2017-2018

Skagit Stream Team Water Quality Report

Citizen Monitoring Summary for Samish Bay, Padilla Bay, Ace of Hearts, Gages Slough, Trumpeter Basin, Kulshan Creek and Nookachamps Creek

Skagit Conservation District
2021 E. College Way, Suite #203
Mount Vernon, WA 98273
(360) 428-4313

Padilla Bay NERR
10441 Bayview Edison Road
Mount Vernon, WA 98273
(360) 428-1558

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2017-2018 Stream Team Volunteers

Scott Adams
Michael Anderson
Russ Barger
Shawn Bell
Rachel Best
Shauna Bjornson
Tash Blackburn
Richard Brown
John Buchanan
Ann Childs
Gena Dilabio
Randall Dills
Terri Dix
Andrea Doll
Claudia Ebsworth
Nicole Fisher
Jason Flowers
Lin Folsom
Dorothy Franklin
John Franklin
James Fukuyama
Luanne Goodrich
Steven Goodrich
Will Goodrich
Thomas Griffith
Kirk Hale
Corrin Hamburg
Dawn Harju
Tony Harrah
Patti Hayes
Milo Heiret
Donna Helgeson
Melissa Henderson
Caleb Jacobs
Marguerite Jacobs
Danna Kellison
Michael Larkin
Hal Lee
Hella Lee
Richard Lorentzen
Maria Magana
Dan McCroskey
Alec McDougall
Sandy McDougall
Jack Middleton
Sue Mitchell
Hannah Moon
James Morgareidge
Gil Ormbrek
John Patton
Claudia Pearl
Graham Read
Frank Repplier
Nancy Richard
Karen Richman
Jim Roberts
Bill Robinson
Bill Rogers
Judi Rogers
Becky Rosencrans
Tom Schmidt
Darlene Thompson
Steve Thornton
Emily Walters
Holli Watne
Mike Watne
Jamie Weiss
Cedar Wyatt

2017-2018 Padilla Bay Storm Team Volunteers: Richard Brown, Lin Folsom, James Fukuyama, Alec McDougall, Sandy McDougall, Jack Middleton, Gil Ormbrek, Bill Rogers, Judi Rogers, Tom Schmidt

Friday Creek Rain Gauge Volunteers: Sue Mitchell and Keith Witter

Data Entry Volunteer: Steve Goodrich

Project Leads: Kristi Carpenter, Skagit Conservation District (SCD)
Susan Wood, Padilla Bay Research Reserve (PBNERR)

Coaches: Kristi Carpenter, SCD; Jeff Frazier, SCD; Cindy Pierce, SCD; Susan Wood, PBNERR

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I. Introduction

This report summarizes the results of the 2017-2018 Skagit Stream Team Program, the twentieth consecutive year of data collection by volunteers. From October 2017 through August 2018, sixty-eight 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, ten of those volunteers formed the Padilla Bay Storm Team, sampling ten sites in the Padilla Bay watershed during sixteen rain events.

This report is meant to provide useful and reliable background water quality 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 1,190 hours during the 2017-2018 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 Jeff Frazier, 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. Kulshan Creek, and Trumpeter Basin each had two teams coached by Kristi Carpenter, SCD. Gages Slough had two teams coached by Cindy Pierce. Ace of Hearts/Happy Valley Creek sites were 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 samples), taken to Burlington Waste Water Treatment Plant (Gages Slough), taken to the Mount Vernon Wastewater Treatment Plant (Trumpeter Basin, Kulshan Creek) or the Anacortes Waste Water Treatment Plant (Ace of Hearts and Happy Valley Creeks) 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 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. Padilla Bay Storm Team

In 2017-2018 , Storm Team volunteers began monitoring sites in the Padilla Bay watershed. Some of these are new sites, and others were monitored by the Storm Team in 2010-2012. They include sites on Joe Leary Slough, No Name Slough, and Bay View drainages, and were selected to support a Department of Ecology water quality improvement project. 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	N48º33'55.02 W122º20'49.49
US2	Swede Creek @ Grip Rd	N48º33'17.75 W122º17'16.23
US3	Thomas Creek @ F&S Grade Rd	N48º31'42.93 W122º16'44.69
US4	Willard Creek @ 8274 F & S Grade Rd	N48º31'13.65 W122º15'58.07
LS1	Hwy 99 Bridge over Samish River	N48º31'32.58 W122º20'24.78
LS2	Samish River @ Jolly Road	N48º32'25.47 W122º20'36.36
LS3	Chuckanut Bridge over Samish River	N48º31'0.69 W122º22'43.29
LS4	Mouth of the Samish River (boat dock)	N48º19'11 W122º19'47

Nookachamps Creek

Figure 2. Map of Nookachamps Creek Sites

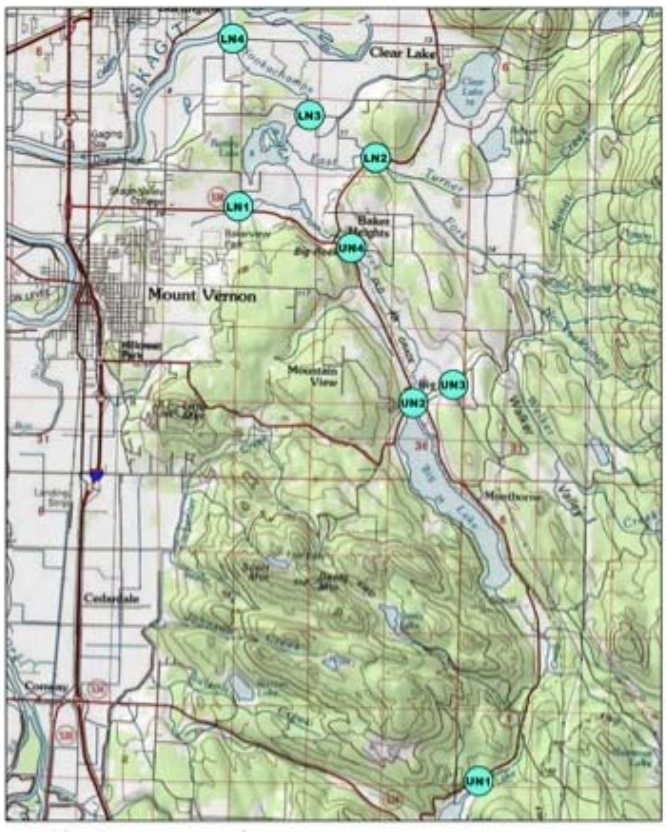

Table 2. Nookachamps Creek Sampling Locations

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	N48º26'10.14 W122º17'29.88
LN2	SR 9 and Babcock	N48º26'45.56 W122º15'8.65
LN3	Swan Road	N48º27'13.79 W122º16'17.84
LN4	Francis Road	N48º28'5.47 W122º17'38.72

No Name Slough

Figure 3. Map of No Name Slough Sites

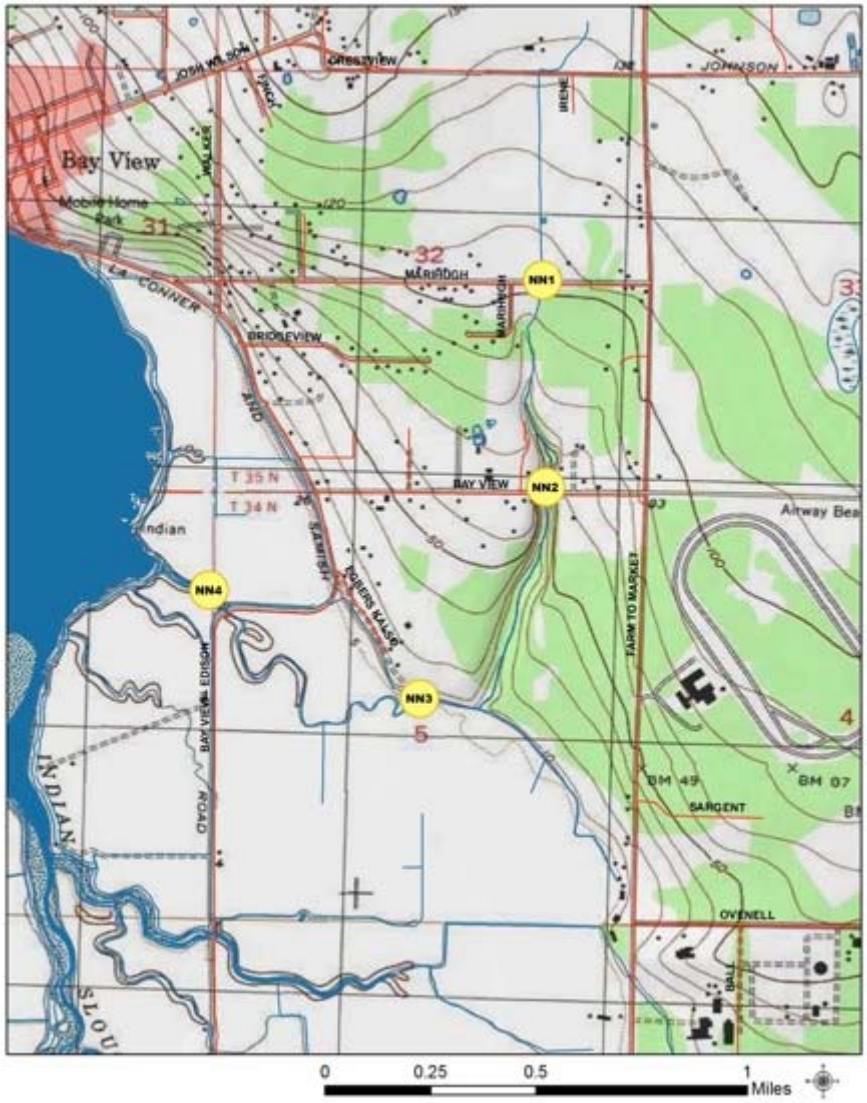

Table 3. No Name Slough Sampling Locations

NN1	Marihugh Road Culvert	N48º17'53. W122º17'31
NN2	Bay View Road Ravine	N48º18'121 W122º17'41
NN3	Egber's Field Bridge	N48º18'30. W122º17'53
NN4	Field Culvert, Bay View-Edison Road	N48º19'11 W122º19'47

Bay View Drainage

Figure 4. Map of Bay View Sites

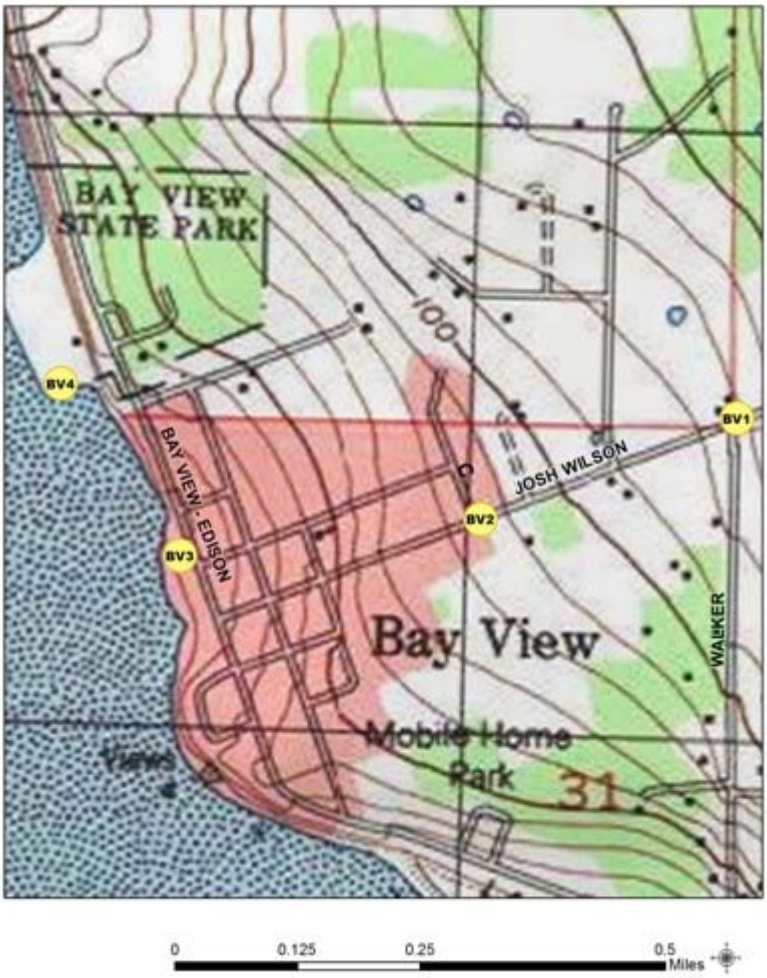

Table 4. Bay View Sampling Locations

BV1	Wilson Road and Walker Road	N48º29'11.94 W122º27'58.92
BV2	Wilson Road and C Street	N48º29'6.3 W122º28'19.26
BV3	Culvert at Boat Launch	N48º29'4.02 W122º28'43.2
BV4	N Beach at Bay View State Park	N48º29'13.02 W122º28'53.04

Joe Leary Slough

Figure 5. Map of Joe Leary Slough Sites

Table 5. Joe Leary Slough Sampling Locations

JL1	Dahlstedt Road	N48º30'53.35 W122º19'2.46
JL2	Hwy 99	N48º29'35.37 W122º20'6.61
JL3	Wilson Rd and Avon-Allen Rd.	N48º29'11.33 W122º22'41.96
JL4	Tide Gate	N48º31'4.90 W122º28'27.87

