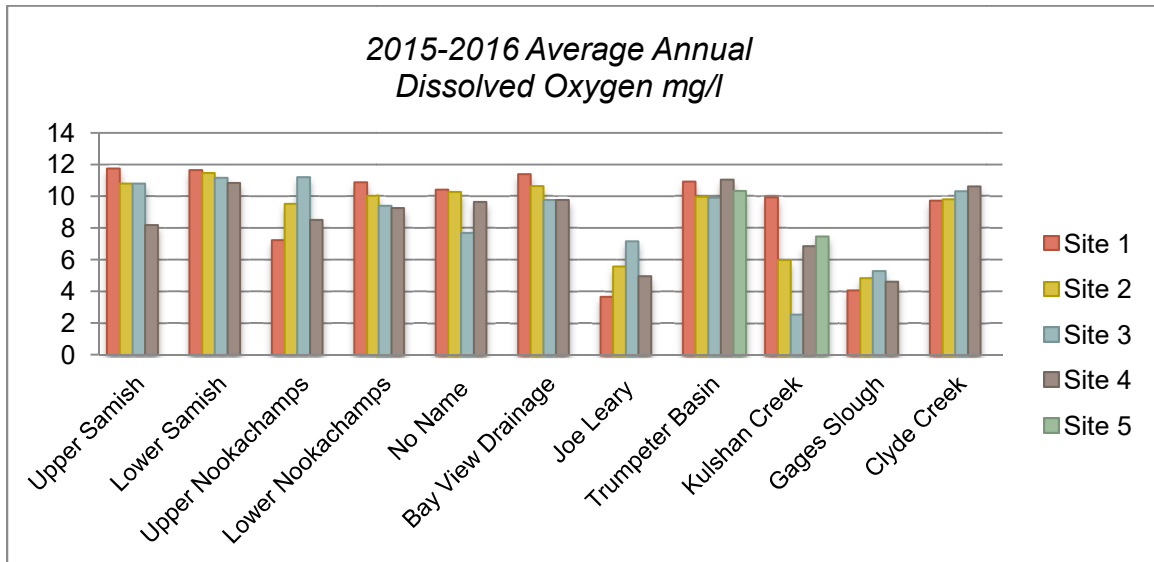


Figure 98. Annual Average Dissolved Oxygen: All sites

Figure 99 (next page) shows average temperature. State standards are not based on annual average temperatures, but on the average 7-day maximum. Most sites were not sampled during the warm summer season.

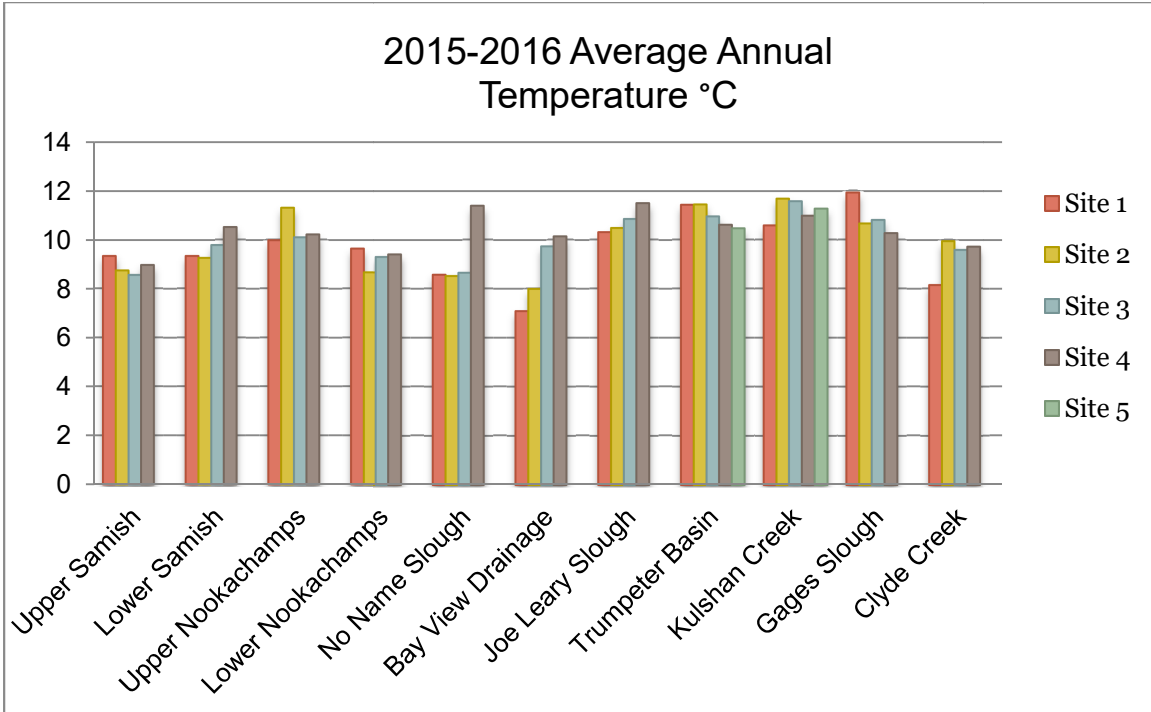


Figure 99. Annual Average Temperature: All sites

Turbidity is the parameter with the greatest naturally occurring variability. Comparing all streams, Gages Slough Sites 1 and 2, and Joe Leary Slough stand out. All Joe Leary sites are 2-3 times higher than most other sites. Along much of Joe Leary's course, it drains cultivated cropland and is periodically dredged to improve drainage.

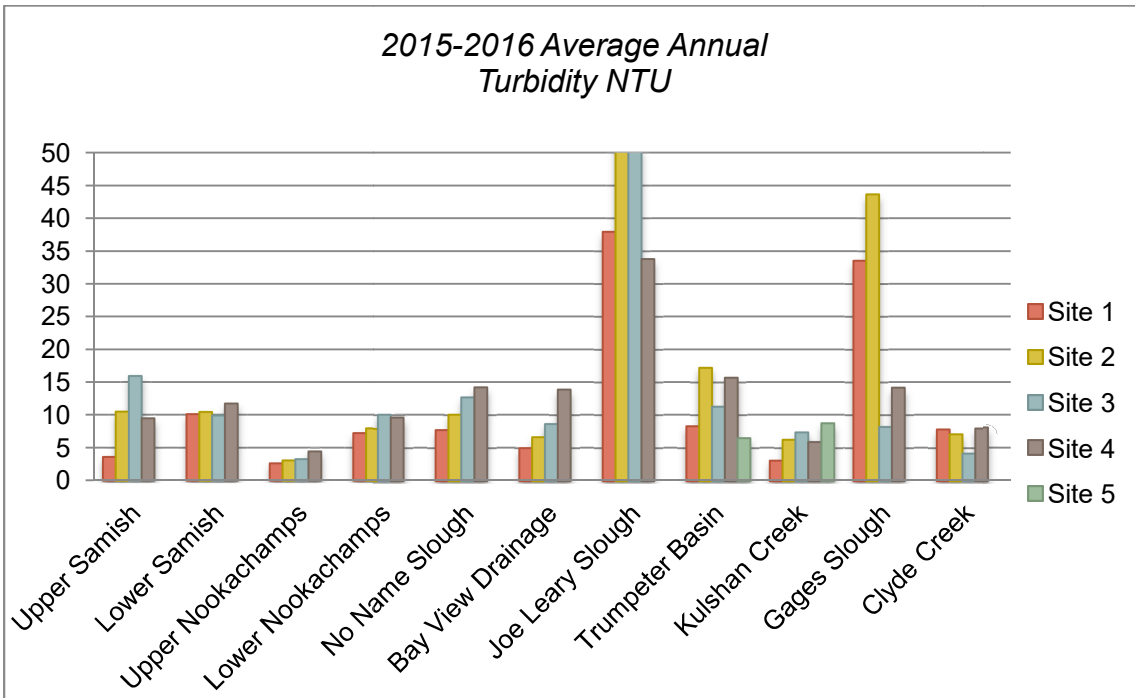


Figure 100. Annual Average Turbidity: All sites

Fecal coliform shown in Figure 101 is the parameter of greatest interest to regulators, health officials, and shellfish growers and harvesters. In 2012-2014, 14 out of 50 sites did not meet the first part of the state standard. Last year, 11 out of 50 sites did not meet Part I of the standard. In 2015-2016, 18 out of 46 sites averaged above 100CFU/100ml. No Name Slough continues to have the worst fecal coliform issues, joined by Kulshan Creek Site 1, Trumpeter Basin, and Clyde Creek Site 4.

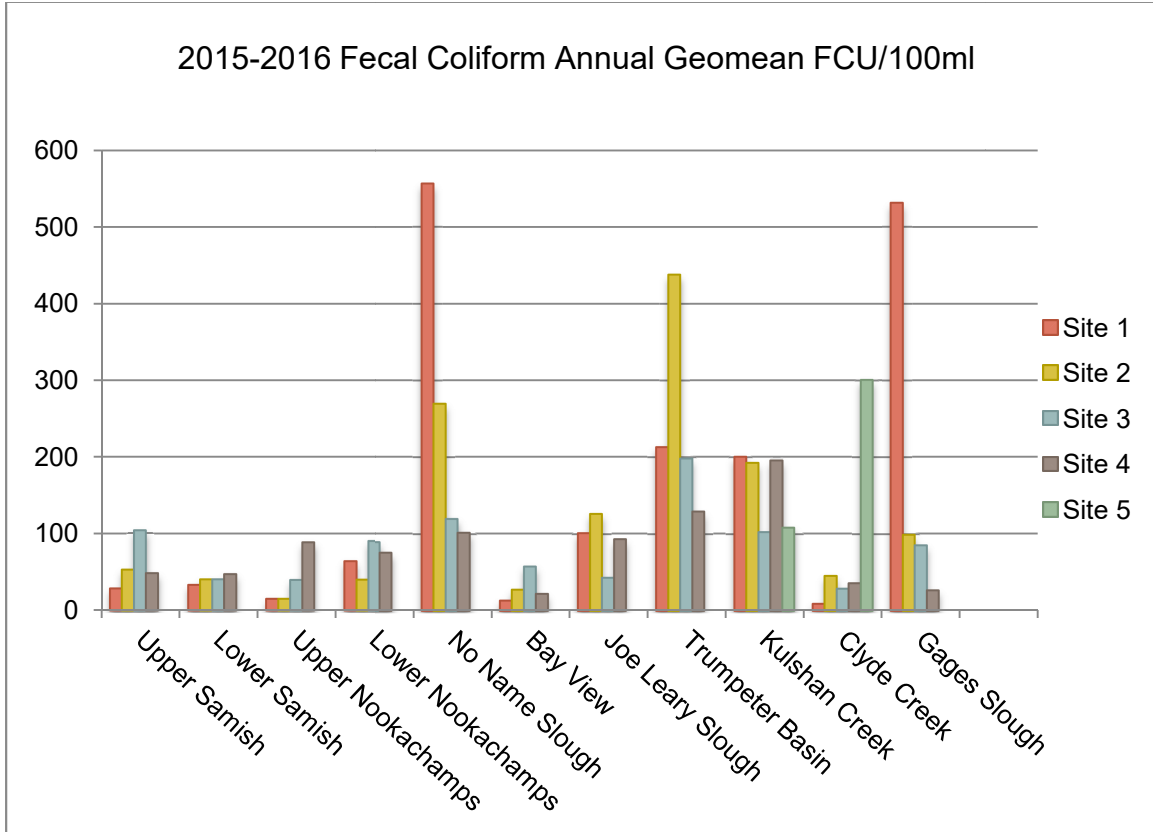


Figure 101. Fecal Coliform Annual Geomean: All sites

Table 11 below shows each site and whether it met Part 1 (geomean <100CFU/100ml) and Part 2 (<10% of samples under 200CFU/100ml) of the state standard for fecal coliform. Bold text denotes sites that met both parts of the standard. Last year, 2014-2015, fifteen sites met both standards. In 2015-2016, thirteen out of 46 sites met both standards.