Trumpeter Basin

Figure 6. Map of Trumpeter Basin Sites

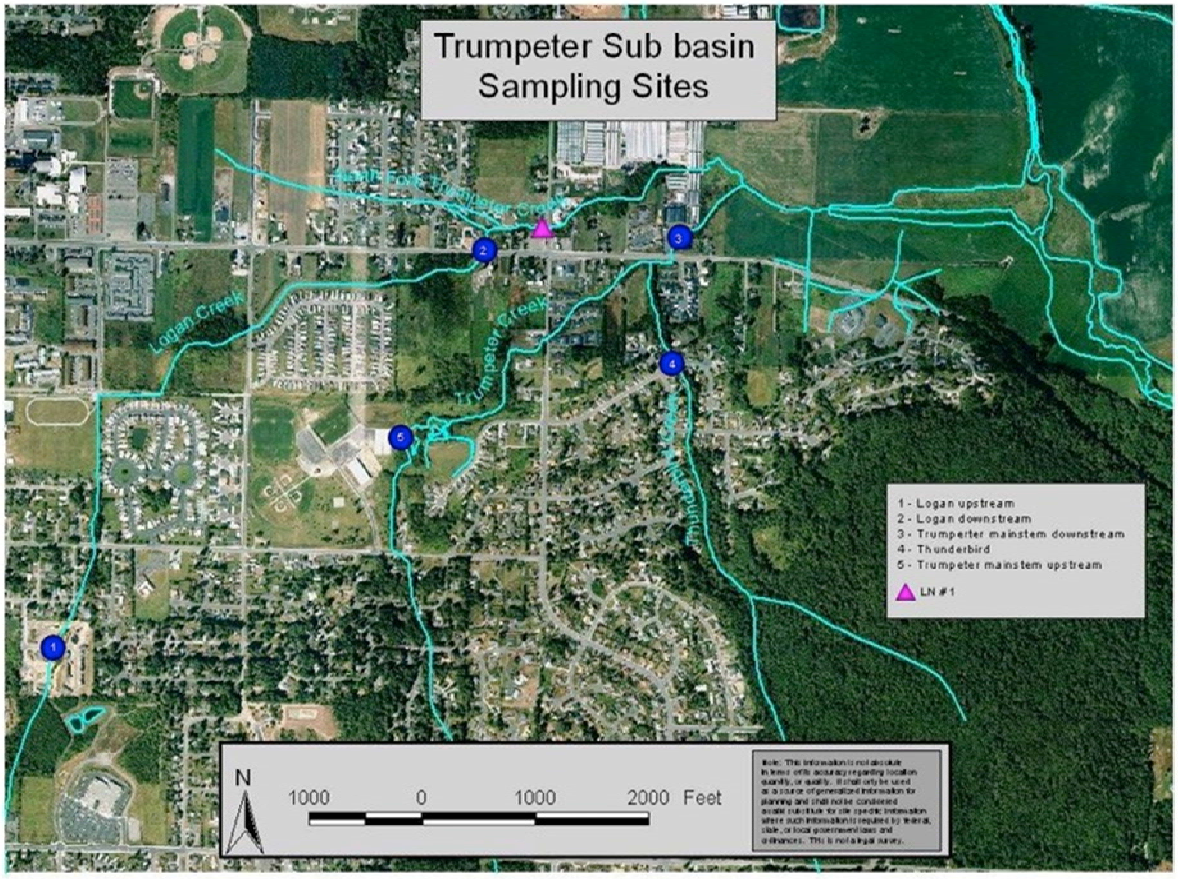

Table 6. Trumpeter Basin Sampling Locations

TB1	Stonebridge Adult Community, Logan Creek Bridge	N48º25'33 W122º18'32
TB2	College Way west of Martin .Waugh Road, Logan Creek	N48º26'09 W122º17'12
TB3	Summersun Nursery Footbridge, Trumpeter.Thunderbird	N48º26'07 W122º17'17
TB4	Culvert on Kiowa, Thunderbird	48º25'53 W122º17'12
TB5	Bakerview Park Footbridge, Trumpeter	N48º25'51 W122º17'48

Kulshan Creek

Figure 7. Map of Kulshan Creek Sites

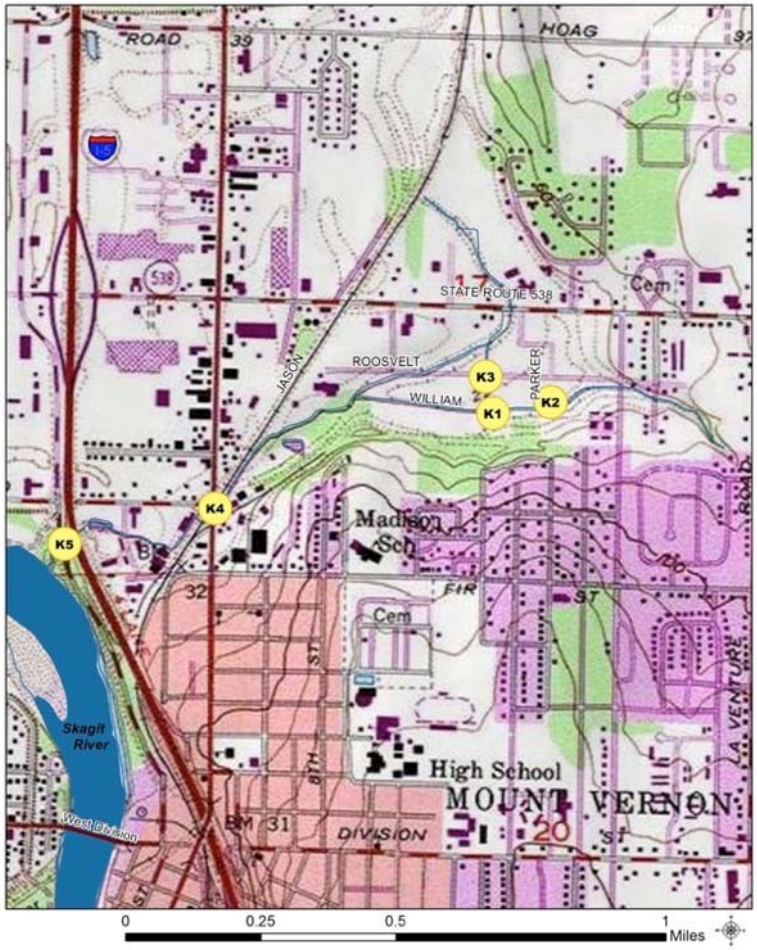

Table 7. Kulshan Creek Sampling Locations

KC1	North end of S 14th .Kulshan Trail	N48º25'59 W122º19'27
KC2	Parker Way	N48º25'59 W122º19'17
KC3	S side Roosevelt.1 blk W of Parker Way	N48º26'11 W122º19'25
KC4	E of Riverside - N of RR crossing	N48º25'54 W122º20'04
KC5	Freeway Drive at Lions Park	N48º25'43 W122º20'28

Ace of Hearts/Happy Valley Creeks

Figure 8. Map of Ace of Hearts/Happy Valley Sites

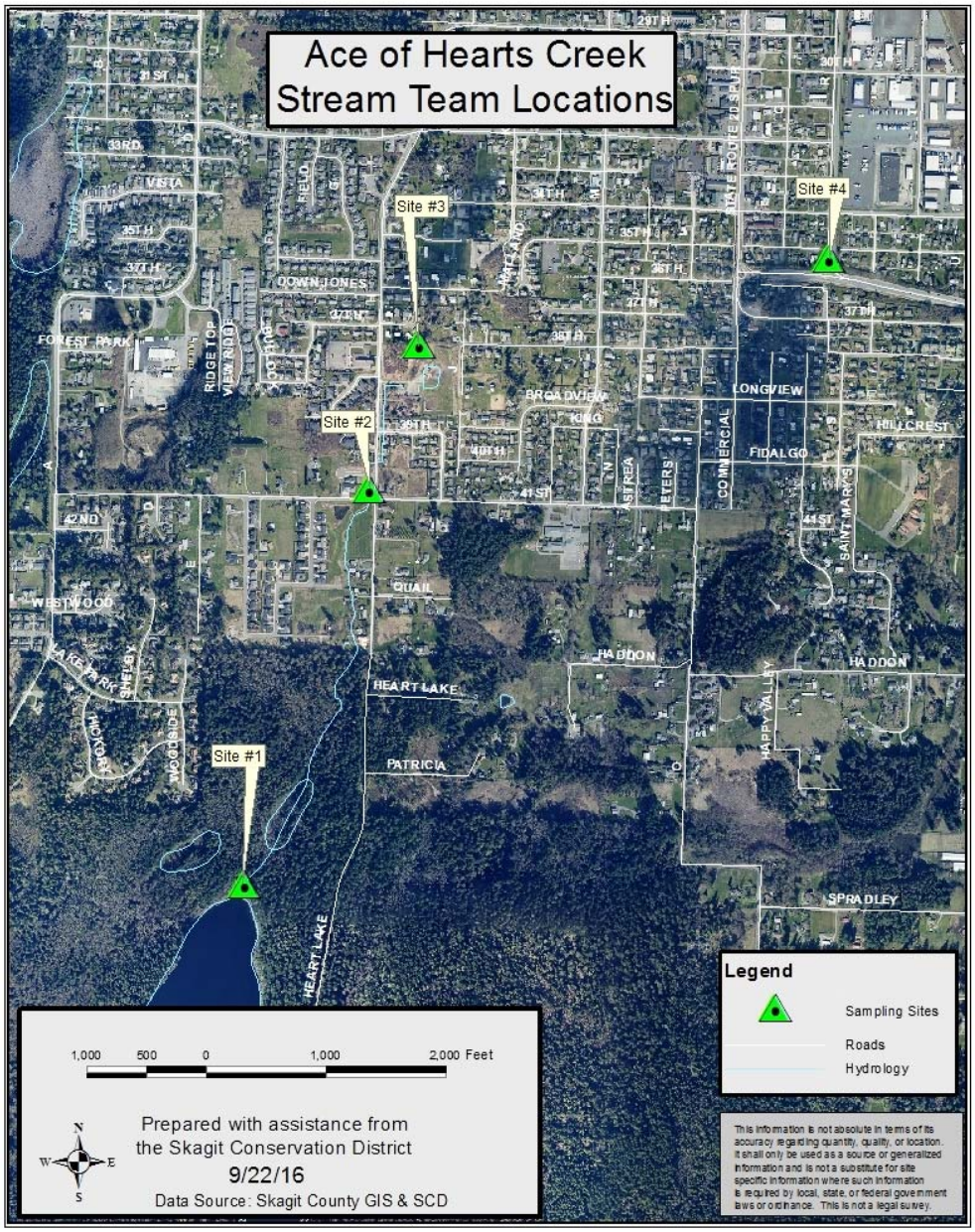

Table 8. Ace of Hearts/Happy Valley Creek Sampling Locations

AH1	Heart Lake outlet	N48d28'42.56" W122d37'44.97"
AH2	41st and H Ave	N48d29'16.62" W122d37'31.59"
AH3	Rotary Dog Park	N48d29'29.53" W122d37'25.27"
AH4	Happy Valley Creek	N48d29'37.28" W122d36'35.56"

Gages Slough

Figure 9. Map of Gages Slough Sites

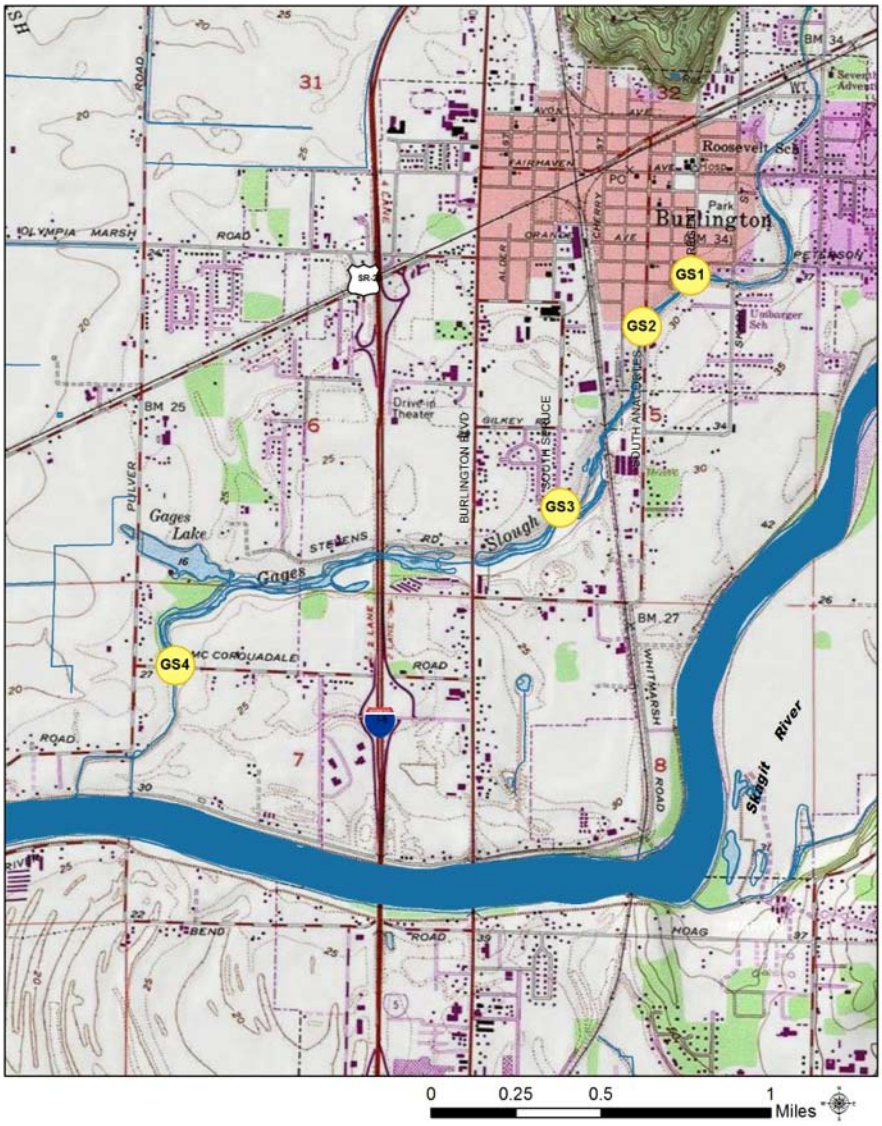

Table 9. Gages Slough Sampling Locations

GS1	Regent and East Rio Vista Streets	N48º28'16 W122º19'19
GS2	South Anacortes Street	N48º28'08 W122º19'30
GS3A	South Spruce Street	N48º27'40 W122º19'48
GS4A	McCorquedale Road	N48°27' 33 W122°20' 9

V. Results

This section presents the data collected during the 2017-2018 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 three categories based on aquatic life use. For Nookachamps Creek, Trumpeter Basin, Kulshan Creek, and Upper Samish Site 2, the standard is a lowest 1 day minimum of 9.5 mg/l required for core summer salmonid habitat. (Higher dissolved oxygen levels are better.) For the lowland watercourses, Joe Leary Slough, No Name Slough, Bay View, Gages Slough and all Samish sites except Swede Creek (Upper Samish 2) the minimum standard is a lowest 1 day minimum of 8.0 mg/l for salmon spawning and rearing. Ace of Hearts and Happy Valley Creeks in Anacortes are classified for salmon rearing and migration, with the lower DO standard of a lowest 1 day minimum of 6.5 mg/l

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 Nookachamps Creek, Trumpeter Basin, Kulshan 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, Sites 1 and 3 maintained levels above the state standard. As in past years, Site 4, the Willard Creek site had the lowest levels, with 4 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 twice in May and June.

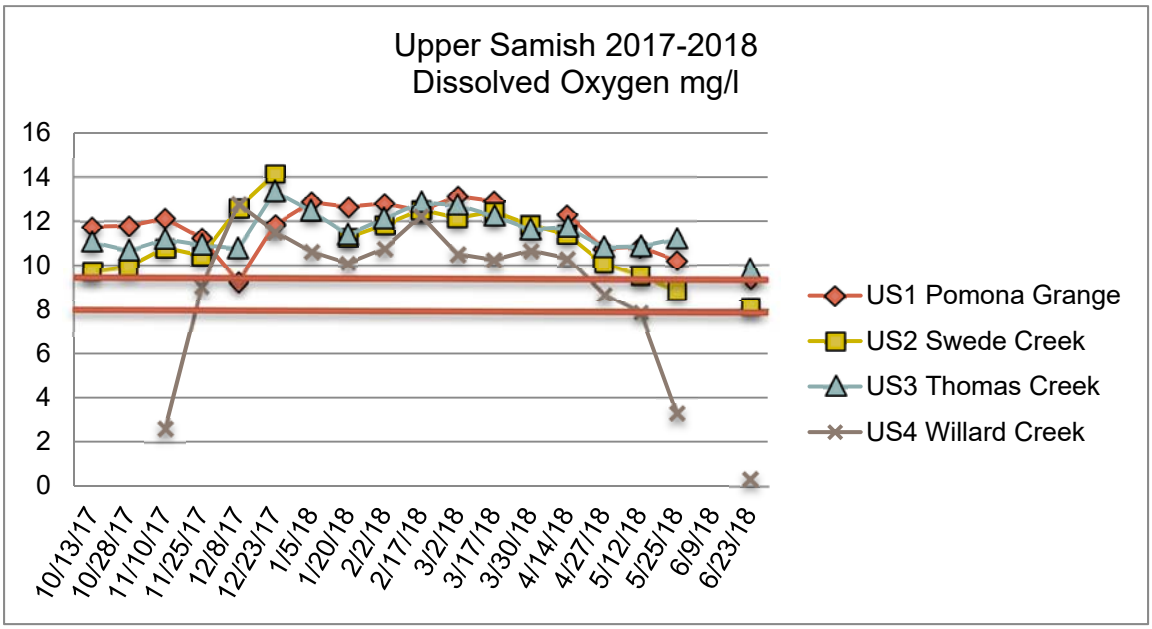

Figure 10. Upper Samish DO: 2017-2018

Figure 11 below shows a comparison of Upper Samish sites over the past 9 years.

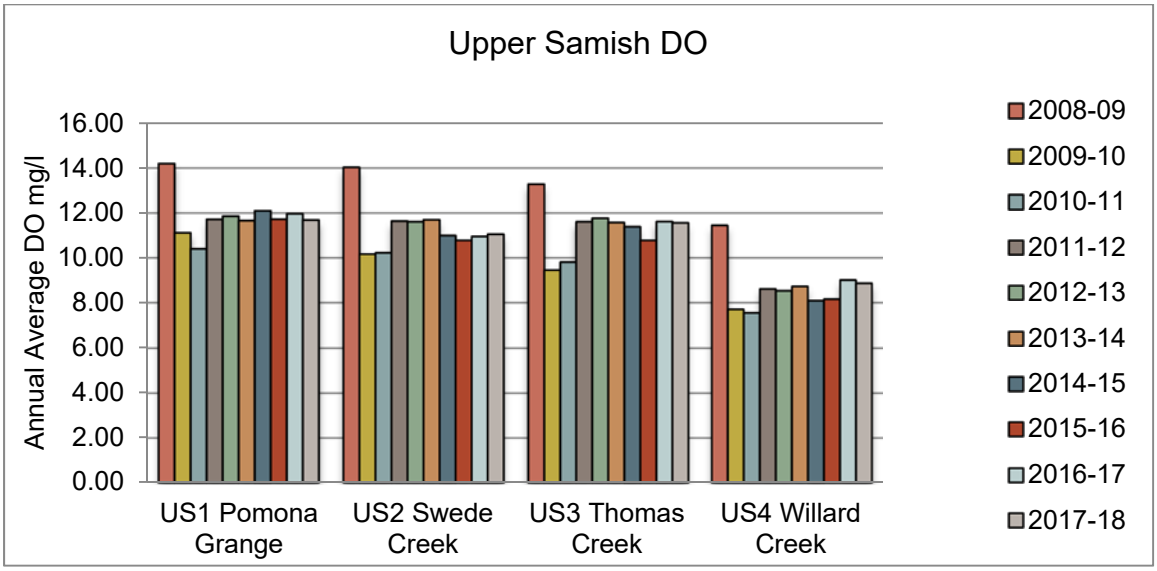

Figure 11. Upper Samish DO: Ten-year comparison

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. Average temperatures show little variation over ten years.

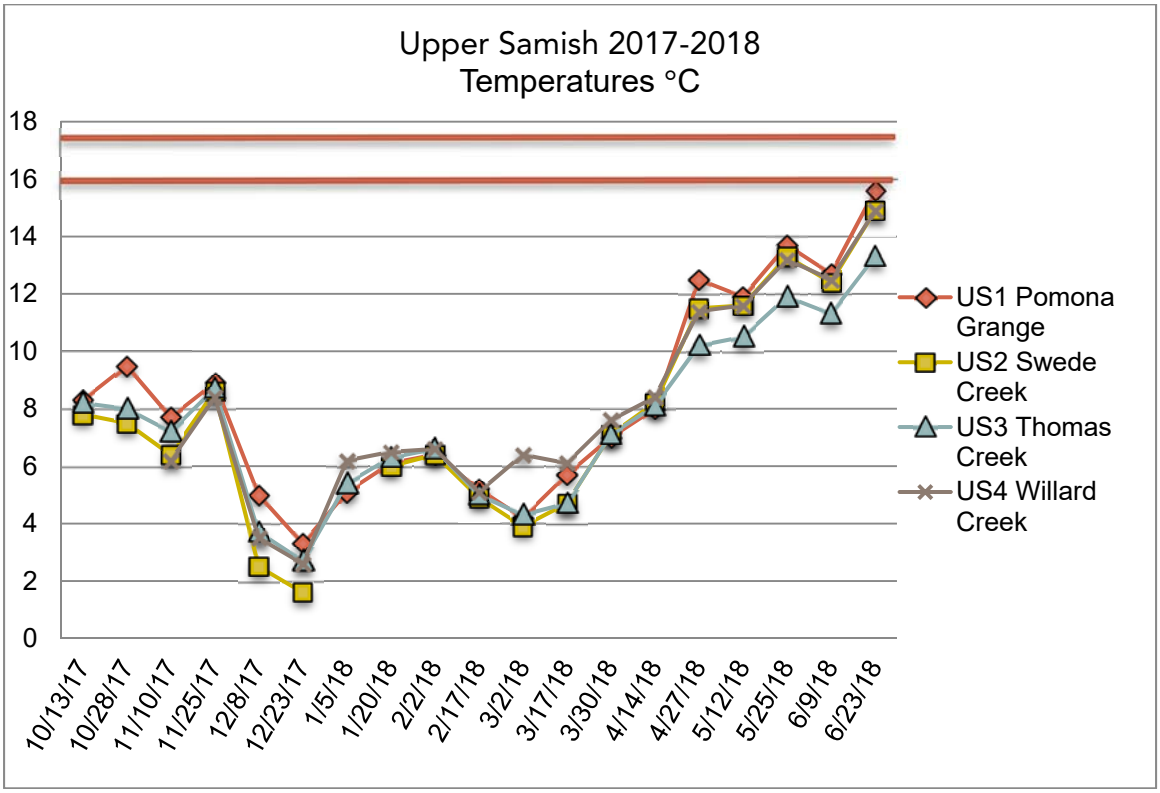

Figure 12. Upper Samish Temperature: 2017-2018

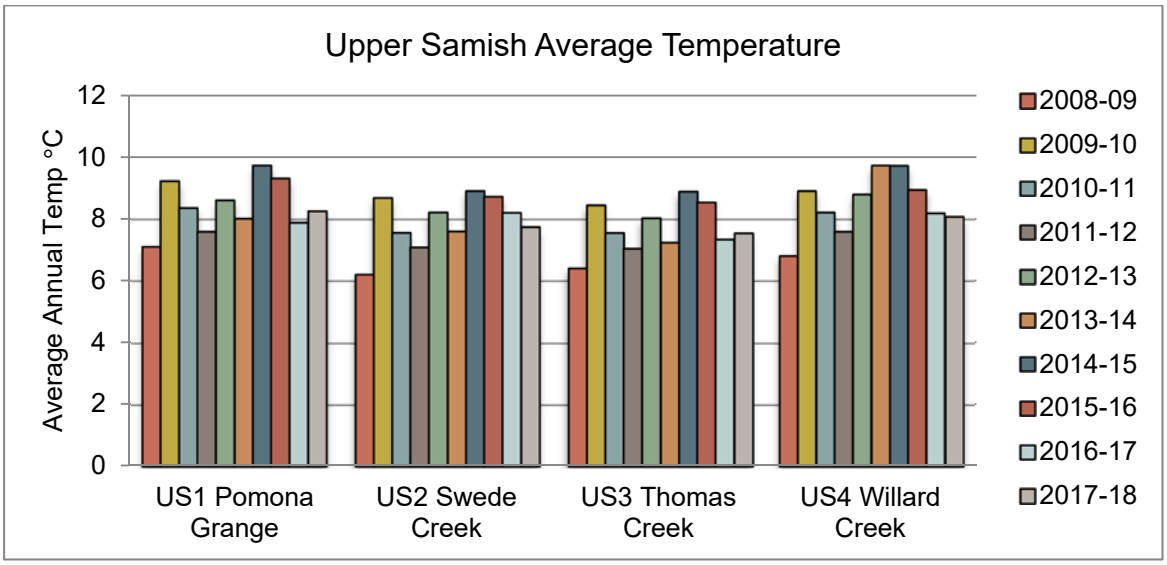

Figure 13. Upper Samish Temperature: Ten-year comparison

Turbidity levels in the Upper Samish (Figure 15) were slightly higer at Site 3, Thomas Creek, and lowest at Site 1, Pomona Grange. The high turbidity levels on 2/17/18 correspond to a small rise in fecal coliform levels. (See figure 16.)