Table 11. Fecal Coliform Results Compared to State Standards

	Site 1		Site 2		Site 3		Site 4		Site 5	
	Part 1	Part 2	Part 1	Part 2	Part 1	Part 2	Part 1	Part 2	Part 1	Part 2
Upper Samish	yes	yes	yes	yes	no	no	yes	yes		
Lower Samish	yes	no	yes	yes	yes	no	yes	yes		
Upper Nookachamps	yes	yes	yes	yes	yes	yes	yes	no		
Lower Nookachamps	yes	no	yes	no	yes	no	yes	no		
No Name Slough	no	no	no	no	no	no	no	no		
Bay View	yes	yes	yes	yes	yes	no	yes	no		
Joe Leary Slough	no	no	no	no	yes	no	yes	no		
Trumpeter Basin	no	no	no	no	no	no	no	no	no	no
Kulshan Creek	no	no	no	no	no	no	no	no	no	no
Clyde Creek	yes	yes	yes	no	yes	yes	yes	no		
Gages Slough	no	no	yes	no	yes	no	yes	yes		

Storm Team Results

2015-2016, was the second year of Storm Team sampling in the Friday Creek watershed. This tributary of the Samish River provides about half of the volume of the river at its confluence. Volunteers sampled 14 sites during 18 rain events. Storm team data should be viewed differently from the rest of the stream team data. It does not represent typical conditions. Even a healthy stream that meets state water quality standards can have occasional high fecal coliform levels during rain events. Standards are based on an average of multiple samples taken over time and in a variety of conditions. These results should not be used to determine whether the streams meet state standards.

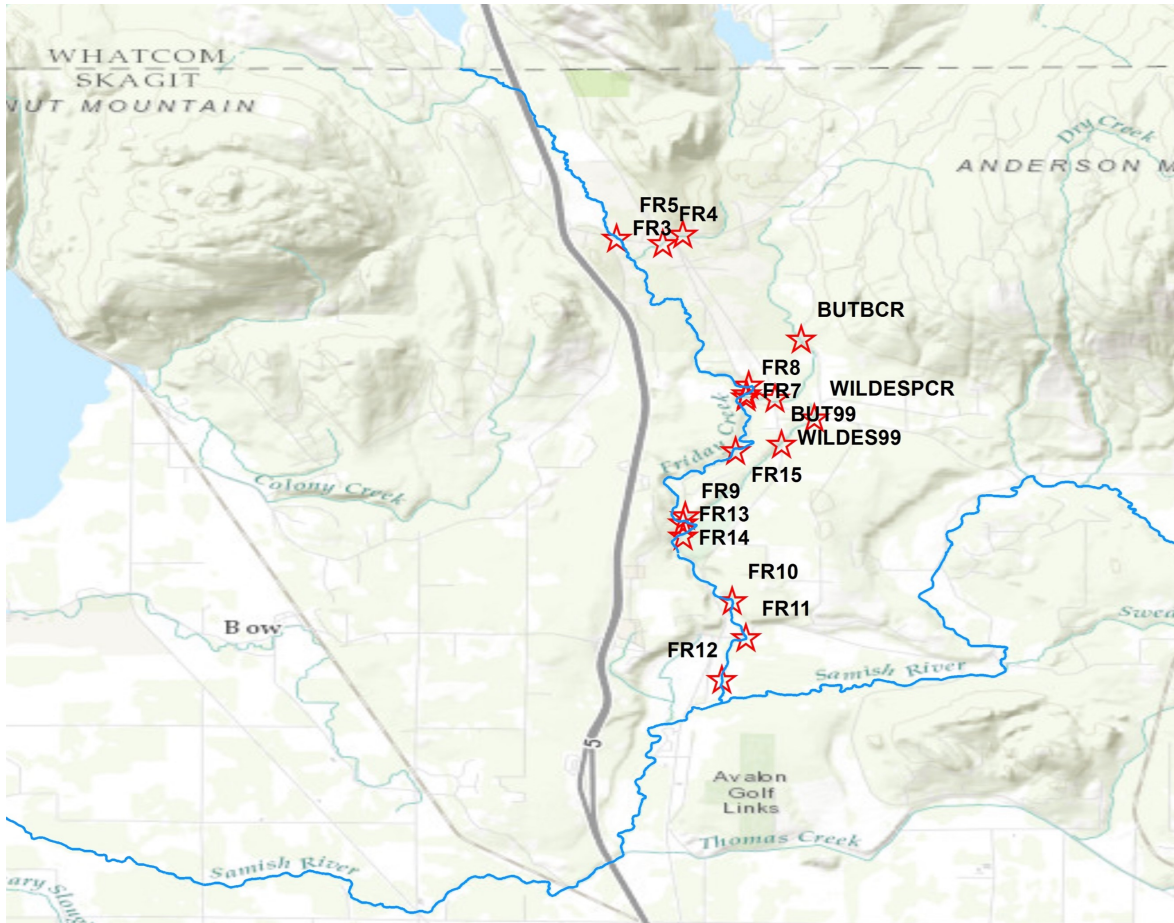


Figure 102. Friday Creek Storm Team Sampling Sites 2015-2016

Table 12. Storm Team Site Names and Location

Site ID	Location	Lat	Long
FR3	Friday Creek at Lake Samish Road (Alger)	48.619	-122.348
FR4	Silver Creek at Alger Hall	48.618	-122.341
FR5	Tributary on Alger-Cain Lake Road W of Corbell LN	48.620	-122.338
FR7	Friday Creek north of Parsons Creek Road	48.596	-122.328
FR8	Butler Creek at Friday Creek Road	48.595	-122.328
WILDESPCR	Wildes Creek at Parsons Creek Road	48.592	-122.318
BUTBCR	Butler Creek at Butler Creek Rd	48.604	-122.320
WILDES99	Wildes Creek at Hwy 99	48.588	-122.323
FR15	Friday Creek at Friday Creek Rd north of Wildes Cr	48.587	-122.330
FR9	Wildes Creek at Friday Creek Road	48.577	-122.338
FR14	Friday Creek above Wildes Creek	48.576	-122.338
FR10	Friday Creek At Pomona Grange Park	48.564	-122.331
FR11	Friday Creek at Prairie Road	48.559	-122.328
FR12	Friday Creek on North Green Road at KOA	48.552	-122.332

Figures 103-106 below show actual fecal coliform counts for all 14 sites sampled. Each graph shows 4-5 sites, and dates are the same on all three graphs. The pattern is consistent with previous years, with high levels with fall rains, low levels through the winter season, and a rise in FC counts in the spring.

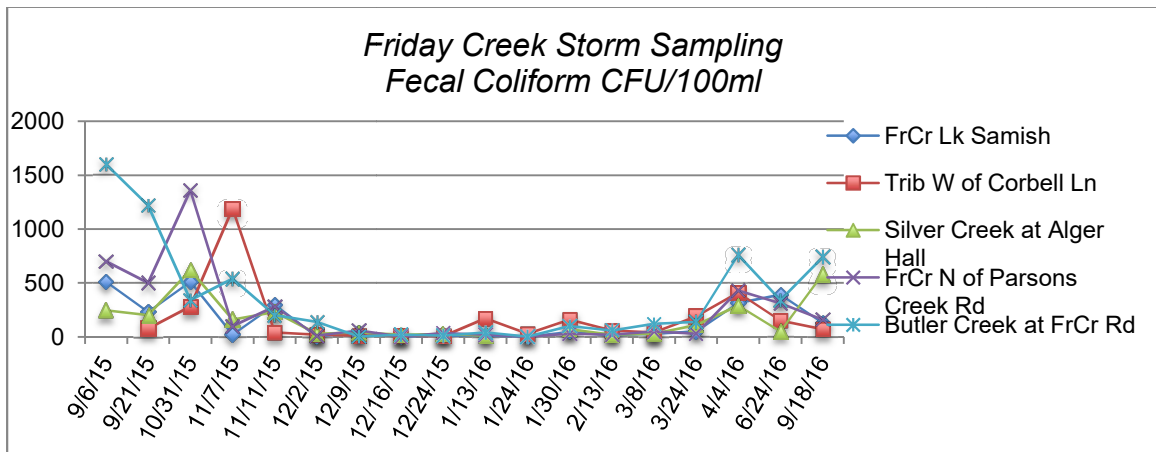


Figure 103. Storm Team: Friday Creek Fecal Coliform Sites FR3-FR7

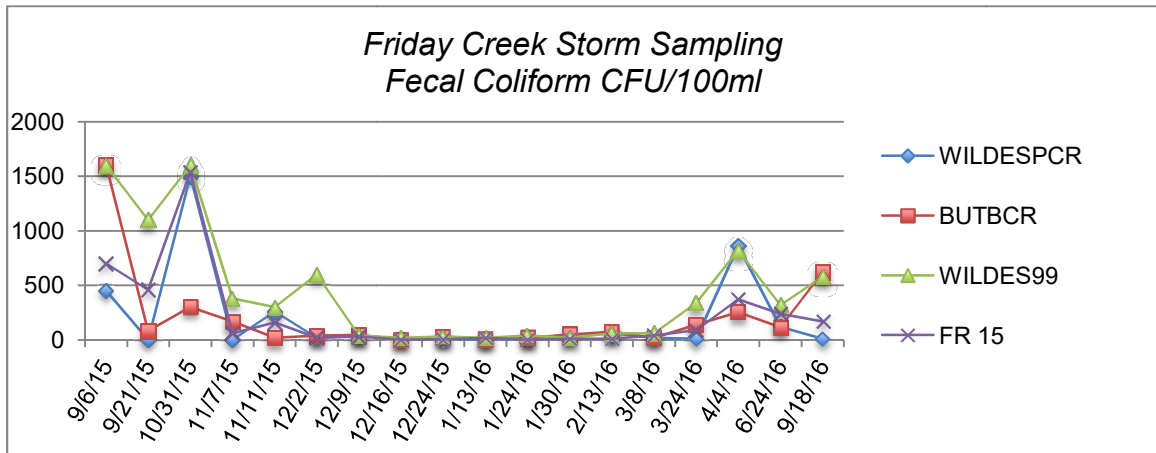


Figure 104. Storm Team: Friday Creek Fecal Coliform Sites WILDESPCR – FR15

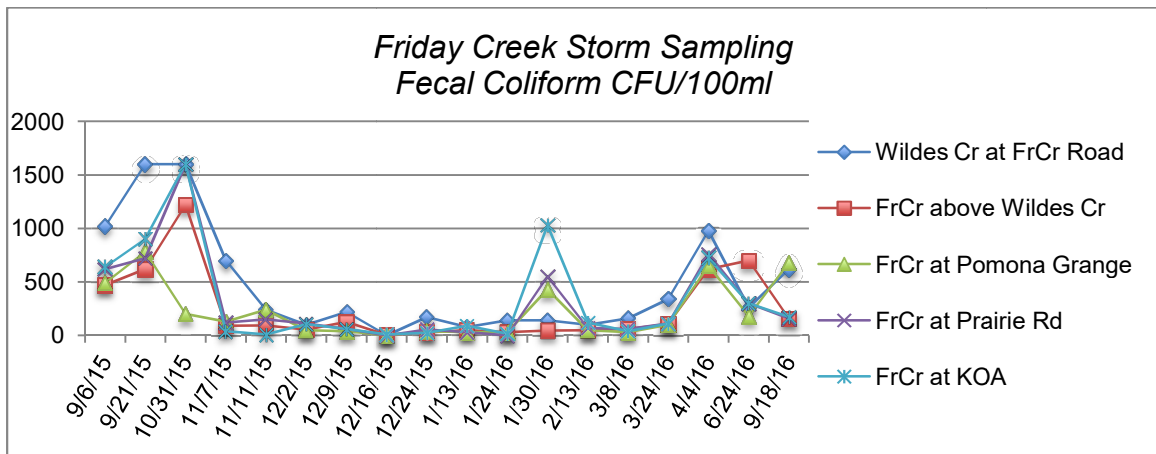


Figure 105. Storm Team: Friday Creek Fecal Coliform Sites FR9 – FR12

Six sites from the 2014-2015 season were eliminated in 2015-2016. With the exception of FR5 and FR12, which have very low levels of fecal coliform, all sites had much lower FC counts in 2015-2016. Most sites had a 50% or more decrease. Site FR9 again had the highest levels of all the sites. These measurements were taken only during high flow storm events.