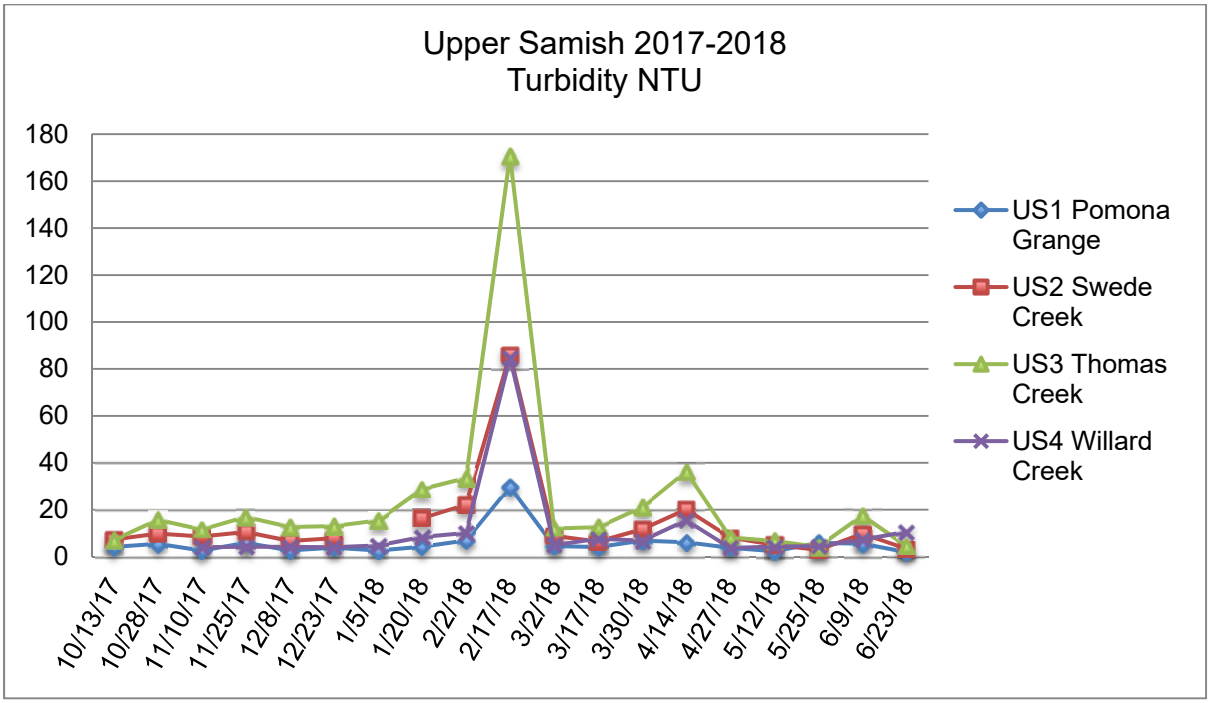

Figure 14. Upper Samish Turbidity: 2017-2018

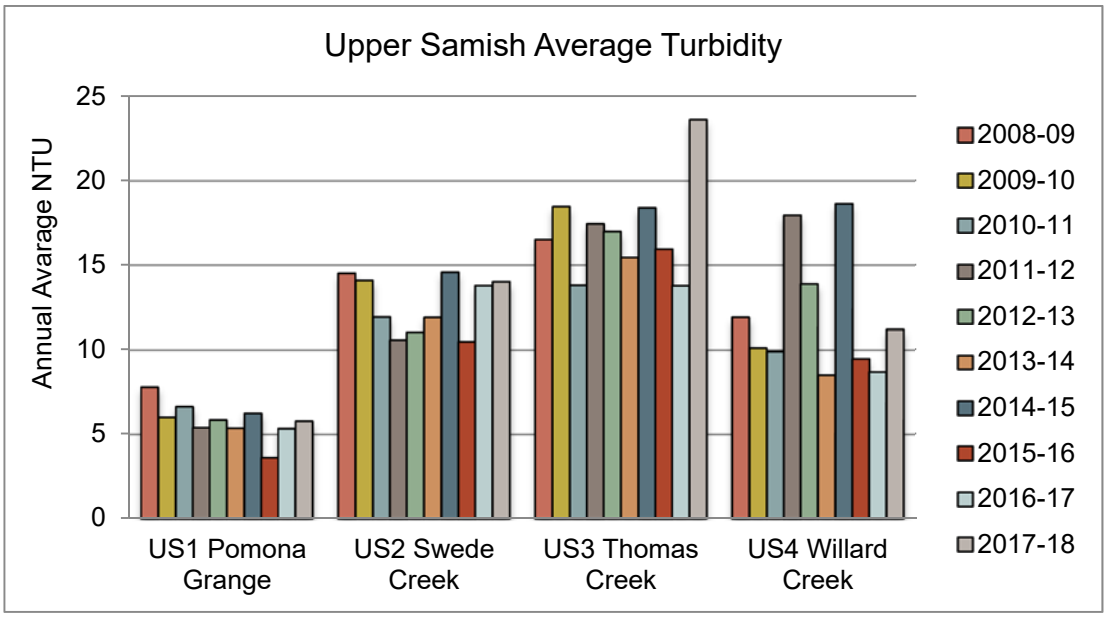

Figure 15. Upper Samish Turbidity: Ten-year comparison

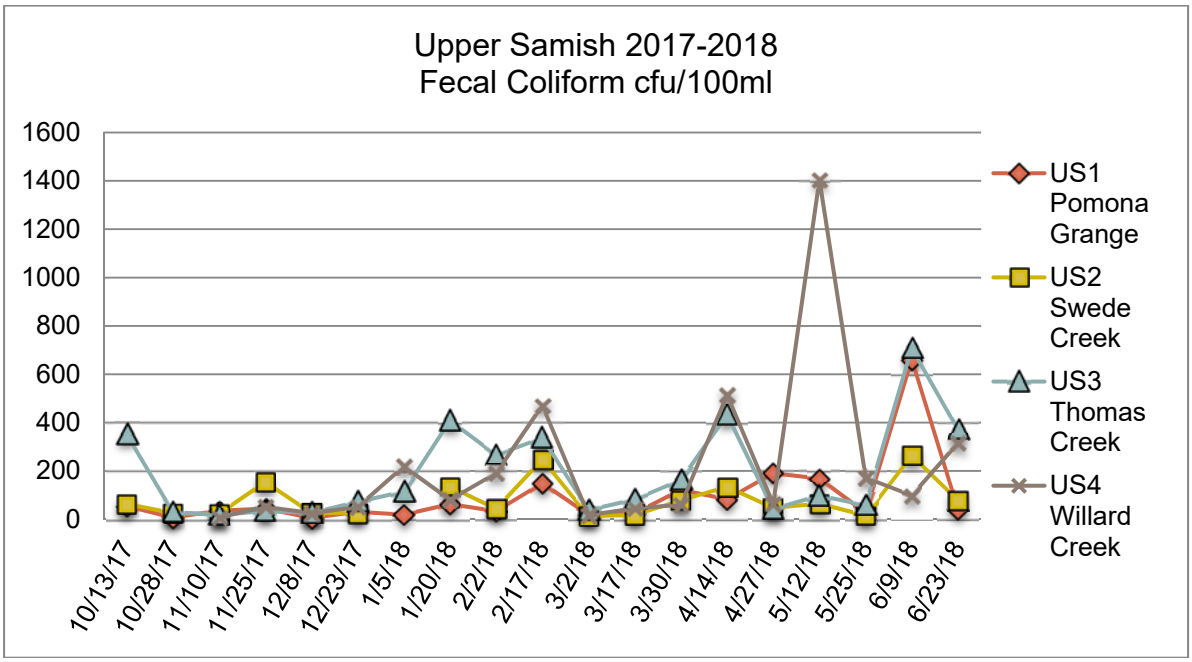

Figure 16. Upper Samish Fecal Coliform: 2017-2018

Fecal coliform levels in the Upper Samish watershed were again highest at Site 3, and Site 4, Willard Creek was nearly as high. Sites 1, 2, and 4 met the state standard of 100CFU/100ml. Only site 1 had fewer than 10% of the samples over 200 CFU/100ml.

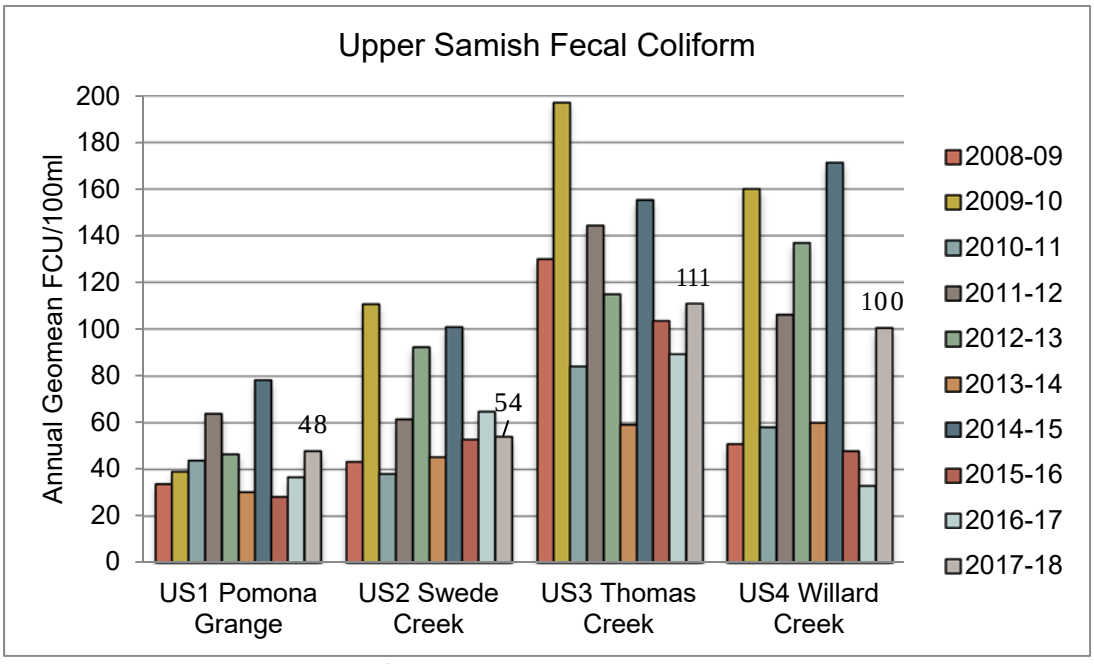

Figure 17. Upper Samish Fecal Coliform: Ten-year comparison

Lower Samish Results

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

Dissolved oxygen levels were similar for all sites, staying above 8mg/l through the sampling season. Sites were not sampled during the warmest summer months when dissolved oxygen is likely to be lowest.

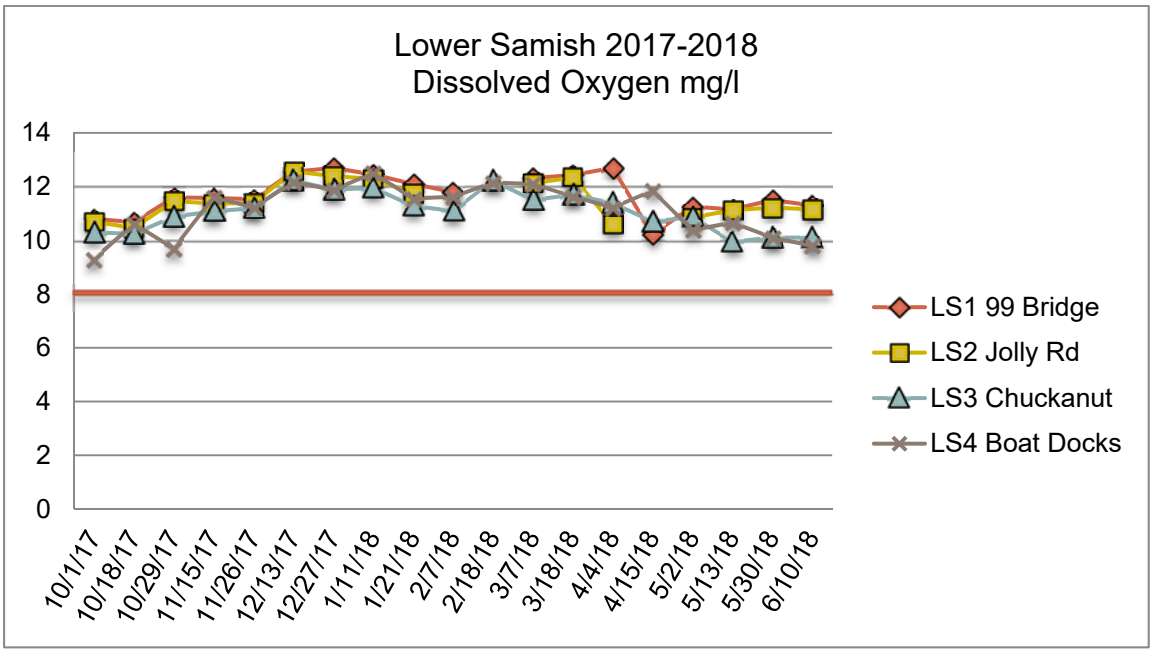

Figure 18. Lower Samish DO: 2017-2018

Average dissolved oxygen levels (Figure 20) at sites 1-3 have been consistent for the last ten years, with most sites in the 10-12mg/l range. The standard is based on the lowest single day, not on an annual average.

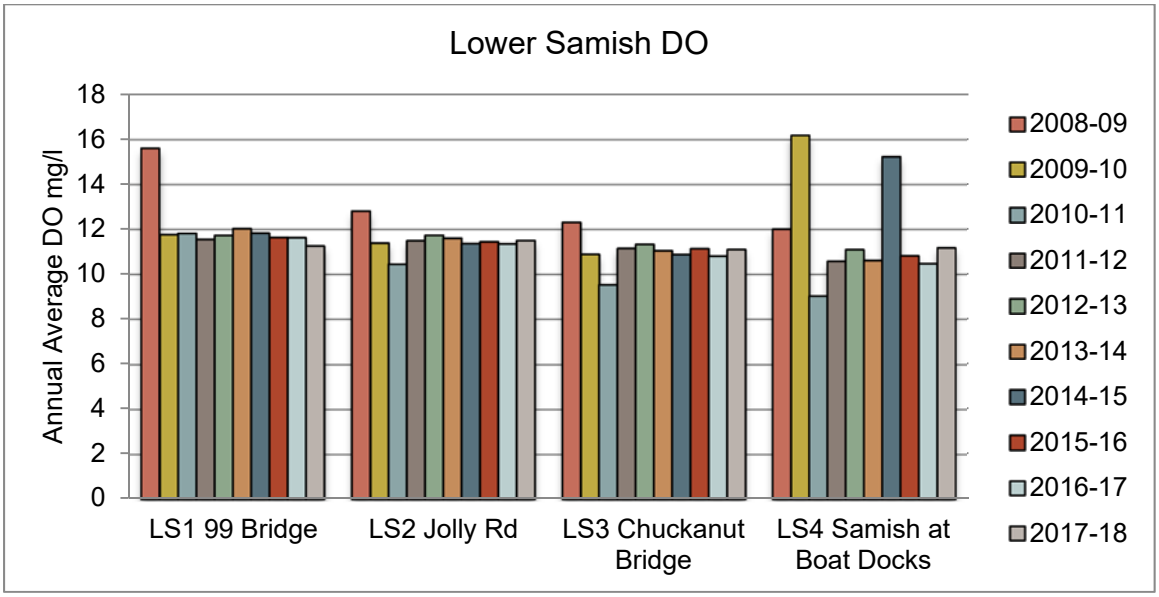

Figure 19. Lower Samish DO: Ten-year comparison

Temperatures throughout the sampling season were below 16 °C, but sampling stopped before the warmest months.

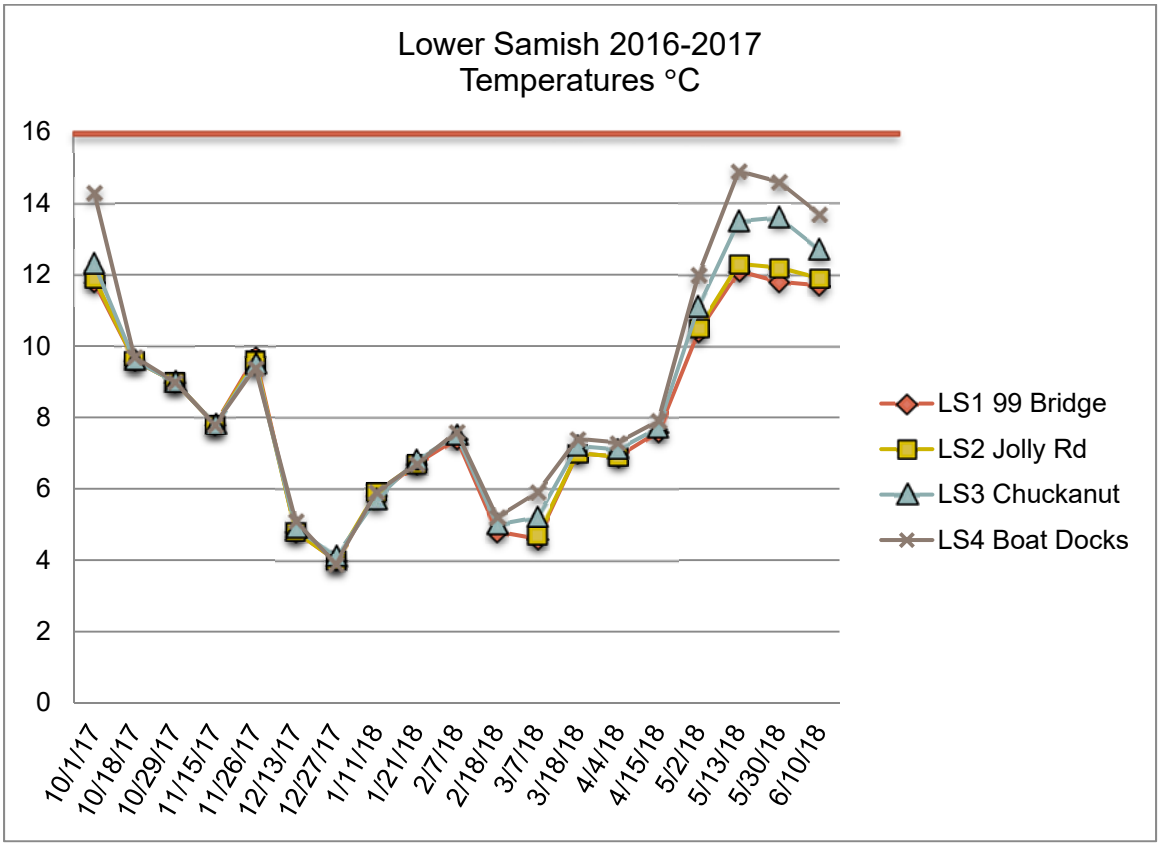

Figure 20. Lower Samish Temperature: 2017-2018

Average temperatures were slightly higher than last year, but show little long-term variation. Standards are not based on average temperatures.

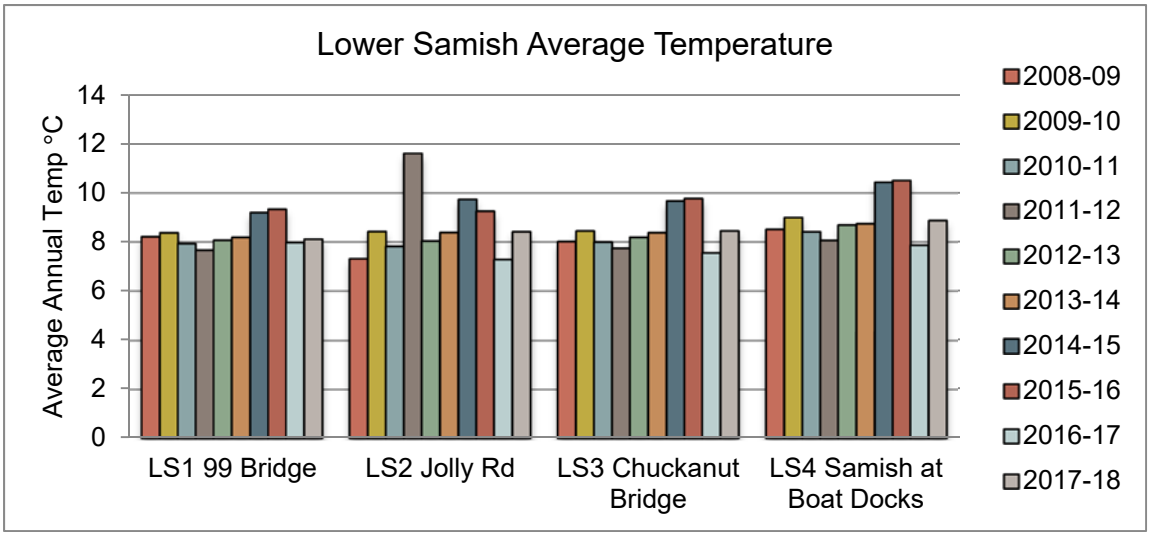

Figure 21. Lower Samish Temperature: Ten-year comparison

The spike in turbidity 2/7/18 can also be seen a week later in the Upper Samish, and corresponds to a half inch of rainfall the previous 24 hours.

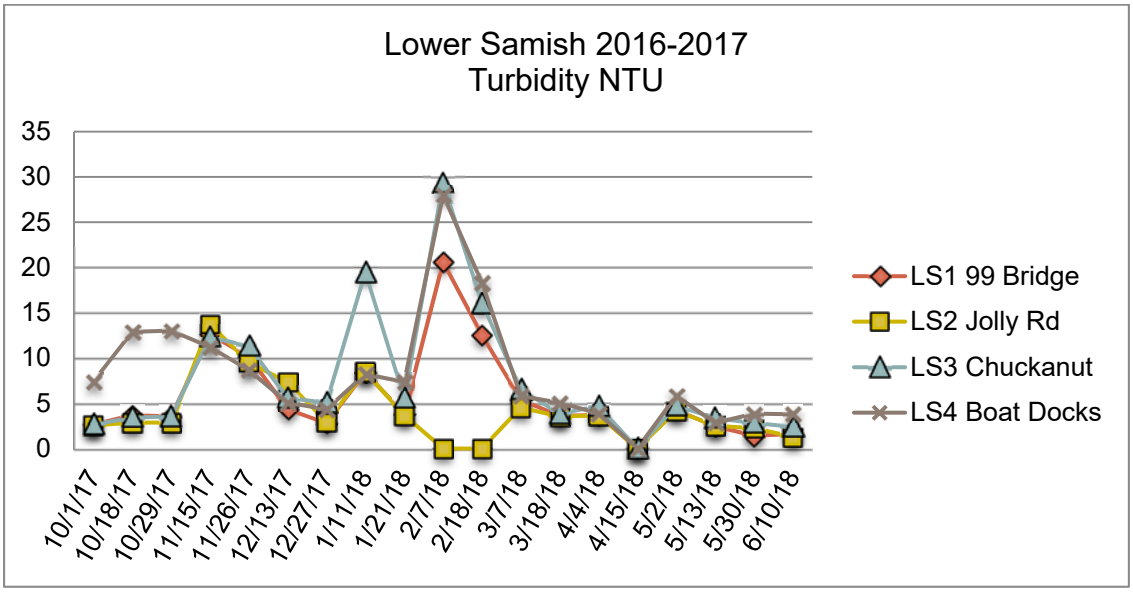

Figure 22. Lower Samish Turbidity: 2017-2018

Turbidity levels have trended downward over the past ten years.

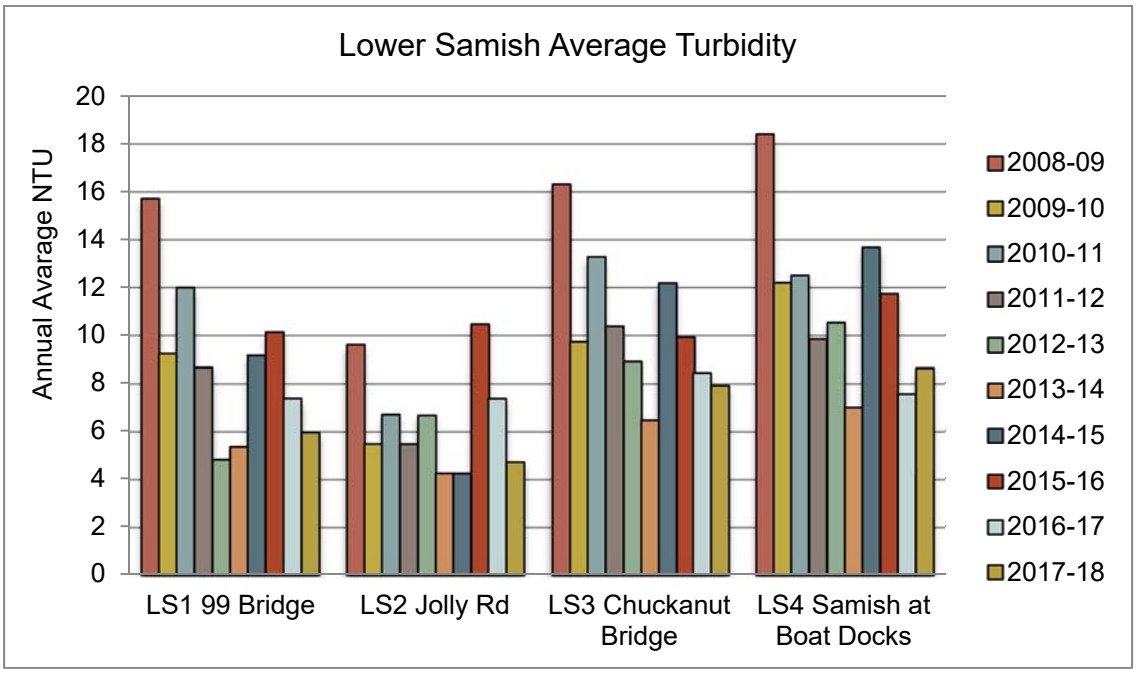

Figure 23. Lower Samish Turbidity: Ten-year comparison

Fecal Coliform levels for the Lower Samish were lower than last year, with a two incidents of high counts.

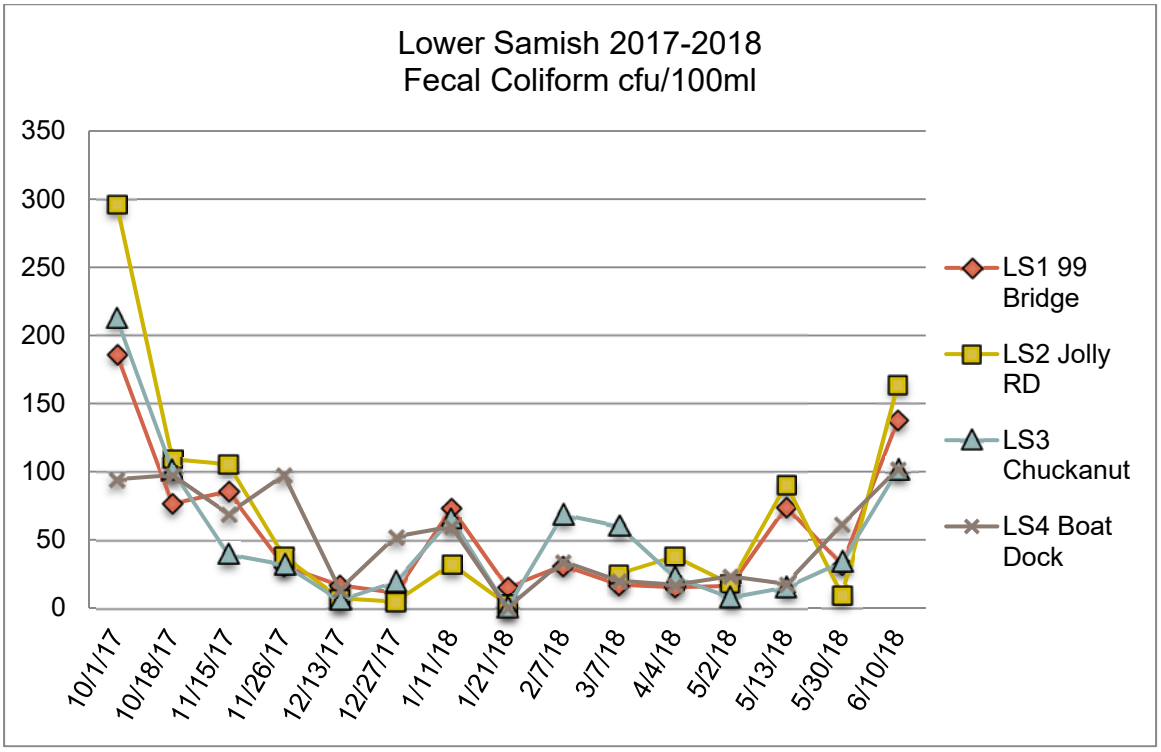

Figure 24. Lower Samish Fecal Coliform: 2017-2018

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

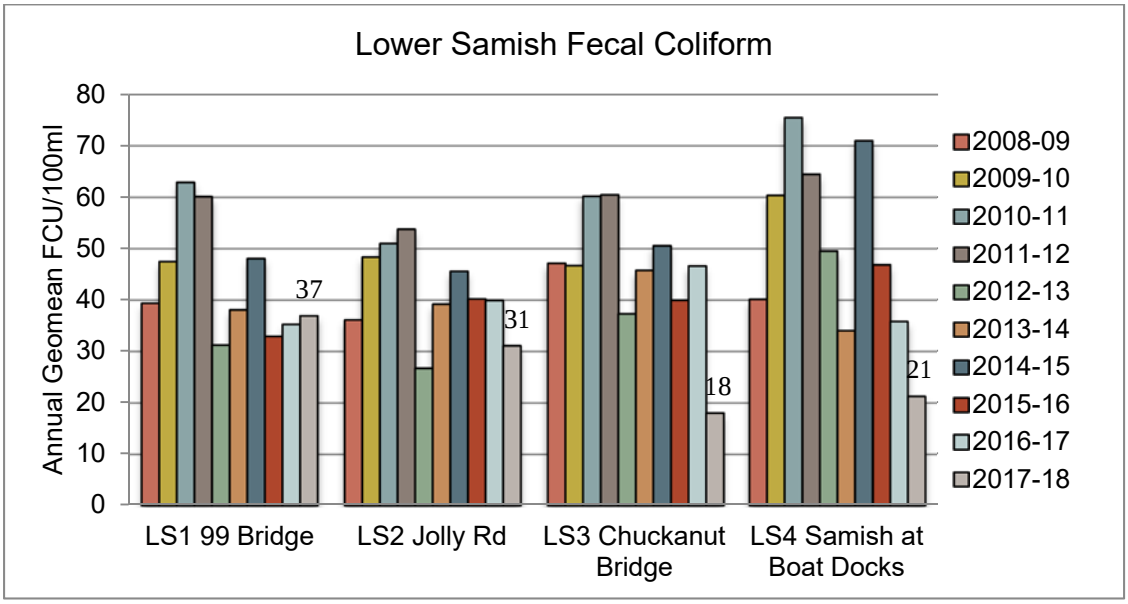

Figure 25. Lower Samish Fecal Coliform: Ten-year comparison

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° much of the season, and was usually the lowest of the four sites.

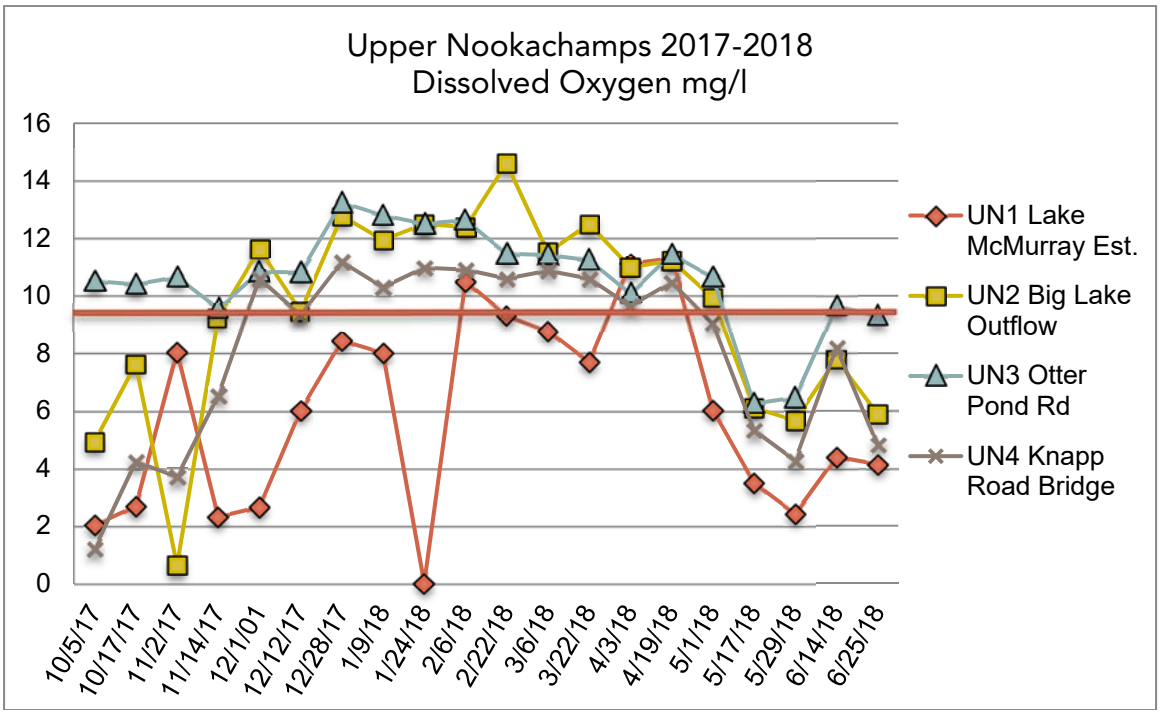

Figure 26. Upper Nookachamps DO: 2017-2018

Sites 1 and 4 had the lowest DO levels in seven years of sampling. State standards are based on the single lowest measurement, not on annual averages, so to see averages below 9.5°C indicates a serious, long-term problem.