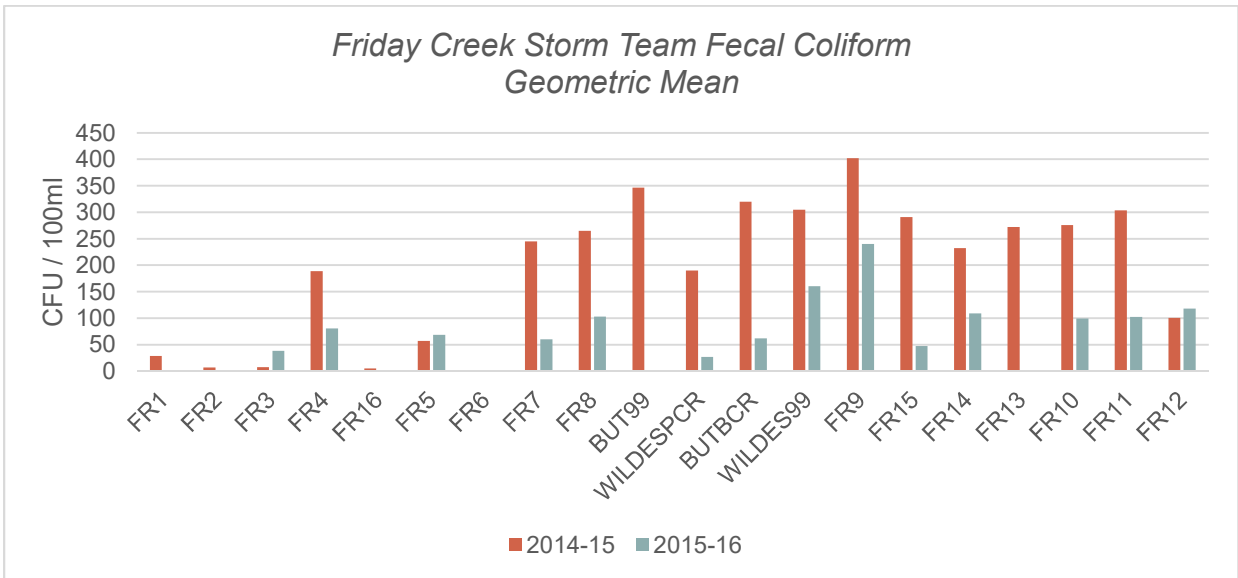


Figure 106. Storm Team: All Sites, Fecal Coliform Geometric Means

VI. Conclusion

The 2015-2016 Stream Team volunteers built upon the success of previous years, and provided a seventeenth year of WQ data for Skagit County's priority watersheds. This year saw the continued monitoring of 46 sites, and fearless Storm Team sampling of the Friday Creek watershed during heavy rain events.

Sixty-one adult volunteers were exposed to a firsthand view of the impact that non-point source pollution has on local water quality. Along the way they experienced sampling techniques used by environmental professionals, learned the importance of establishing a long-term, routine sampling program, formed lasting friendships and enriched their own lives through volunteering.

Thanks to 1,174.5 volunteer hours, this program has provided valuable data to citizens and agencies, assessing current conditions so water quality improvements can be made and documented in the future. This is key data for the long-term protection of our water resources. We hope that our data is useful in identifying trends, improvements, and problem areas for the attention of the appropriate agencies and local citizens.

Appendix A - Data

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
No Name Slough						
NN1 Marihugh Road	Average/Geomean	8.6	7.75	88.12	10.36	556
-	9/29/15	-	-	-	-	-
-	10/11/15	-	-	-	-	-
-	10/29/15	11.9	8.18	71	7.5	510
-	11/11/15	7.8	5.2	88	10.4	860
-	11/24/15	5.6	6.55	98.7	12.47	830
-	12/6/15	7.5	8	104	10.4	195
-	12/22/15	4.6	7.9	114	14.89	215
-	1/9/16	1.7	6.6	105	14.8	225
-	1/21/16	7	8.83	112.5	14.05	3720
-	2/3/16	5.6	6.34	80.8	10.05	660
-	2/18/16	8.2	15.25	100.5	11.96	3610
-	3/4/16	10.1	13.95	87.35	9.48	120
-	3/17/16	5.7	7.32	112.2	14.14	140
-	3/31/16	12	7.65	93.9	10.01	115
-	4/14/16	9.5	12.98	83.2	9.22	1190
-	4/29/16	12.3	4.71	77	8.14	815
-	5/13/16	14.5	1	46.5	4.7	395
-	5/26/16	12.9	6.24	35.2	3.62	2395
-	6/4/16	-	-	-	-	-
-	6/24/16	-	5.12	-	-	859
NN2 Bay View Road	Average/Geomean	8.5	10.13	89.51	10.21	270
-	9/29/15	-	-	-	-	-
-	10/11/15	13.1	6.7	54.5	5.7	125
-	10/29/15	11.5	10.79	85.3	9.27	625
-	11/11/15	7.8	9	115	10.9	65
-	11/24/15	5.3	8.75	71.7	9.14	1090
-	12/6/15	7.6	11.4	105	10.3	60
-	12/22/15	4.5	10.2	90	9.05	170
-	1/9/16	2	8.7	110	15	190
-	1/21/16	6.8	10.55	106.5	12.89	2630
-	2/3/16	5.8	8.12	83.4	10.44	280
-	2/18/16	7.9	19.2	103.3	11.82	4770
-	3/4/16	9.4	11.75	79.2	9.04	105
-	3/17/16	5.5	8.75	114.3	14.42	955
-	3/31/16	10.7	8.32	94.2	10.51	85
Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)

NN2 Bay View Road	4/14/16	9.7	12.87	85.3	9.82	980
-	4/29/16	13.1	5	91.2	10.27	55
-	5/13/16	15.3	11.9	43.2	4.86	45
-	5/26/16	-	-	-	-	
-	6/4/16	-	-	-	-	
-	6/24/16	-	7.05	-	-	1158

NN3 Egbers Field	Average/Geomean	8.6	12.74	66.09	7.65	119
-	9/29/15	9.8	4.1	38.1	4.12	9
-	10/11/15	13.6	11	16.5	1.73	160
-	10/29/15	11.5	10.4	52	5.75	877
-	11/11/15	8	10	71	8	13
-	11/24/15	5.5	10.9	61.7	7.9	764
-	12/6/15	7.6	15.8	93.5	9.1	10
-	12/22/15	4.7	22.7	86	11.32	343
-	1/9/16	2.6	12.4	82	11.2	76
-	1/21/16	6.8	15.56	92.7	11.16	1990
-	2/3/16	6	11.07	74.9	9.29	218
-	2/18/16	8	42.3	97.7	11.74	824
-	3/4/16	8.6	9.86	77.2	8.98	258
-	3/17/16	6.5	13.31	98.5	12.32	46
-	3/31/16	11.7	10.47	85	9.4	60
-	4/14/16	10.6	13.29	77.1	8.42	666
-	4/29/16	3.2	1.82	54.6	5.73	21
-	5/13/16	12.9	16.69	37.15	3.1	100
-	5/26/16	12.8	6.94	34.9	3.5	2
-	6/4/16	13.6	7.23	25.2	2.62	426
-	6/24/16	-	9.02	-	-	376

NN4 Field Culvert	Average/Geomean	11.4	14.25	85.83	9.60	102
-	9/29/15	18.3	3.85	45.4	9.65	8
-	10/11/15	15.3	8.5	64	5.7	10
-	10/29/15	12.6	4.35	113	10.58	115
-	11/11/15	7.8	13	77.7	9.5	45
-	11/24/15	5.8	14.6	61.2	7.15	663
-	12/6/15	8	14.5	88	8.6	20
-	12/22/15	4.6	42.7	89.6	11.75	275
-	1/9/16	2.5	17	73	10.5	20
-	1/21/16	7	14.67	79.2	9.52	843
-	2/3/16	6.9	12.54	70.8	8.59	58
-	2/18/16	8.3	48.6	96.5	11.6	1450

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
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NN4 Field Culvert	3/4/16	8.2	8.5	72.8	8.81	295
-	3/17/16	6.6	17.01	84.4	10.11	50
-	3/31/16	15.3	13.54	110.1	11.06	20
-	4/14/16	10.6	14.74	89.6	9.96	2838
-	4/29/16	19	6.85	113.1	8.98	168
-	5/13/16	22	6.29	155.08	13.08	138
-	5/26/16	20	5.02	124.2	9.69	205
-	6/4/16	16.9	8.15	88.6	7.52	18
-	6/24/16	-	10.6	-	-	102

Upper Samish

US1 PomonaGrange	Average/Geomean	9.3	4.86	101.39	11.71	28
-	10/9/15	12.7	2.2	98.4	10.37	18
-	10/24/15	8.3	0.92	90.8	10.66	8
-	11/6/15	9.9	3.8	105.5	11.87	19
-	11/21/15	6.8	4.74	98	11.93	18
-	12/4/15	7.2	23	108.3	13.07	129
-	12/19/15	5.8		100.6	12.56	26
-	1/1/16	2.4	4.3	103.7	14.18	14
-	1/16/16	4.7	7.83	115.5	14.82	14
-	1/29/16	6.7	4.78	116	14.14	11
-	2/13/16	7.2	10.55	116.7	14.05	100
-	2/26/16	6.8	3.66	99	12.04	5
-	3/12/16	8.1	4.17	85.9	10.12	19
-	3/25/16	7.9	5.5	99.4	11.79	78
-	4/9/16	11.2	3.28	92.5	10.07	7
-	4/22/16	13.5	3.6	97.9	10.21	48
-	5/7/16	12.5	2.11	100.1	10.65	43
-	5/20/16	11.7	2.1	100.8	10.96	165
-	6/4/16	15.6	2.17	101.5	10.1	64
-	6/17/16	11.9	2.1	99.1	10.72	38
-	7/2/16	15.4	1.46	98	9.83	79

US2 Swede Creek	Average/Geomean	8.7	10.48	93.21	10.76	53
-	10/9/15	12.5	4.3	84	8.9	74
-	10/24/15	7.9	3.82	81.6	9.67	28
-	11/6/15	8.5	11.88	92.2	10.74	126
-	11/21/15	4.6	6.64	91.6	11.97	32
-	12/4/15	6.8	27.5	97.6	11.87	149
-	12/19/15	5.4		94.9	11.99	32

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
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Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)	
US2 Swede Creek	1/1/16	0.9	5.93	98.8	14.05	8	
	-	1/16/16	4.6	21.7	95.9	12.33	134
	-	1/29/16	7	11.01	112.5	13.64	20
	-	2/13/16	7.2	26.3	100	12.07	251
	-	2/26/16	6.2	6.12	98.4	12.2	9
	-	3/12/16	8.2	13.35	94.1	11.09	24
	-	3/25/16	8.1	13.7	98.5	11.65	108
	-	4/9/16	10.1	8.75	94.6	6.8	34
	-	4/22/16	12.7	7.7	94.2	9.97	47
	-	5/7/16	11.6	7.04	90.3	9.81	52
	-	5/20/16	11.7	5	93.8	10.16	82
	-	6/4/16	14.9	4.72	86.7	8.77	197
	-	6/17/16	11	6.7	91	10.02	127
	-	7/2/16	14.6	7.03	73.4	7.48	38