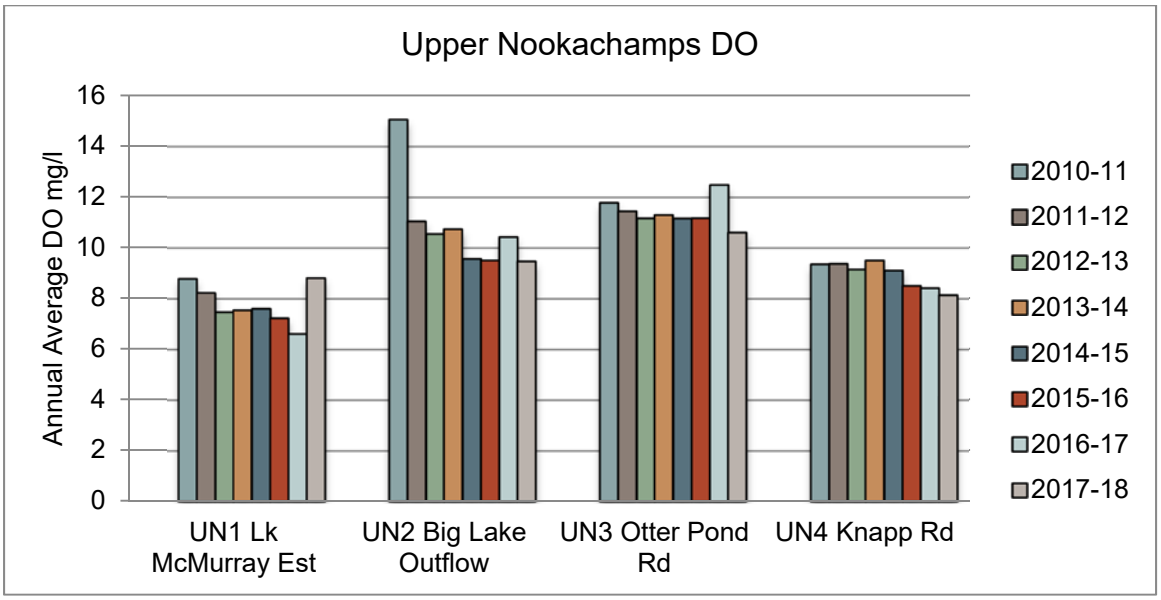

Figure 27. Upper Nookachamps DO: Eight-year comparison

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

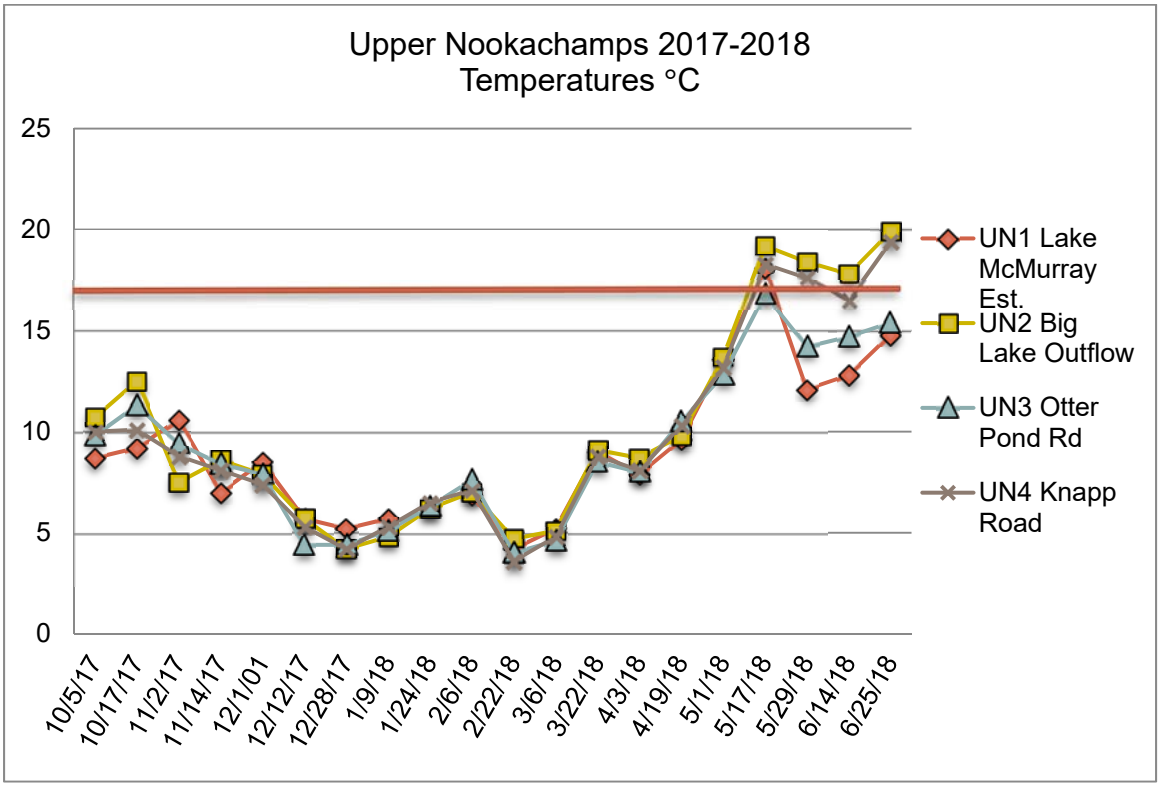

Figure 28. Upper Nookachamps Temperature: 2017-2018

Average temperatures for all Upper Nookachamps sites were above the previous year, but still lower than the highest temperatures in 2014-15. State standards are not based on average annual temperature.

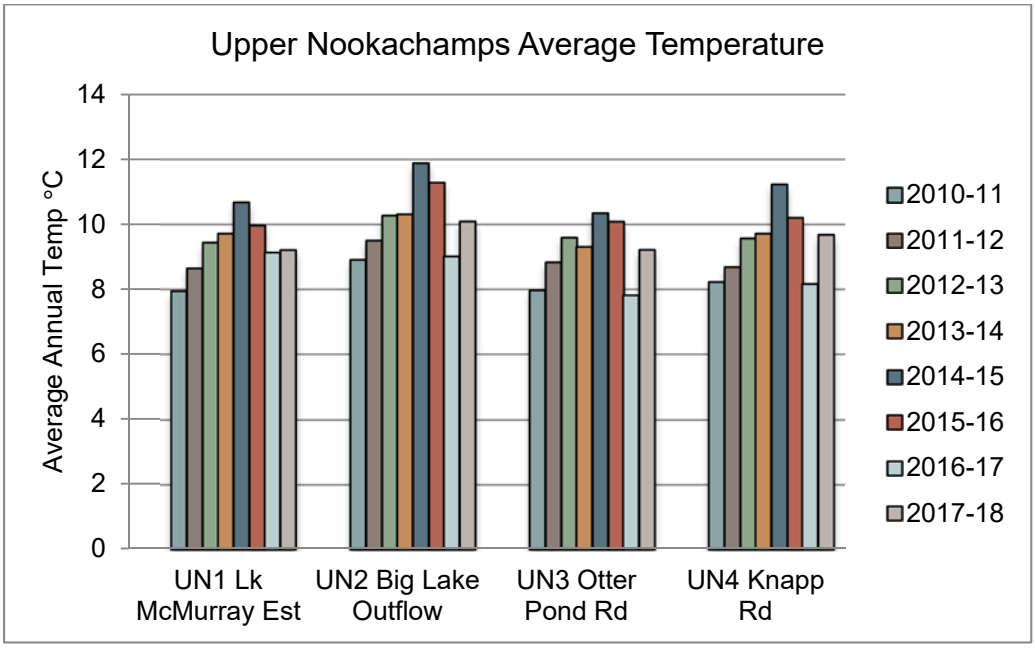

Figure 29. Upper Nookachamps Temperature: Eight-year comparison

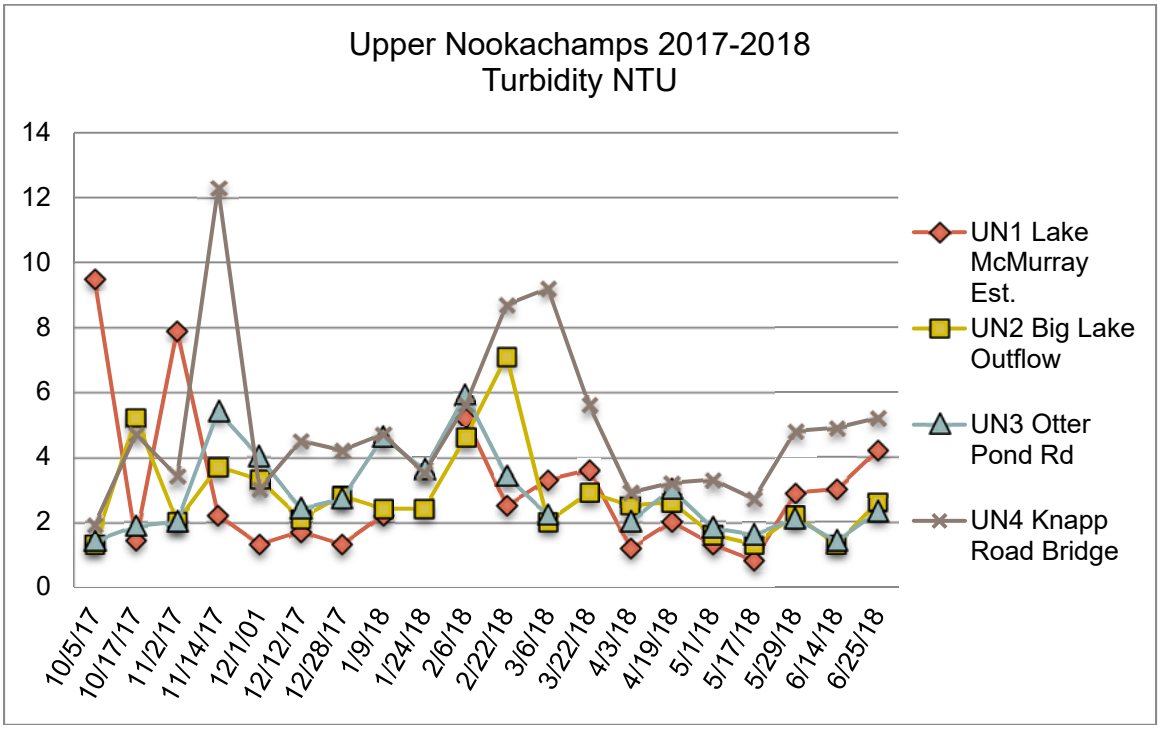

Figure 30. Upper Nookachamps Turbidity: 2017-2018

As in the previous years, turbidity was highest at site 4.

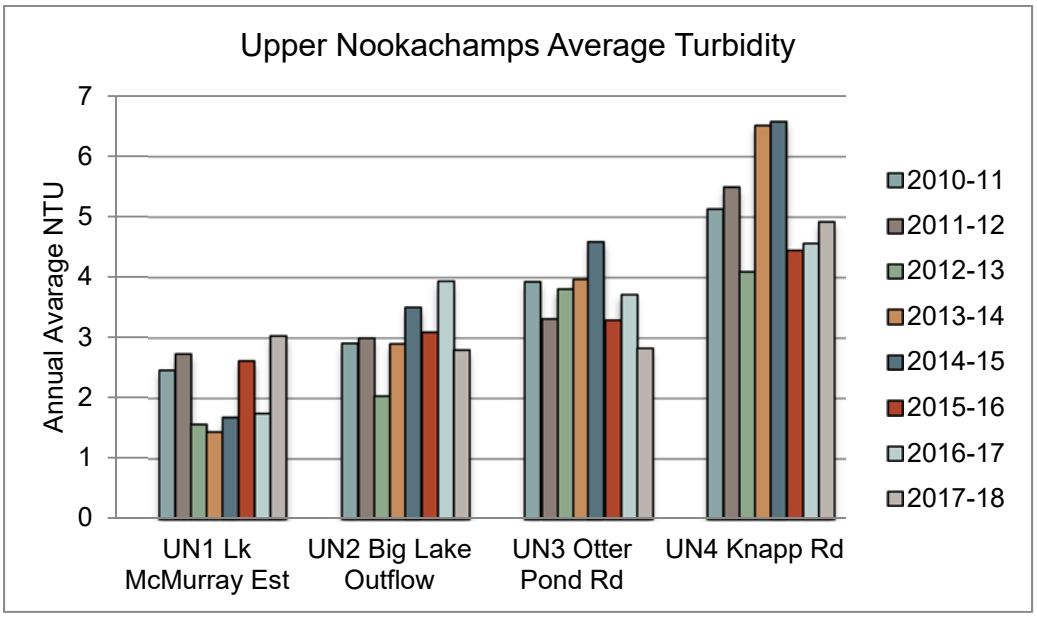

Figure 31. Upper Nookachamps Turbidity: Eight-year comparison

Fecal coliform levels (Figure 32 below) stayed relatively low through the season for Sites 1-3. Site 4 was more variable, with several very high counts.