US3 Thomas Creek	Average/Geomean	8.5	15.93	95.34	11.04	103
-	10/9/15	12.3	9.2	89.4	9.58	188
-	10/24/15	8.3	1.85	89.6	10.54	76
-	11/6/15	8.6	17.28	96	11.16	96
-	11/21/15	4.7	10.92	91.7	11.78	30
-	12/4/15	6.9	40.9	92	11.96	300
-	12/19/15	5.9		97.2	12.1	48
-	1/1/16	1.9	10.78	98.1	13.6	18
-	1/16/16	5	28.5	98	12.48	19
-	1/29/16	7.1	17.6	112.5	13.63	27
-	2/13/16	7.4	55.6	88.5	10.63	942
-	2/26/16	6.6	10.4	99.3	12.16	105
-	3/12/16	8.2	18.21	96.6	11.36	58
-	3/25/16	7.9	19.1	96.6	11.45	190
-	4/9/16	9.4	13.12	94.8	6.91	90
-	4/22/16	11.6	12.1	96.4	10.45	253
-	5/7/16	11	6.29	91.8	10.14	106
-	5/20/16	10.8	7.8	98.6	10.92	284
-	6/4/16	13.4	7.62	94.1	9.82	93
-	6/17/16	10.7	10.4	94.1	10.45	119
-	7/2/16	13.1	5.04	91.4	9.61	441

US4 Willard Creek	Average/Geomean	8.9	9.47	72.14	8.16	48
-	10/9/15	-	-	-	-	-
-	10/24/15	-	-	-	-	-
-	11/6/15	8.8	7.04	79	9.16	173
Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)

US4 Willard Creek	11/21/15	5.2	4.31	80.4	10.17	29
-	12/4/15	7.1	18.14	87.3	10.54	213
-	12/19/15	6	-	83.1	10.33	24
-	1/1/16	2.9	3.47	81.4	10.99	3
-	1/16/16	5.4	8.12	82.5	10.42	101
-	1/29/16	7.2	6.6	96.5	11.65	21
-	2/13/16	7.5	33.7	96.2	10.76	158
-	2/26/16	8	3.9	81.8	9.66	12
-	3/12/16	8.4	6.29	81.5	9.51	44
-	3/25/16	8.2	8.5	87.1	10.24	109
-	4/9/16	7.2	5.32	94.6	5.34	77
-	4/22/16	12.9	8.3	58.1	6.12	47
	5/7/16	11.9	7.3	45.8	4.94	55
	5/20/16	12	11.5	49.5	5.32	182
	6/4/16	15.5	14.41	36	3.58	157
	6/17/16	12.1	6.6	53.2	5.71	42
	7/2/16	14.7	7.5	24.6	2.42	#NUM!

Lower Samish

LS1 99 Bridge	Average/Geomean	9.3	10.13	100.64	11.62	33
-	10/3/15	10.7	1.7	95.7	10.6	20
-	10/11/15	12.7	3.2	94.2	9.92	149
-	10/31/15	11.7	51.5	98.5	10.58	219
-	11/8/15	9.7	15.82	94.6	10.8	71
-	11/28/15	3.7	6.83	101.1	13.2	17
-	12/7/15	8.2	14.9	99.2	11.87	9
-	12/26/15	4.9	7.8	107.1	13.64	3
-	1/7/16	3.8	6.35	98.8	13	20
-	1/23/16	6.7	13.51	84.2	10.35	34
-	2/3/16	6.4	8.8	122.2	15.4	18
-	2/20/16	7	13.72	108.2	13.02	9
-	3/3/16	8.8	9.7	101.9	11.89	26
-	3/19/16	7.2	4.02	100.2	12.03	5
-	4/16/16	9	5.58	112.3	12.99	30
-	4/28/16	11.4	3.7	100.9	11	90
-	5/14/16	13.4	1.76	91.1	9.46	63
-	6/3/16	16	8.7	101.4	10.02	54
-	6/11/16	12.7	5.45	104.6	11.02	172
-	6/24/16	13.1	9.1	97.1	10.23	201
Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)

LS2 Jolly Rd	Average/Geomean	9.2	10.46	99.40	11.43	40
-	10/3/15	10.9	1.6	95.2	10.5	24
-	10/11/15	13.1	3.1	91.6	9.68	122
-	10/31/15	11.6	62.3	96.4	10.41	351
-	11/8/15	9.7	15.2	92.5	10.68	192
-	11/28/15	3.7	7.3	97.6	12.85	7
-	12/7/15	8.3	14.26	98.3	11.53	22
-	12/26/15	4.9	9.2	104.6	13.45	7
-	1/7/16	4.1	6.55	98.3	12.9	11
-	1/23/16	6.7	12.23	84	10.28	15
-	2/3/16	6.3	8.6	118.7	14.68	17
-	2/20/16	7	13.46	106.5	12.87	22
-	3/3/16	9	9.5	101	11.66	25
-	3/19/16	7.2	4.36	99.2	11.87	12
-	4/16/16	9	5.03	111.2	12.9	34
-	4/28/16	11.2	3.1	102	11.17	167
-	5/14/16	13.7	1.7	92.6	9.49	61
-	6/3/16	16.2	8.6	102.3	9.58	90
-	6/11/16	-	5.04	104.8	11.08	170
-	6/24/16	13.2	8.1	93.7	9.9	160

LS3 Chuckanut	Average/Geomean	9.8	9.92	97.51	11.13	40
Bridge	10/3/15	11.3	2.6	94.2	10.3	60
-	10/11/15	14	4.2	99	10.19	207
-	10/31/15	11.6	16.93	93.2	10.09	231
-	11/8/15	9.7	21.2	93.8	10.6	202
-	11/28/15	3.8	8.63	90.5	12.02	18
-	12/7/15	8.2	14.16	94.3	11.16	20
-	12/26/15	4.8	10.4	98.2	12.51	10
-	1/7/16	4.5	7.95	92.2	12.09	10
-	1/23/16	6.8	19.2	95.6	11.65	40
-	2/3/16	6.3	10.4	116	14.27	39
-	2/20/16	7.1	23.9	101.6	12.21	29
-	3/3/16	9.1	6.9	97	11.23	17
-	3/19/16	7.5	6.36	92.9	11.11	3
-	4/16/16	9.4	5.32	107.3	12.22	30
-	4/28/16	11.8	5.1	97.8	10.62	34
-	5/14/16	15	3.11	87.2	8.82	70
-	6/3/16	16	-	105.5	10.24	
-	6/11/16	13.7	3.84	103.1	10.71	110
-	6/24/16	14.1	6.6	94.1	9.65	183

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
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LS4 Samish at Boat	Average/Geomean	10.5	11.73	96.71	10.81	47
Docks	10/3/15	12.3	6.8	87.4	9.38	12
-	10/11/15	16.1	8.6	87	8.67	66
-	10/31/15	12	26.3	91.7	9.81	480
-	11/8/15	10	26.4	90.7	10.29	241
-	11/28/15	3.7	11.69	98.5	11.91	21
-	12/7/15	8.3	16.22	94.5	10.74	36
-	12/26/15	4.8	12.3	97.3	12.48	5
-	1/7/16	4.5	8.35	90.6	11.9	121
-	1/23/16	7.1	19.25	95.1	11.5	36
-	2/3/16	6.4	12.6	114.1	14.1	61
-	2/20/16	7.2	27.2	100.8	12.15	42
-	3/3/16	9.3	5.6	97.1	11.07	45
-	3/19/16	8.1	6.02	92.3	10.9	19
-	4/16/16	10	5.82	108	12.15	28
-	4/28/16	12.5	4.3	100.4	10.66	31
-	5/14/16	16	3.23	78.4	7.74	71
-	6/3/16	20.5	8.4	115.8	10.05	59
-	6/11/16	14.9	4.85	94	9.49	68
-	6/24/16	15.7	8.9	103.8	10.42	68

Gages Slough

GS1 Regent St. & E Rio Vista St.	Average/Geomean	11.9	33.5	50.2	4.1	101.5
	10/8/15	15.7	27.2	53.7	5.23	>200
-	11/5/15	10.3	89.5	107.5	-	>200
-	12/3/15	11.6	7.62	81	8.2	>200
-	1/7/16	10.4	86.2	33.3	2.35	72
-	1/28/16	10.1	87.9	98.1	10.95	>200
-	2/25/16	10.7	16.2	49.9	4.9	52
-	3/29/16	11.5	2.31	28.6	0.89	72
-	4/21/16	11.9	2.98	23.1	1.72	>200
-	5/19/16	13	9.06	8.2	0.76	394
-	6/16/16	13.7	5.92	18.6	1.52	>200
GS2 Anacortes St.	Average/Geomean	10.6	43.61	48.55	4.84	50
-	10/8/15	15.4	25.4	25.1	2.4	>200
-	11/5/15	10.1	30.2	100.6	-	>200
-	12/3/15	10.4	75.7	60.4	6.71	43
-	1/7/16	4.3	135	41.5	5.56	40
Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
GS2 Anacortes St.	1/28/16	9.5	54.9	63.3	7.03	228

-	2/25/16	7.2	7.65	49.1	5.96	34
-	3/29/16	9.3	78.2	36.4	3.98	12
-	4/21/16	14.2	10.31	23.1	2.22	12
-	5/19/16	13.2	33.7	76.7	7.98	486
-	6/16/16	12.6	18.1	12.2	1.26	38

GS3 S. Spruce St.	Average/Geomean	10.8	10.50	45.66	5.27	58
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-	10/8/15	-	-	-	-	-
-	11/5/15	-	-	-	-	-
-	12/3/15	-	-	-	-	-
-	1/7/16	-	-	-	-	-
-	1/28/16	-	-	-	-	-
-	2/25/16	8.8	4.1	67.7	8.07	26
-	3/29/16	-	-	-	-	-
-	4/21/16	-	-	-	-	-
-	5/19/16	-	-	-	-	-
-	6/16/16	13.3	13.2	30.2	3.13	280

GS4 McCorquedale	Average/Geomean	10.2	14.20	39.09	4.61	27
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-	10/8/15	-	-	-	-	-
-	11/5/15	9.5	2.52	20.6	-	98
-	12/3/15	6.8	4.59	29.7	3.37	10
-	1/7/16	2.2	11	38.3	5.06	6
-	1/28/16	10.4	13.2	57.3	6.31	32
-	2/25/16	7.9	5.78	55.2	6.62	12
-	3/29/16	9.7	8.48	66.3	7.46	56
-	4/21/16	17.9	17.5	36.5	3.39	10
-	5/19/16	13.7	39.8	29.4	2.97	31
-	6/16/16	14.1	24.9	18.5	1.67	170



Bay View

BV1 Walker Rd	Average/Geomean	7.1	5.0	94.6	11.3	13.3
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-	10/8/15	-	-	-	-	-
-	10/20/15	-	-	-	-	-
-	11/5/15	-	5.35	-	-	48
-	11/18/15	8.7	3.22	96.4	11.27	8
-	12/5/15	-	3	-	-	4
-	12/17/15	5	2.3	100.5	12.43	10
-	12/30/15	3.4	-	103	13.72	1

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
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BV1 Walker Rd	1/14/16	-	-	-	-	2
-	1/27/16	10	2.5	103.3	9.43	9
-	2/7/16	6.1	2.5	61	11.6	4
-	2/27/16	-	1.7	-	-	2
-	3/6/16	9.2	7.2	103.5	9.5	48
-	3/26/16	-	3.2	-	-	92
-	4/3/16	-	-	-	-	-
-	4/23/16	-	12.6	-	-	76
-	5/7/16	-	-	-	-	-
-	5/21/16	-	-	-	-	-
-	6/4/16	-	-	-	-	-
-	6/18/16	-	11.56	-	-	592

BV2 C Street	Average/Geomean	8.0	6.7	92.2	10.6	28
-	10/8/15	-	-	-	-	
-	10/20/15	-	-	-	-	
-	11/5/15	-	3.4	-	-	140
-	11/18/15	8.5	NA	95	11.14	41
-	12/5/15	-	8.4	-	-	7
-	12/17/15	4.5	6	97.4	12.65	6
-	12/30/15	2.8	-	105.6	14.25	3
-	1/14/16	-	-	-	-	23
-	1/27/16	10.5	5.7	100	8.86	102
-	2/7/16	5.7	7.3	93	12	18
-	2/27/16	-	4.7	-	-	13
-	3/6/16	9.2	10	97	8.9	43
-	3/26/16	-	4.6	-	-	4
-	4/3/16	10.1	7.9	91.4	10.3	67
-	4/23/16	-	3.63	-	-	52
-	5/7/16	12.5	10	58	6.5	18
-	5/21/16	-	-	-	-	
-	6/4/16	-	-	-	-	
-	6/18/16	-	8.78	-	-	658

BV3 Boat Launch	Average/Geomean	9.7	8.7	87.3	9.7	57.8
-	10/8/15	14.9	3.9	107	9.03	360
-	10/20/15	13.2	2.55	77.6	6.8	53
-	11/5/15	11.2	4.05	92.3	9.9	274
-	11/18/15	8.3	36.1	96.86	9.65	111
-	12/5/15	7.8	16.2	30	10.3	7
-	12/17/15	5.9	5.7	98	12.3	14
Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)

BV3 Boat Launch	12/30/15	3.5	-	109.2	13.77	13
-	1/14/16	-	-	104.6	6	12
-	1/27/16	9.6	5	103.1	9.12	71
-	2/7/16	6.6	6.7	95	11.5	11
-	2/27/16	-	3.5	25	9.55	117
-	3/6/16	9.8	18	102	9.7	40
-	3/26/16	-	4	-	-	205
-	4/3/16	10.6	5.3	102	11.3	14
-	4/23/16	-	2.87	-	-	838
-	5/7/16	15.1	8	80	7	207
-	5/21/16	-	-	-	-	-
-	6/4/16	-	-	-	-	-
-	6/18/16	-	-	-	-	-

BV4 Bay View State	Average/Geomean	10.1	13.90	87.01	10.06	22
Park	10/8/15	14.6	3.1	109	9.01	47
-	10/20/15	13.5	2.5	81.5	7	70
-	11/5/15	9.8	2.7	89.8	8.31	7
-	11/18/15	8	51	96.4	9.31	286
-	12/5/15	7.8	16.6	32	10.5	89
-	12/17/15	5.5	4.3	101.5	10.6	31
-	12/30/15	3.6	-	106.6	12.82	3
-	1/14/16	-	-	30	9.55	4
-	1/27/16	10.4	26.5	104.4	9.32	16
-	2/7/16	8.1	17	89	11	6
-	2/27/16	-	8.6	30	9.69	12
-	3/6/16	9.6	18	110	10.7	334
-	3/26/16	-	23.4	-	-	3
-	4/3/16	12.9	6	133	14	23
-	4/23/16	-	-	-	-	-
-	5/7/16	17.5	1	105	9	28
-	5/21/16	-	-	-	-	-
-	6/4/16	-	-	-	-	-
-	6/18/16	-	-	-	-	-

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
Trumpeter Basin						
TB1 Stonebridge	Average/Geomean	11.4	8.4	99.0	10.9	223.3
Adult Community	10/22/15	10.7	0.87	96.9	10.69	67
-	11/5/15	10.7	14.56	94.7	10.49	573
-	11/18/15	9.3	11.5	104	11.95	360
-	12/16/15	6.7	9.14	98.8	12.11	20
-	1/13/16	7.2	49.55	105.7	12.75	873
-	1/28/16	9.5	25.06	103.4	11.82	793
-	2/25/16	7.7	3.37	105	12.56	60
-	3/24/16	9.6	6.69	100.9	11.5	227
-	4/6/16	11	3.41	104.7	11.58	93
-	4/21/16	13.3	2.05	91.4	9.53	100
-	5/4/16	12.3	1.75	99.4	10.64	200
-	5/19/16	13.2	6.59	98.1	10.24	3533
-	6/1/16	13.5	1.49	97	10.09	40
-	6/16/16	14.1	2.69	96.5	9.92	567
-	6/29/16	14.8	1.34	94.6	9.65	787
-	7/14/16	14.7	1.21	95.8	9.63	87
-	7/27/16	15.5	0.92	95.5	9.52	320
TB2 Frazier Home						
on College Way	Average/Geomean	11.4	17.2	89.9	9.9	472.1
-	10/22/15	11.4	1.21	72.1	7.7	273
-	11/5/15	10.3	23.74	87.8	9.86	1307
-	11/18/15	8.4	20.41	97.5	11.49	333
-	12/16/15	5.8	13.2	93.7	11.7	67
-	1/13/16	6.6	103.6	100.6	12.3	960
-	1/28/16	9.6	59.25	98.7	11.26	780
-	2/25/16	7	7.76	102.1	12.39	200
-	3/24/16	9.2	14.69	93.5	10.84	487
-	4/6/16	10.7	6.83	92.4	10.25	407
-	4/21/16	14.2	3.24	86.7	8.92	160
-	5/4/16	12.9	2.37	86	9.06	27
-	5/19/16	13	15.67	90	9.48	5880
-	6/1/16	14.7	8.11	89.8	9.07	527
-	6/16/16	13.2	4.26	90.7	9.55	1400
-	6/29/16	15.4	3.14	84.6	8.45	713
-	7/14/16	15.2	3.37	82.2	8.45	900
-	7/27/16	16.3	2.21	79.6	7.8	1013

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
TB3 Summerson Nursery Bridge	Average/Geomean	10.9	11.4	88.5	9.9	198.1
-	10/22/15	10.7	1.3	72.3	8	20
-	11/5/15	10.2	8.6	87.3	9.84	1267
-	11/18/15	8.2	25.36	98.3	11.57	373
-	12/16/15	5.8	13.88	94.2	11.84	120
-	1/13/16	6.6	47.69	95.2	11.6	700
-	1/28/16	9.4	41.28	98.6	11.28	207
-	2/25/16	6.9	5.17	99.3	12.09	47
-	3/24/16	8.7	9.65	95.1	11.14	180
-	4/6/16	10.2	4.6	93.1	10.44	67
-	4/21/16	13.6	2.04	81.7	8.48	33
-	5/4/16	12.5	6.07	83.8	8.96	40
-	5/19/16	11.9	16.76	91.8	9.89	2720
-	6/1/16	13.3	1.18	80.5	8.42	193
-	6/16/16	12.8	5.13	94	9.94	1760
-	6/29/16	14.6	1.71	79	8.04	780
-	7/14/16	14.8	1.09	79.8	8.06	67
-	7/27/16	15.6	1.51	79.8	7.92	187
TB4 Kiowa Street	Average/Geomean	10.6	15.7	98.1	11.0	75.6
-	10/22/15	10.6	1.49	87.7	9.8	547
-	11/5/15	10.1	14.4	92.2	10.43	413
-	11/18/15	8.3	38.97	103	12.15	380
-	12/16/15	5.7	23.85	96.9	12.17	140
-	1/13/16	6.1	52.26	98.5	12.33	1213
-	1/28/16	9	66.89	103.2	11.95	140
-	2/25/16	7	6	104.4	12.68	13
-	3/24/16	8.6	9.35	99.8	11.59	0
-	4/6/16	10.2	4.59	100.4	11.32	0
-	4/21/16	12.7	1.7	96.1	10.23	127
-	5/4/16	11.4	2.58	99.4	10.83	400
-	5/19/16	11.4	31.94	101.6	11.11	573
-	6/1/16	12.6	3.67	93.7	9.92	93
-	6/16/16	13.4	6.09	98.9	10.33	1827
-	6/29/16	13.8	1.54	96	9.82	913
-	7/14/16	14.3	0.93	101.2	10.35	107
-	7/27/16	14.8	0.9	95.4	9.67	67
TB5 Bakerview Park Footbridge	Average/Geomean	10.4	6.48	91.86	16.23	63.69
-	10/22/15	-	-	-	-	-
-	11/5/15	10.2	5.76	85.8	9.62	353

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)	
TB5 Bakerview Park Footbridge	11/18/15	8.9	5.1	96.6	11.17	-	
	12/16/15	6.3	4.42	91	11.24	140	
	1/13/16	6.7	31.83	94.7	11.52	547	
	1/28/16	9.4	17.39	98.6	11.35	387	
	-	2/25/16	8	2.57	102.1	12.06	20
	-	3/24/16	8.8	3.85	95.4	11.02	93
	-	4/6/16	10	2.61	97.9	11.01	47
	-	4/21/16	13.8	2.08	94.7	9.9	0
	-	5/4/16	11.9	2.81	93.3	10.06	13
	-	5/19/16	11.8	6.48	95	10.3	607
	-	6/1/16	13.7	2.15	59.1	6.22	527
	-	6/16/16	12.3	2.09	93.1	92.6	533
	-	6/29/16	14.3	1.61	88.7	9.19	140
	-	7/14/16	-	-	-	-	-
	-	7/27/16	-	-	-	-	-

Clyde Creek

CC1 Jasper Way	Average/Geomean	8.1	7.86	82.18	9.68	9
-	10/7/15	-	-	-	-	-
-	10/21/15	-	-	-	-	-
-	11/4/15	12.1	3.41	56.1	6.1	35
-	11/18/16	8.2	-	130.5	14.53	22
-	12/2/15	6.8	-	96.9	11.96	5
-	12/16/15	6.1	-	96.6	11.31	10
-	12/30/15	3.6	-	96	12.75	25
-	1/13/16	6.6	7.7	78.6	9.59	2
-	1/27/16	9	10.08	78.7	9.63	8
-	2/10/16	7.4	10.24	78	9.31	2
-	2/24/16	7.1	-	77	9.4	12
-	3/9/16	8.3	-	85.1	9.77	18
-	3/27/16	8.6	-	80	9.37	1
-	4/6/16	9.8	-	82	9.45	48
-	4/20/16	12.2	-	77	8.2	5
-	5/4/16	-	-	38	4.2	25
-	5/18/16	-	-	-	-	-
CC2 Clyde Way	Average/Geomean	9.9	7.15	85.75	9.75	45
-	10/7/15	15.7	24.26	61.4	6.52	590
-	10/21/15	-	-	-	-	-

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
CC2 Clyde Way	11/4/15	10.5	1.2	79.6	9	28
-	11/18/15	9.4	-	89.8	10.41	107
-	12/3/15	7.4	-	86	10.3	32
-	12/16/15	6.6	-	77.1	7.12	30
-	12/30/15	5.3	-	77.5	10.5	5
-	1/13/16	7.2	2.12	96.2	11.57	8
-	1/27/16	8.8	3.84	113	13.7	67
-	2/10/16	8	4.33	91.6	10.83	93
-	2/24/16	7.7	-	96	11.41	20
-	3/9/16	8.6	-	92.3	10.73	12
-	3/27/16	9.5	-	91.7	10.5	172
-	4/6/16	10.5	-	93	10.39	60
-	4/20/16	12.3	-	85.5	9.2	18
-	5/4/16	13.4	-	74	7.73	>2000
-	5/18/16	13.7	-	77.3	8.2	18
-	6/1/16	13.9	-	75.7	7.7	28
-						
CC3 Queen Ann Way	Average/Geomean	9.6	4.19	90.76	10.27	29
-	10/7/15	13.5	5.28	93.6	9.75	236
-	10/21/15	11.8	-	91.5	9.92	103
-	11/4/15	9.9	0.56	85	9.52	50
-	11/18/15	9.4	-	94.6	10.8	100
-	12/3/15	7.8	-	71.8	8.64	38
-	12/16/15	6.1	-	71	8.3	15
-	12/30/15	5.1	-	88.3	9.6	15
-	1/13/16	7.5	2.24	96.1	11.36	55
-	1/27/16	9.4	4.39	107.2	12.69	43
-	2/10/16	8.1	8.49	95.3	11.22	20
-	2/24/16	7.8	-	100.4	12.09	10
-	3/9/16	8.5	-	96.8	11.23	22
-	3/27/16	9.4	-	95	10.85	58
-	4/6/16	10.4	-	93.5	10.55	50
-	4/20/16	12.1	-	91.9	9.87	2
-	5/4/16	11.7	-	91.7	9.93	133
-	5/18/16	11.7	-	85.1	9.28	10
-	6/1/16	12	-	84.8	9.2	2
CC4 Marine Drive	Average/Geomean	9.7	7.99	92.51	10.57	36
-	10/7/15	13.8	12.75	100.3	10.4	770
-	10/21/15	11.4	-	99.9	10.87	67
-	11/4/15	10.2	7.1	86.8	9.78	60