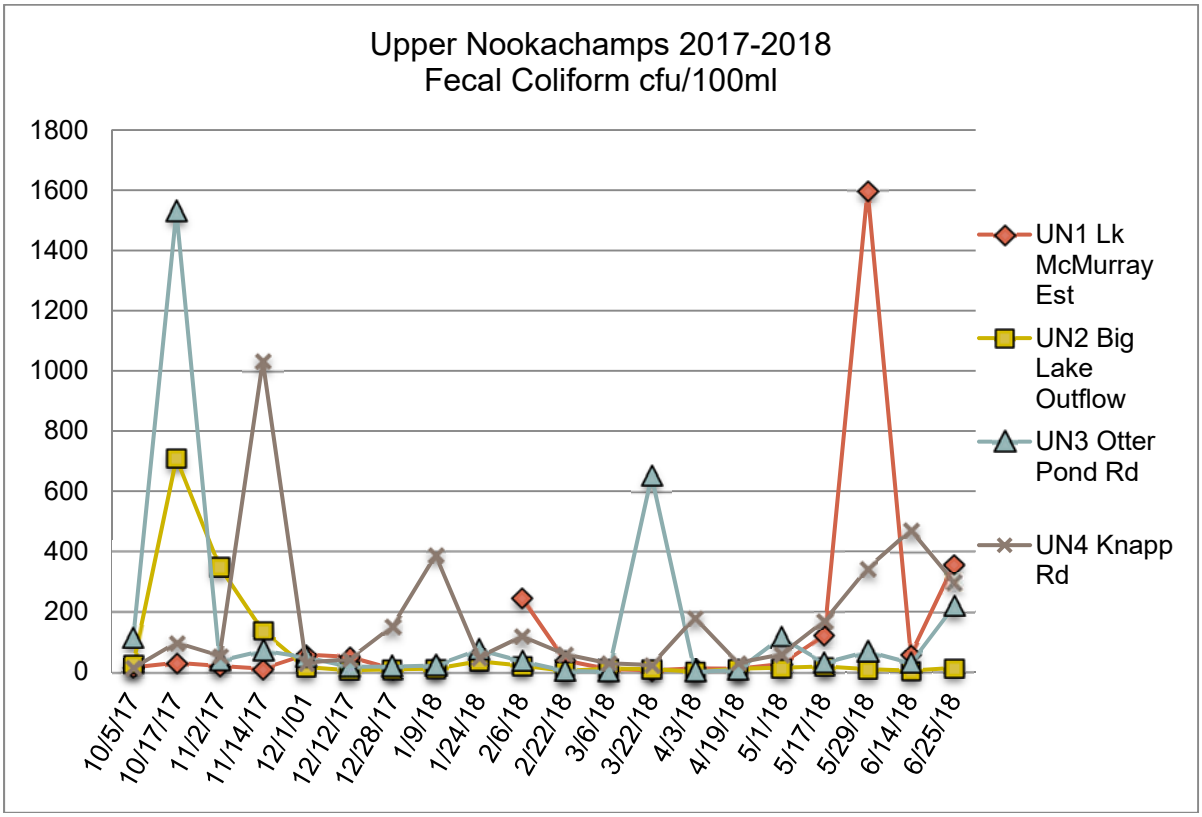

Figure 32. Upper Nookachamps Fecal Coliform: 2017-2018

Annual geometric means for fecal coliform for all Sites (Figure 33 below) met part 1 of the state standard (100 CFU/100ml). None of the sites met part 2 with <10% of samples below 200 CFU/100ml.

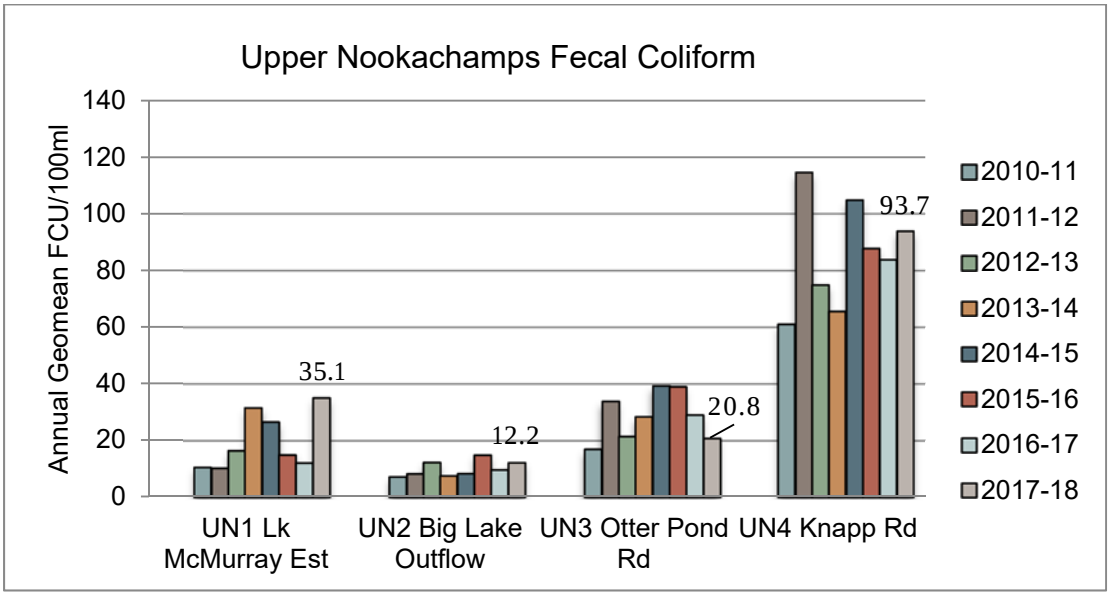

Figure 33. Upper Nookachamps Fecal Coliform: Eight-year comparison

Lower Nookachamps Results

Figures 34 through 41 below present results from Lower Nookachamps Creek sampling.

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

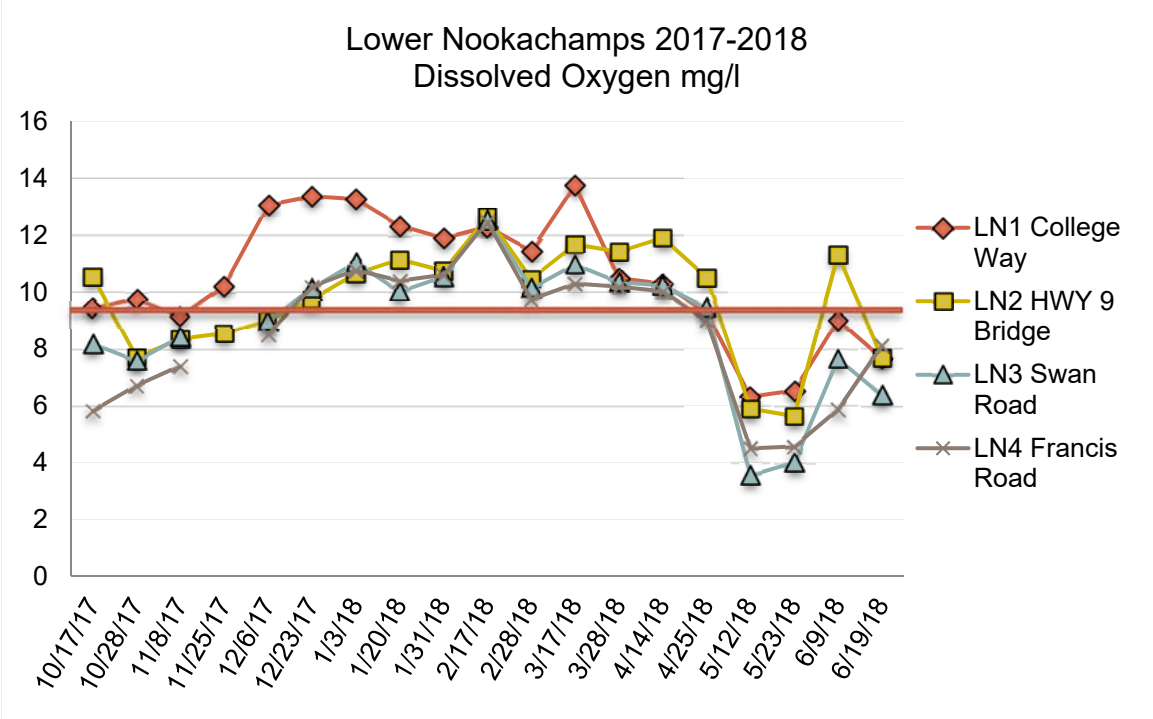

Figure 34. Lower Nookachamps DO: 2017-2018

Average dissolved oxygen levels were low relative to the standard of 9.5°C at all sites, with the lowest readings in eight years at sites 2 and 4. Averages are shown below for comparing sites and years, and are not relevant to state standards.

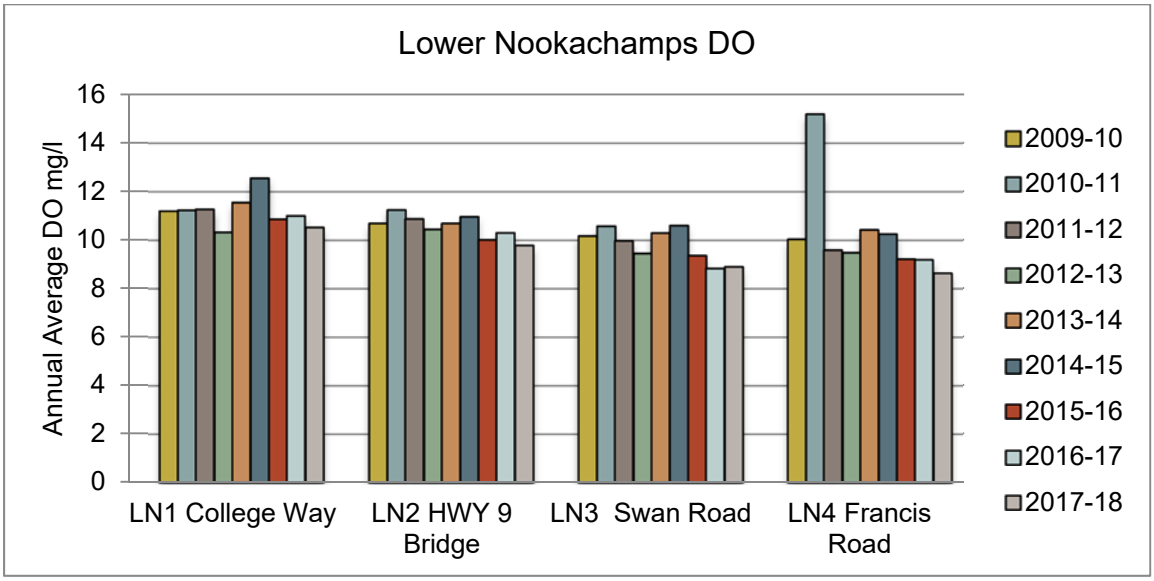

Figure 35. Lower Nookachamps DO: Nine-year comparison

Temperatures for Site 4 went above the state standard of 16°C in June. No samples were taken during the warmest summer months.

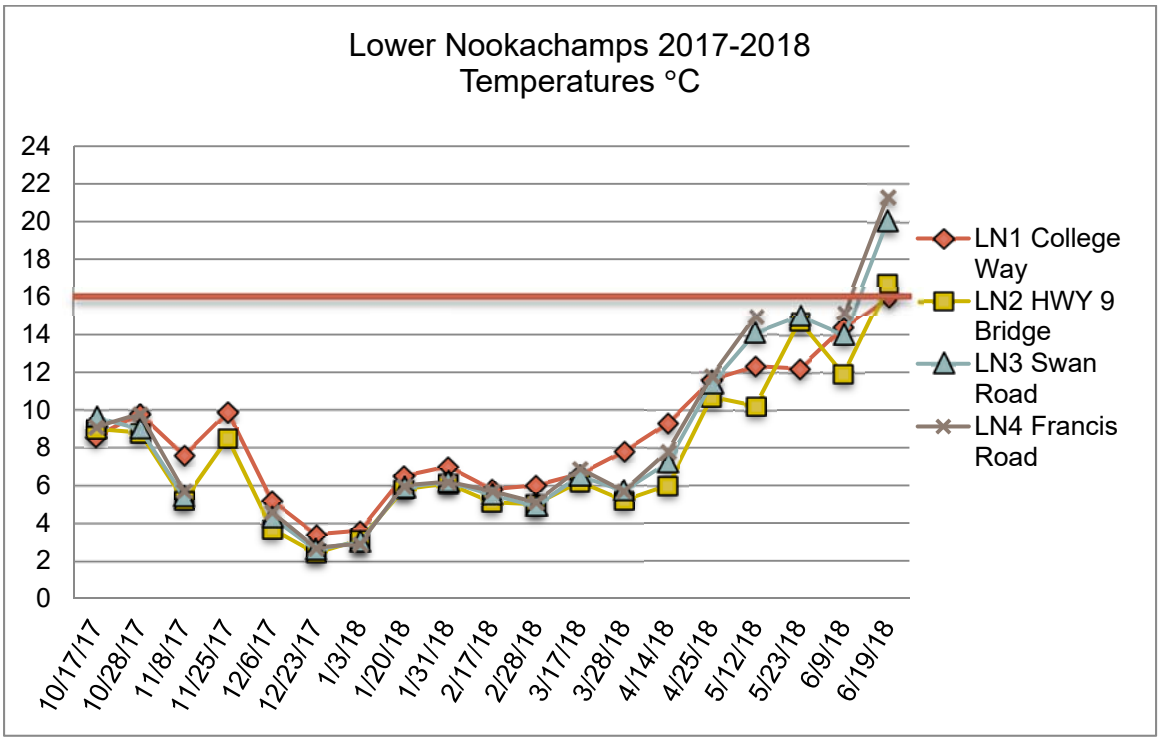

Figure 36. Lower Nookachamps Temperature: 2017-2018

Annual average temperatures for all Lower Nookachamps Sites (Figure 37 below) were the highest in eight years of sampling. State standards are not based on the annual average

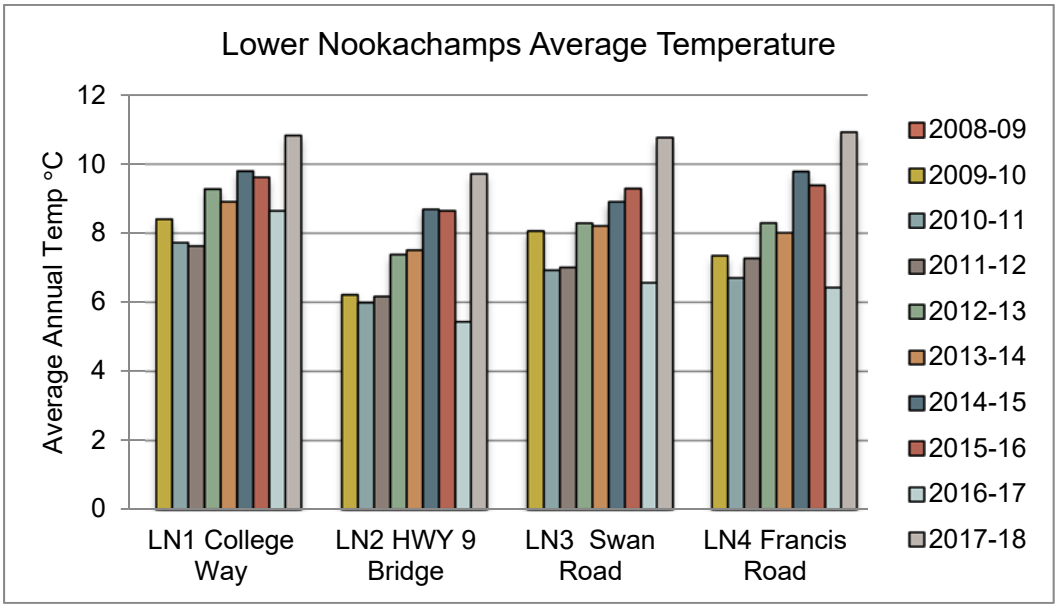

Figure 37. Lower Nookachamps Temperature: Ten-year comparison

The unusually high tubidity at site 2 on November 25 was the result of high rains and flood condition that prevented sampling at sites 3 and 4.