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
CC4 Marine Drive	11/18/15	9.4	-	90.6	10.12	1
-	12/3/15	8.2	-	68.8	8.16	30
-	12/16/15	7.1	-	58.1	7.78	12
-	12/30/15	5.3	-	83.7	10.67	15
-	1/13/16	7.5	3.99	97.5	11.68	266
-	1/27/16	9.4	4.96	104.8	12.25	30
-	2/10/16	8.3	11.17	99.8	11.73	10
-	2/24/16	8	-	100.7	11.9	8
-	3/9/16	8.7	-	96.8	11.3	18
-	3/27/16	9.2	-	97	11.2	8
-	4/6/16	10.4	-	98.2	10.92	38
-	4/20/16	11.5	-	95.8	10.43	5
-	5/4/16	11.5	-	93.8	10.25	260
-	5/18/16	12.2	-	97.2	10.62	>2000
-	6/1/16	12.4	-	95.4	10.2	77

Kulshan Creek

KC1 S 14th St.	Average/Geomean	10.6	3.1	87.7	9.9	200.4
-	9/28/15	11.3	1.27	79.1	8.75	567
-	10/29/15	12.9	3.61	76.9	8.12	1147
-	11/9/15	10.8	3.17	81.9	9.08	307
-	11/24/15	7.9	3.11	94.7	11.26	79
-	12/7/15	9.2	3.7	89.9	10.31	393
-	12/22/15	6.7	8.12	93.2	11.9	280
-	1/6/16	4.6	2.73	89.6	11.6	160
-	1/19/16	7.1	2.33	88.6	10.8	40
-	2/2/16	6.6	2.57	97.7	12.04	20
-	2/16/16	9.1	5.95	99.2	11.48	60
-	3/1/16	8.4	5.13	96.1	11.3	233
-	3/28/16	9	3.61	92.2	10.66	73
-	4/12/16	10.7	2.91	87.2	9.69	227
-	4/25/16	11.5	2.55	84.4	9.22	47
-	5/10/16	11.4	2.06	89.7	9.78	300
-	5/25/16	12.6	2.28	85.5	8.97	493
-	6/6/16	15.3	3.2	78.7	7.92	580
-	6/21/16	13.6	2.27	85	8.78	327
-	7/5/16	13.5	1.73	85.2	8.89	267
-	7/18/16	14.9	1.73	85.8	8.73	233
-	8/2/16	14.6	1.35	80.8	8.2	520

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
KC2 Parker Way	Average/Geomean	11.7	6.3	52.7	6.0	192.6
-	9/28/15	12	6.29	17.8	1.89	567
-	10/29/15	13.9	3.45	59.1	6.13	667
-	11/9/15	11.9	5.01	72.2	7.67	360
-	11/24/15	8.7	5.55	82.7	9.65	60
-	12/7/15	9.5	7.41	77.3	8.84	1733
-	12/22/15	6.8	26.96	90.4	11.05	487
-	1/6/16	5.2	5.35	78.1	9.6	133
-	1/19/16	7.4	4.36	51.7	7.77	93
-	2/2/16	7.3	6.48	82	9	67
-	2/16/16	9.3	17.98	93.6	10.68	173
-	3/1/16	-	7.08	89.5	10.09	53
-	3/28/16	9.7	4.96	82.8	9.3	60
-	4/12/16	11.2	3.43	42.8	4.74	367
-	4/25/16	13.1	5.15	60.6	6.17	367
-	5/10/16	12.5	3.08	21	2.24	240
-	5/25/16	14	2.13	23.1	2.33	107
-	6/6/16	16.9	2.87	12.5	1.23	67
-	6/21/16	15.2	3.22	40.4	4.01	793
-	7/5/16	15	2.99	15	1.5	167
-	7/18/16	16.8	4.58	5.1	0.56	80
-	8/2/16	16.6	4.36	9.2	0.89	123
KC3 Roosevelt Ave	Average/Geomean	11.5	7.4	23.9	2.5	102.4
-	9/28/15	12.9	5.69	2.8	0.3	100
-	10/29/15	13.5	4.83	2	0.1	147
-	11/9/15	11	16.94	22.8	2.52	620
-	11/24/15	7.6	4.39	44.5	5.26	486
-	12/7/15	9.1	2.22	29.1	3.33	673
-	12/22/15	6.3	4.01	59.9	7.35	320
-	1/6/16	4.5	5.34	31.4	4.07	80
-	1/19/16	6.9	4.34	19.2	2.3	93
-	2/2/16	6.8	2.66	83.9	-	20
-	2/16/16	9.3	4.9	48	5.56	67
-	3/1/16	8.8	7.91	57.8	6.81	67
-	3/28/16	9.9	3.01	49.3	5.6	27
-	4/12/16	11.8	8.13	5.9	.68	73
-	4/25/16	12.9	4.9	17.1	1.84	133
-	5/10/16	13.7	30.1	2.1	0.32	81
-	5/25/16	14.3	14.49	5.8	0.54	360
-	6/6/16	18.7	9.63	2.7	0.25	33

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
KC3 Roosevelt Ave	6/21/16	15.3	5.82	5.9	0.57	67
-	7/5/16	15.4	7.96	1.2	0.13	20
-	7/18/16	16.6	3.78	1.4	0.63	127
-	8/2/16	17	5.35	9.5	0.94	60
-						
KC4 Riverside Dr.	Average/Geomean	10.9	6.0	61.3	6.8	195.5
-	9/28/15	11.3	1.4	31.1	3.37	107
-	10/29/15	12.9	4.77	49.5	5.25	280
-	11/9/15	10.7	4.18	60.3	6.67	167
-	11/24/15	7.4	8.5	69.1	8.3	546
-	12/7/15	9.1	3.49	70.1	8.12	1207
-	12/22/15	6.3	8.85	75	9.31	833
-	1/6/16	4.4	9.52	72.5	9.3	220
-	1/19/16	7.2	3.71	76.4	9.2	127
-	2/2/16	6.6	3.97	80.1	8	67
-	2/16/16	9.2	13.98	80.8	9.28	347
-	3/1/16	8.5	8.52	79.8	9.31	953
-	3/28/16	9.3	4.35	79.8	9.16	127
-	4/12/16	11.9	4.02	73.4	7.9	60
-	4/25/16	12.4	4.97	66.5	7.1	24
-	5/10/16	13	6.57	38	3.99	820
-	5/25/16	13.8	4.33	71.2	7.26	120
-	6/6/16	17.2	3.87	31	3.24	100
-	6/21/16	14.6	3.1	65.6	6.71	120
-	7/5/16	14.4	3.62	73.4	7.53	253
-	7/18/16	14.4	7.09	13.3	1.37	60
-	8/2/16	15.3	12.78	31.2	3.14	233
-						
KC5 Lions Park	Average/Geomean	11.2	8.7	67.3	7.4	300.5
-	9/28/15	14.7	1.95	37.7	3.85	87
-	10/29/15	13	6.44	58.5	6.17	1233
-	11/9/15	10.8	5.32	63.4	6.85	486
-	11/24/15	7.6	14.58	71.9	8.59	800
-	12/7/15	9.2	4.53	71.5	8.26	1253
-	12/22/15	6.1	21.46	81.6	10.13	2213
-	1/6/16	4.9	14.3	72.1	9.35	933
-	1/19/16	7.4	4.58	75.2	9.14	100
-	2/2/16	6.9	4.45	76.5	9.26	180
-	2/16/16	9.1	20.12	77.4	8.96	500
-	3/1/16	8.6	10.77	90	9.35	813
-	3/28/16	9.1	6.69	74	8.65	387
-	4/12/16	11.8	5.52	63.8	6.9	60

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
KC5 Lions Park	4/25/16	12.1	9.01	63.1	7.27	613
-	5/10/16	13.7	24.82	47.8	4.94	24000
-	5/25/16	13.9	4.04	68.1	7.23	80
-	6/6/16	15.3	5.05	59.4	5.92	73
-	6/21/16	14.8	2.95	70.8	6.92	153
-	7/5/16	15	5.18	63	6.45	20
-	7/18/16	15.9	6.84	62.9	5.62	173
-	8/2/16	16.1	4.94	65.2	6.45	13



Joe Leary Slough

JL1 Dahlstedt Road	Average/Geomean	10.3	37.92	33.41	3.65	101
-	10/10/15	-	-	-	-	
-	10/21/16	-	-	-	-	
-	11/7/15	10.3	N/A	34.7	3.8	96
-	11/18/15	7.8	69.5	38.2	4.59	466
-	12/5/15	8.9	13.09	23.4	2.66	115
-	12/16/15	8	12.78	9.9	1.22	70
-	1/2/16	8.4	10.52	26.8	3.08	2
-	1/13/16	8.4	105.1	8.8	1.02	439
-	1/30/16	8	40.5	20.7	2.12	311
-	2/10/16	9.8	34.7	24.7	2.81	157
-	2/27/16	10.5	22.2	22.7	2.42	113
-	3/9/16	9.6	26.4	29.7	3.35	75
-	3/26/16	13.3	16.9	23.1	2.4	82
-	4/6/16	10.9	23	24.2	2.53	95
-	4/23/16	11.7	18.1	47.7	5.14	40
-	5/4/16	11.1	28.2	47.7	5.05	155
-	5/21/16	11.7	46.6	56.2	6	17
-	6/1/16	12.4	125.5	48.4	5.14	
-	6/18/16	12	25.6	58.3	6.24	519
-	6/29/16	12.2	26	56.2	6.15	207

JL2 Hwy 99.Gear Rd	Average/Geomean	10.5	52.02	50.37	5.56	126
-	10/10/15	14.5	100.5	48.8	5.01	292
-	10/21/16	12.2	55	50.9	5.43	20
-	11/7/15	10.9	36.9	66.3	7.31	1600
-	11/18/15	7.4	53.5	50.9	6.06	777
-	12/5/15	8.9	21.7	38.8	4.44	40
-	12/16/15	7.3	39.7	25.9	3.13	68

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
JL2 Hwy 99.Gear Rd	1/2/16	7.1	23.5	43.2	5.19	6
-	2/27/16	10.1	48.2	40.1	4.41	42
-	3/9/16	9.2	41.4	46.9	5.45	163
-	3/26/16	11.5	37.8	51.8	5.56	37
-	4/6/16	10.6	64.2	42.3	4.61	
-	4/23/16	11.7	50.2	59.6	6.39	212
-	5/4/16	11.4	51.6	58.9	6.36	73
-	5/21/16	12	60.5	60.8	6.55	659
-	6/1/16	12.4	52.3	64.1	6.9	280
-	6/18/16	13.3	29.4	70.7	7.37	268
-	6/29/16	13.3	55.7	57.2	5.94	104

JL3 Wilson.Avon	Average/Geomean	10.8	50.64	64.60	7.12	43
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Allen	10/10/15	16.1	9.04	49.6	4.75	9
-	10/21/16	11.8	12.1	61.4	6.7	4
-	11/7/15	12	56.1	71.3	7.6	73
-	11/18/15	8.4	73.5	45.9	5.4	248
-	12/5/15	8.8	31.2	60.2	6.89	6
-	12/16/15	7.3	35.6	54.6	6.48	7
-	1/2/16	6.1	19.65	72.5	9.11	4
-	1/13/16	8.4	60.7	58.7	7.02	68
-	1/30/16	7	90.4	64.2	7.67	297
-	2/10/16	9	97.2	60.3	6.95	548
-	2/27/16	10.3	36.3	61	6.71	4
-	3/9/16	9.4	33.6	63.7	7.31	85
-	3/26/16	12.3	44	76.9	8.15	28
-	4/6/16	11.1	26.5	59.7	6.43	124
-	4/23/16	12.5	42.7	75	7.89	120
-	5/4/16	11.5	87.5	71.9	7.74	79
-	5/21/16	12.5	70.2	71.3	7.62	86
-	6/1/16	14.7	96.3	76.7	7.78	
-	6/18/16	13.3	31.3	69.5	7.3	328
-	6/29/16	14	59	67.5	6.96	55

JL4 Tide Gate	Average/Geomean	11.5	33.74	45.82	4.95	93
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-	10/10/15	15.8	4.15	81.6	7.28	263
-	10/21/16	12.9	6.7	57	5.9	122
-	11/7/15	10	10.9	54.7	6.26	228
-	11/18/15	8.1	118.9	64.3	7.56	717
-	12/5/15	8.1	53.2	44.6	5.17	31
-	12/16/15	7.2	31.2	53.4	6.38	72
-	1/2/16	5.4	27.1	45	5.67	11

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
JL4 Tide Gate	1/13/16	8.2	29.6	49.1	5.75	18
-	1/30/16	7.5	46.1	51.4	5.9	299
-	2/10/16	9.1	29.2	33.8	3.87	41
-	2/27/16	10.2	33.1	29.4	3.24	12
-	3/9/16	9.1	37.2	49	5.62	230
-	3/26/16	11.4	29	35.6	3.86	175
-	4/6/16	11.6	38.6	33.2	3.51	203
-	4/23/16	13.3	36	32	3.33	70
-	5/21/16	15.8	31.7	39.1	3.87	99
-	6/1/16	17.2	29.1	37.1	3.63	78
-	6/18/16	16.2	22.9	48.8	4.7	131
-	6/29/16	18.1	21	42.1	3.96	216



Upper Nookachamps						
UN1 Lake McMurray	Average/Geomean	10.0	2.6	63.5	7.2	14.9
Estates	9/29/15	9.1	5.8			13
-	10/13/15	12.4	8			110
-	10/30/15	11	3.5			10
-	11/11/15	10.9	1.9	48.3	5.38	22
-	11/23/15	8.6	2.9	53.9	6.27	2
-	12/8/15	10	2.2	71.9	6.18	11
-	12/21/15	6.7	-	64.8	7.89	7
-	1/5/16	4.3	1.4	69	8.52	19
-	1/21/16	6.1	2.2	65.8	8.34	12
-	2/1/16	5.2	1.2	96.3	12.17	10
-	2/18/16	7.5	3.2	86.5	10.36	21
-	3/1/16	7.7	4.1	78.8	9.34	6
-	3/17/16	7.1	1.2	80.9	9.77	2
-	3/29/16	8.3	1.2	85	10.5	10
-	4/14/16	11.9	1.7	58.6	6.23	21
-	4/26/16	13.1	0.8	66.3	6.35	45
-	5/12/16	13.1	2.62	24.3	2.5	15
-	5/24/16	13	2.2	36.5	3.8	26
-	6/9/16	14.9	2.7	21.4	2.6	60
-	6/21/16	18.2	1	71.5	6.52	61
UN2 Big lake	Average/Geomean	11.3	3.1	85.7	9.5	14.9
Outflow	9/29/15	13.3	1.8	16	1.66	26
-	10/13/15	15	2.6	36.6	3.56	46

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
UN2 Big lake	10/30/15	13.5	6.5	79	8.1	325
Outflow	11/11/15	10.9	4.4	111.8	12.34	56
-	11/23/15	7.9	3.9	81	9.65	14
-	12/8/15	7.4	5.6	108	12.17	11
-	12/21/15	6	-	92	11.4	6
-	1/5/16	2.8	2.4	89.6	12.16	4
-	1/21/16	5.6	3.6	94.5	11.83	13
-	2/1/16	6.4	2.6	99.3	12.18	8
-	2/18/16	8.1	4.4	96.1	11.35	20
-	3/1/16	8.4	3.3	92.2	10.92	4
-	3/17/16	8.2	2.4	94	11.02	3
-	3/29/16	9.5	2.1	98.1	11.16	1
-	4/14/16	13.1	1.8	91.6	9.48	22
-	4/26/16	14.9	1.3	101.2	10.3	8
-	5/12/16	18.4	2.01	92.5	8.498	18
-	5/24/16	17.7	2.8	81.7	7.79	49
-	6/9/16	20.4	2.1	78.2	6.95	33
-	6/21/16	18	3.2	80.1	7.4	35
UN3 Otter Pond Rd	Average/Geomean	10.1	3.3	98.4	11.2	39.1
-	9/29/15	11	1.4	96.4	10.67	310
-	10/13/15	14.3	2.2	96.2	9.83	42
-	10/30/15	12.9	3.5	96.3	10.2	191
-	11/11/15	10	4	124.4	14.06	126
-	11/23/15	6.9	3.1	94	11.16	20
-	12/8/15	7.5	4	105.1	12.58	51
-	12/21/15	5.8	-	95.4	12	9
-	1/5/16	2.1	2.4	100.3	13.83	21
-	1/21/16	6	7.4	98	12.22	76
-	2/1/16	5.9	3.7	104	12.94	9
-	2/18/16	8.3	6.2	99.7	11.74	24
-	3/1/16	8	3.8	95.6	11.35	45
-	3/17/16	7.8	3.4	101.1	12.4	20
-	3/29/16	8.8	2.2	103.7	12.07	7
-	4/14/16	11.4	3.4	-	9.92	27
-	4/26/16	13	1.6	103	10.96	76
-	5/12/16	15.1	3.2	86.8	8.73	19
-	5/24/16	14.5	2.5	98	10	49
-	6/9/16	15.6	2.3	82.5	8.11	85
-	6/21/16	16.5	2.3	89	8.49	77

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
UN4 Knapp Road	Average/Geomean	10.2	4.4	74.4	8.5	89.7
Bridge	9/29/15	11.1	3.2	11.8	1.29	40
-	10/13/15	13.6	3.4	11.9	1.31	76
-	10/30/15	12	3.6	44.6	4.8	1
-	11/11/15	10	5.4	98.7	11.12	329
-	11/23/15	7.1	5.3	73	8.83	
-	12/8/15	8.6	5.6	94.8	11.07	107
-	12/21/15	5.5	-	84.2	10.3	37
-	1/5/16	2.7	4.4	92.7	12.25	67
-	1/21/16	6	6.3	91.1	11.35	26
-	2/1/16	5.8	3.3	93	11.59	21
-	2/18/16	8.1	4	92	10.9	569
-	3/1/16	8.2	5.7	88	10.46	331
-	3/17/16	7.1	4.6	94	11.42	66
-	3/29/16	8.7	3	93.6	10.91	42
-	4/14/16	12.2	3.5	83.5	8.95	38
-	4/26/16	13	2.3	86.5	9.13	136
-	5/12/16	18.1	4.58	58.9	5.55	260
-	5/24/16	15.9	7	79.5	7.85	2497
-	6/9/16	18.8	4.3	50.1	4.64	391
-	6/21/16	11.3	5	65.5	6.13	130

Lower Nookachamps						
Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
LN1 College Way	Average/Geomean	9.6	7.2	94.8	10.9	63.4
-	10/6/15	10.6	2.35	68.5	7.56	460
-	10/24/15	9.9	2.21	81.1	9.18	80
-	11/4/15	9.5	6.06	94.4	10.7	110
-	11/21/15	6.2	8.15	98.4	12.13	15
-	12/2/15	6.4	12.15	96.1	11.83	85
-	12/19/15	6.6		100.6	12.31	1
-	12/29/15	5.1	9.4	96.5	12.25	31
-	1/16/16	5.8	11.11	102.1	12.74	40
-	1/27/16	9.1	8.8	94.9	10.93	6
-	2/1/16	8.2	20.7	101	11.81	205
-	2/24/16	6.8	7.33	95.6	11.71	20
-	3/12/16	9.1	8.38	103.5	11.91	145
-	3/16/16	9.8	8.52	97	10.93	190
-	4/9/16	11.8	3.27	108	12.32	80
-	4/20/16	12.5	3.2	95.9	10.21	105
-	5/7/16	12.7	3.54	99.7	10.57	75

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
LN1 College Way	5/18/16	12.8	3.9	86.8	9.19	175
-	6/4/16	16.2	2.44	101	9.71	25
-	6/15/16	13.5	8.3	80.5	8.16	>1600
LN2 Hwy 9 Bridge	Average/Geomean	8.6	8.0	85.8	10.0	39.7
-	10/6/15	10.8	3.06	74.2	8.18	57
-	10/24/15	9.8	2.91	78.3	8.86	31
-	11/4/15	8	9.85	69.8	8.3	92
-	11/21/15	5.3	10.62	54.7	6.91	35
-	12/2/15	4.9	4.15	81.2	10.47	59
-	12/19/15	5.5	-	86.5	10.88	14
-	12/29/15	4.1	3.81	83.6	10.93	23
-	1/16/16	5	4.86	86.3	11	6
-	1/27/16	7.2	10.4	92.4	11.2	31
-	2/1/16	7.1	56.4	96.7	11.69	779
-	2/24/16	5.9	5.61	82.5	10.31	28
-	3/12/16	7.5	5.12	97.2	11.63	18
-	3/16/16	7.3	5.83	97.1	11.71	18
-	4/9/16	11.8	2.32	89.7	9.71	10
-	4/20/16	12.2	2.9	87.4	9.42	13
-	5/7/16	13.6	3.01	84.4	8.72	39
-	5/18/16	13.5	3.7	90	9.42	177
-	6/4/16	15.4	1.38	103.3	10.19	63
-	6/15/16	9.3	7.6	94	10.51	341
LN3 Swan Road	Average/Geomean	9.3	10.1	82.0	9.4	89.3
-	10/6/15	11.6	5.3	71.5	7.76	128
-	10/24/15	9.8	3.6	68.7	7.8	39
-	11/4/15	9.3	12.4	52.1	6	224
-	11/21/15	4.6	43.8	56.3	7.23	114
-	12/2/15	5.4	7.1	86.6	10.9	57
-	12/19/15	5.6	-	83.8	10.53	30
-	12/29/15	4.2	6.28	86.4	11.25	34
-	1/16/16	4.8	4.64	87.1	11.17	4
-	1/27/16	7.2	8.9	91.2	11.07	34
-	2/1/16	7.2	42.2	93.7	11.25	672
-	2/24/16	6.7	7.03	80.7	9.86	17
-	3/12/16	8.1	4.91	93.3	11.03	65
-	3/16/16	8.3	5.11	94.2	11	34
-	4/9/16	11.4	3.04	91.7	10.1	261
-	4/20/16	13.9	4	84	8.74	537
-	5/7/16	15.6	4.92	98.8	7.83	140