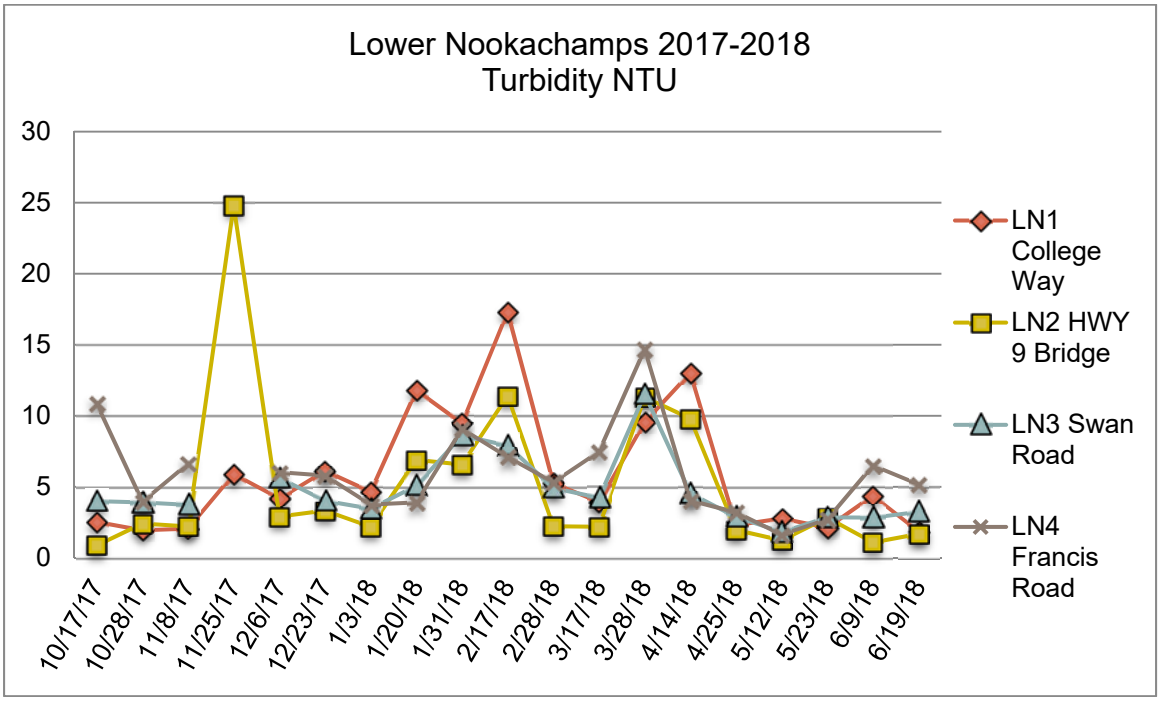

Figure 38. Lower Nookachamps Turbidity: 2017-2018

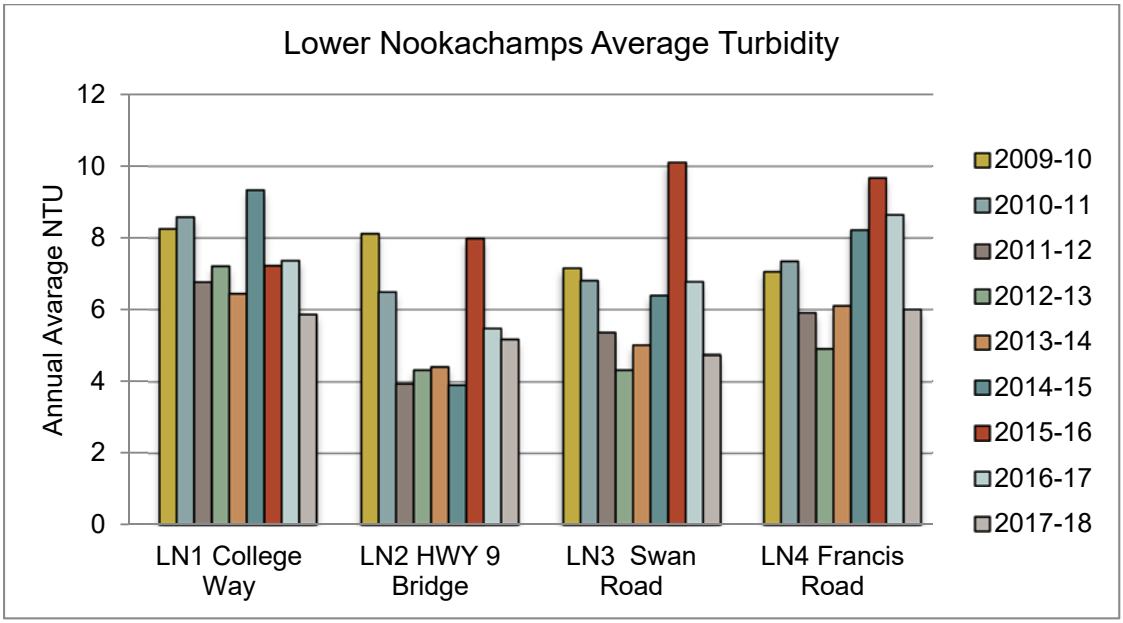

Figure 39. Lower Nookachamps Turbidity: Nine-year comparison

Site 1, College Way again saw periodic high fecal coliform levels while other sites were relatively low.

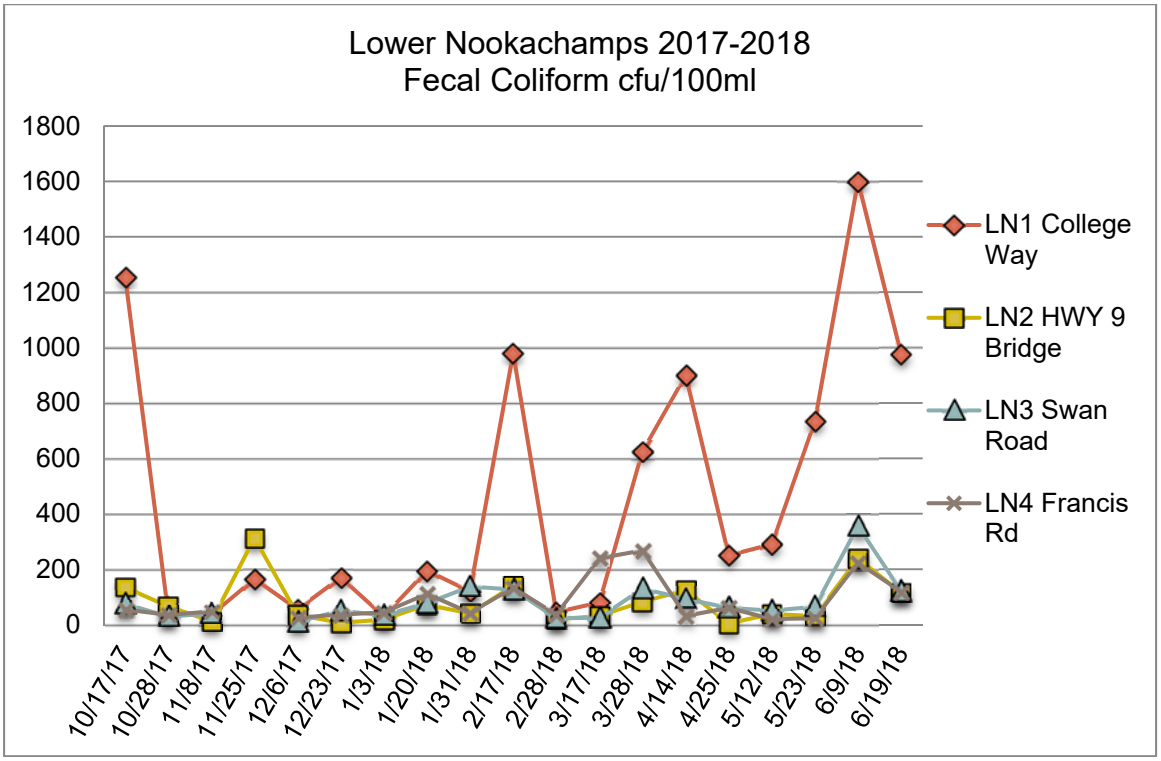

Figure 40. Lower Nookachamps Fecal Coliform: 2017-2018

Site 1 fecal coliform has been highly variable over the past 10 years. Sites2-4 met the first part of the standard (<100 CFU/100ml). Site 3 also met the <10% over 200 CFU/100ml standard.

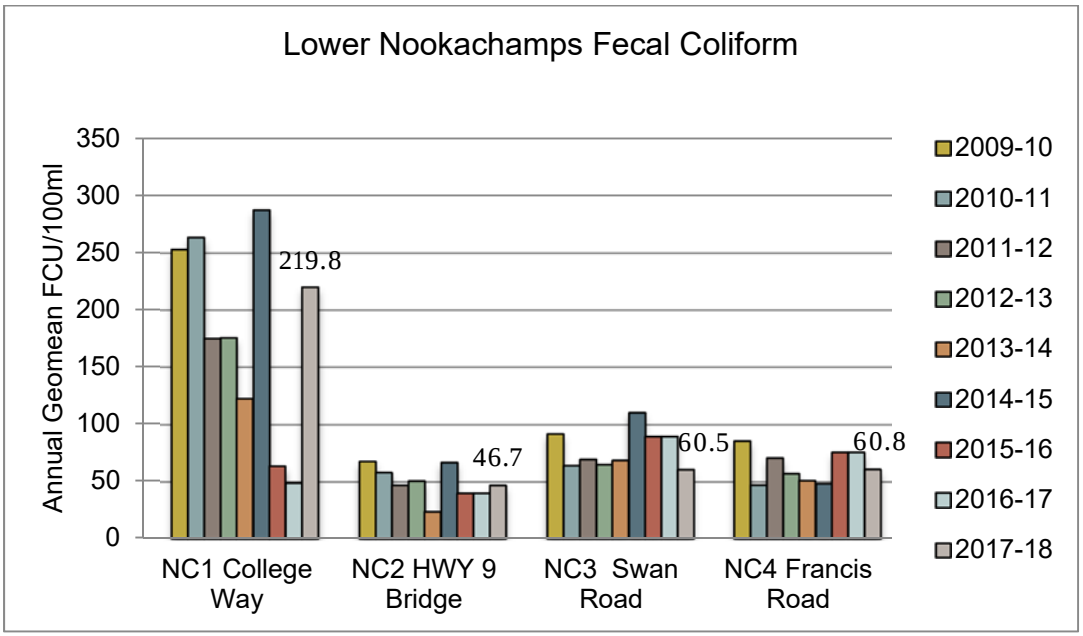

Figure 41. Lower Nookachamps Fecal Coliform: Nine-year comparison

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 at all sites during the sampling season. The upper stream dries up in early summer.

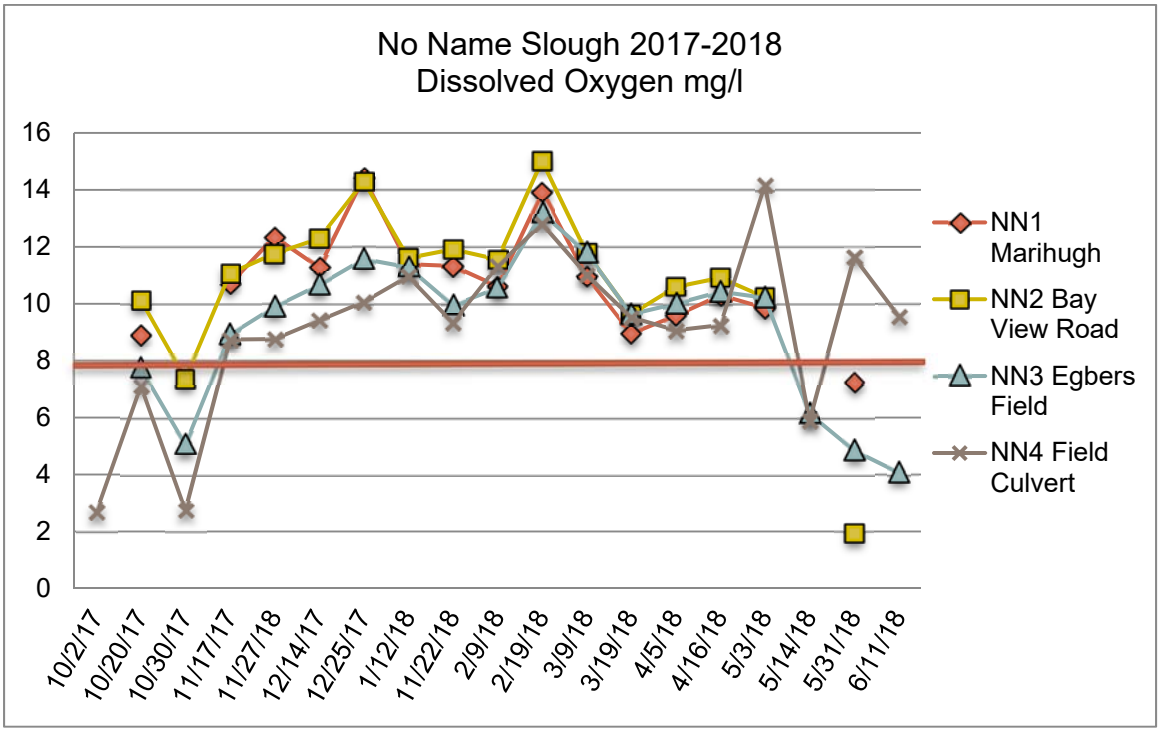

Figure 42. No Name Slough DO: 2017-2018

Average DO were similar to past years at all sites. State standards are not based on the annual average.