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
LN3 Swan Road	5/18/16	15.4	5.5	78	7.71	80
-	6/4/16	17	2.55	70	6.75	207
-	6/15/16	10.2	10.5	89	9.8	>1600
LN4 Francis Road	Average/Geomean	9.4	9.7	79.7	9.2	75.5
-	10/6/15	12.3	6.5	67.8	7.24	72
-	10/24/15	9.6	4.51	59.7	6.81	44
-	11/4/15	9.4	16.9	49.4	5.6	234
-	11/21/15	6	18.02	61.4	7.64	55
-	12/2/15	5.9	7.2	78.4	9.74	43
-	12/19/15	5.7	-	83.8	10.55	24
-	12/29/15	4.3	7.35	84.6	11	17
-	1/16/16	4.8	5.42	83.5	10.72	13
-	1/27/16	7.3	11.2	91.3	10.97	19
-	2/1/16	6.7	42	97.4	11.89	546
-	2/24/16	6.9	8.13	80	9.72	18
-	3/12/16	8.1	4.73	89	10.42	30
-	3/16/16	8.7	6.38	88.9	10.4	40
-	4/9/16	13.2	4.08	83.5	8.8	334
-	4/20/16	14.8	5.1	86.6	8.81	783
-	5/7/16	16.7	5.6	82.3	7.98	121
-	5/18/16	-	6.3	86.8	8.48	44
-	6/4/16	18.1	3.04	90.1	8.51	109
-	6/15/16	10.2	11.5	90.1	9.7	1600

Appendix B - Storm Team Data

	9/6/15	9/21/15	10/31/15	11/7/15	11/11/15	12/2/15	12/9/15	12/16/15	12/24/15
FR3	510	230	510	20	295	0	40	0	12
FR5		77	280	1190	40	20	10	10	5
FR 4	245	200	620	160	230	30	40	20	25
FR 7	700	500	1360	100	280	10	60	0	35
FR8	1750	1220	340	540	200	140	0	20	10
WILDESPCR	450	0	1500	0	260	20	40	10	5
BUTBCR	2620	80	300	170	20	40	45	0	26
WILDES99	2430	1100	380	380	300	600	40	20	30
FR 15	700	460	1540	60	160	20	30	0	5
FR 9	1020	1680	2380	700	240	100	220	0	170
FR 14	470	620	1220	90	95	55	125	5	30
FR 10	490	780	200	130	240	50	40	0	40
FR 11	620	720	1940	120	150	110	60	0	55
FR 12	640	900	1900	40	10	105	60	10	25

	1/13/16	1/24/16	1/30/16	2/13/16	3/8/16	3/24/16	4/4/16	6/24/16	9/18/16	Geomean
FR3	10	0	45	15	30	50	315	390	130	38
FR5	170	30	160	60	40	190	410	150	70	69
FR 4	10		70	20	30	110	290	50	580	81
FR 7	20	0	30	20	50	30	430	310	160	60
FR8	40	0	100	60	120	140	760	340	740	103
WILDESPCR	0	10	50	60	20	10	860	120	10	27
BUTBCR	5	20	50	75	20	140	255	115	620	62
WILDES99	20	40	20	60	60	340	820	320	580	160
FR 15	20	0	10	10	40	90	370	240	170	48
FR 9	80	140	280	100	160	340	980	260	620	240
FR 14	50	30	45	50	60	105	620	700	160	109
FR 10	30	30	430	50	30	100	650	180	680	99
FR 11	30	0	550	70	60	110	760	300	160	103
FR 12	90	15	1030	120	40	110	725	300	175	118

Site ID	Friday Creek Sites	Site ID	
FR3	Friday Creek at Lake Samish outfall	WILDES99	Wildes Creek at Hwy 99
FR5	Tributary West of Corbell Lane	FR 15	Friday Creek at Friday Creek Road N of Wildes Creek
FR 4	Silver Creek at Alger Hall	FR 9	Wildes Creek at Friday Creek Road
FR 7	Friday Creek north of Parsons Creek Road	FR 14	Friday Creek above Wildes Creek
FR8	Butler Creek at Friday Creek Road	FR 10	Friday Creek at Pomona Grange Park
WILDESPCR	Wildes Creek at Parsons Creek Road	FR 11	Friday Creek at Prairie Road
BUTBCR	Butler Creek at Butler Creek Road	FR 12	Friday Creek on North Green Road at KOA

Appendix C. Quality Objectives

parameter	method	precision (Rel. Std. Dev.)	accuracy	detection level
Dissolved Oxygen (DO)	YSI 55 Probe	Unavailable	± 0.3 mg/l	0-20 mg/l
Total depth	Fixed hand-held Tape	± 20%	± 0.05 meters	0 - 1 cm
Turbidity	Turbidimeter	Unavailable	0.01 NTU	0-19.9 NTU 0-199.9 NTU
Temperature	YSI 55 Probe	Unavailable	0.2° C	°-5 to 45° C

parameter	method	test equipment	filter type	incubation
Fecal coliform bacteria	Membrane Filtration	Millipore sterilil aseptic system	47 mm membrane filter .45 um pore space	Millipore single chamber incubator Temp. range 30°c (±0.5) 44.5°c (±0.2)

Standard Operating Procedures (SOP's)

1. Dissolved Oxygen (DO)- Samples will be taken with a bottle placed in an extension pole and dipped using the Standard Methods. DO will be measured using a YSI 55 probe. Results will be recorded as DO mg/l.

DO testing procedure (YSI 55 Probe):

- i. Turn probe on and calibrate immediately when picking up equipment. Make sure sponge inside the calibration chamber is wet with distilled water.
- ii. Place probe in water below the surface of water and move probe back and forth until the reading stabilizes. Record the result in mg/l. Leave probe on for the rest of the sampling.

2. Temperature will be measured with a YSI probe and recorded in °C.

3. Total depth is measured using depth gauges installed at some sites.

4. Water clarity will be determined by placing a sample into a turbidimeter (EPA approved VWR 66120-200)

- i. Warm-up Turbidimeter 30 minutes and calibrates w. 0 NTU polymer standard using the "zero-adjustment".
- ii. Thoroughly shake the water sample in a clean sampling jar.
- iii. Pour sample into unscratched, clean, and Kim-wiped vial. Mix again
- iv. Place in turbidimeter w. index line facing directly out to the front.
- v. Read and record the steady reading after the highest readings settle.
- vi. If reading is greater than 200 NTU, dilute the sample by 50%. (x 2).

variable	sampling equipment	sample container	sample preservation	maximum holding time
fecal coliform	Pole w.glass bottle	glass bottle pre-sterilized	ice chest with ice pack	1 hr
<u>d. oxygen</u>	YSI probe	instream	none	immediately
total depth	Installed depth gauge	instream	none	immediately
temperature	YSI probe	instream	none	immediately
	thermometer	instream	none	immediately
turbidity	turbidimeter	glass bottle, wide-mouth	ice chest	2 hrs

Equipment calibration and maintenance

1. Millipore Sterifil Filtration System maintenance

Maintenance: Immediately after use disassemble the apparatus and clean the components to ensure optimum performance.

- i. Remove the cover from the funnel. Carefully remove the O-ring using forceps. Remove the support screen from the base by pushing a short blunt rod through the base outlet.
- ii. Clean all components with a sponge, hot water, and non-alkaline, non-abrasive cleanser (anti-bacterial soap). Remove stubborn residues on the insides of the holder, cover port, and flask side arms using a plastic bristle brush and pipe cleaner dipped in cleanser (do not use any steel wool or abrasive materials that can harm the components).
- iii. Rinse the components with lab water and sterilize.

2. Sample Containers and Equipment maintenance

Maintenance: Empty bottles and place in Liquinox and warm water. Wash with a bottlebrush. Double rinse with tap water and final rinse with distilled water. Autoclave all fecal coliform sample bottles and graduated cylinders.

3. Millipore Portable Single Chamber Incubator maintenance

Maintenance: Clean the exterior case and interior chamber with a damp cloth and warm water (anti-bacterial soap). Give final spray with rubbing alcohol.

4. VWR Turbidimeter

Calibration: Insert 0 NTU polymer standard with the range control set at "20". Set the "Zero Control" to 0. Set the coarse so that the meter reads as close to zero as possible. Calibrate turbidimeter annually.

5. YSI Meters (DO, Temp)

Calibration: Press and release UP ARROW and DOWN ARROW keys at the same time. Enter "0" for altitude and salinity, and ENTER afterwards. Instrument is calibrated.

Maintenance: Turn YSI 55 off and rinse probe with distilled water after each use. Replace membrane filters and Kim-wipe moisturizers monthly. Replace batteries as needed.

Appendix D. Sample Data Sheet

Date: _____

Dupe Site _____
FC Results _____

**Lower Samish Watershed
Skagit Stream Team
Water Quality Monitoring**

Field Work By _____

Lab Work By: _____

Site LS1. Old Hwy. 99 Samish Bridge Water Appearance <input type="checkbox"/> Scum/Film <input type="checkbox"/> Foam <input type="checkbox"/> Muddy Brown <input type="checkbox"/> Milky <input type="checkbox"/> Clear <input type="checkbox"/> Oily Sheen <input type="checkbox"/> Frozen <input type="checkbox"/> Other _____ Field: Biological/Unusual Observations: _____	Time of Sample	Total Depth	Water Temp	Turbidity
		ft	°C	
	D.O. saturation	D.O.		Fecal Coliform
	%	mg/L		$\frac{\text{FC}}{\text{mL}} = \frac{\text{FC}}{\text{100 mL}}$
	Lab metadata			Fecal Coliform
				$\frac{\text{FC}}{\text{mL}} = \frac{\text{FC}}{\text{100 mL}}$

Site LS2. Samish River @ Jolly Road Water Appearance <input type="checkbox"/> Scum/Film <input type="checkbox"/> Foam <input type="checkbox"/> Muddy Brown <input type="checkbox"/> Milky <input type="checkbox"/> Clear <input type="checkbox"/> Oily Sheen <input type="checkbox"/> Frozen <input type="checkbox"/> Other _____ Field: Biological/Unusual Observations: _____	Time of Sample	Total Depth	Water Temp	Turbidity
		ft	°C	
	D.O. saturation	D.O.		Fecal Coliform
	%	mg/L		$\frac{\text{FC}}{\text{mL}} = \frac{\text{FC}}{\text{100 mL}}$
	Lab metadata			Fecal Coliform
				$\frac{\text{FC}}{\text{mL}} = \frac{\text{FC}}{\text{100 mL}}$

Site LS3. Samish River @ Chuckanut Drive Bridge Water Appearance <input type="checkbox"/> Scum/Film <input type="checkbox"/> Foam <input type="checkbox"/> Muddy Brown <input type="checkbox"/> Milky <input type="checkbox"/> Clear <input type="checkbox"/> Oily Sheen <input type="checkbox"/> Frozen <input type="checkbox"/> Other _____ Field: Biological/Unusual Observations: _____	Time of Sample	Total Depth	Water Temp	Turbidity
		ft	°C	
	D.O. saturation	D.O.		Fecal Coliform
	%	mg/L		$\frac{\text{FC}}{\text{mL}} = \frac{\text{FC}}{\text{100 mL}}$
	Lab metadata			Fecal Coliform
				$\frac{\text{FC}}{\text{mL}} = \frac{\text{FC}}{\text{100 mL}}$

Site LS4. Samish River @ Mouth (Boat Dock) Water Appearance <input type="checkbox"/> Scum/Film <input type="checkbox"/> Foam <input type="checkbox"/> Muddy Brown <input type="checkbox"/> Milky <input type="checkbox"/> Clear <input type="checkbox"/> Oily Sheen <input type="checkbox"/> Frozen <input type="checkbox"/> Other _____ Field: Biological/Unusual Observations: _____	Time of Sample	Total Depth	Water Temp	Turbidity
		ft	°C	
	D.O. saturation	D.O.		Fecal Coliform
	%	mg/L		$\frac{\text{FC}}{\text{mL}} = \frac{\text{FC}}{\text{100 mL}}$
	Lab metadata			Fecal Coliform
				$\frac{\text{FC}}{\text{mL}} = \frac{\text{FC}}{\text{100 mL}}$

Additional notes or observations: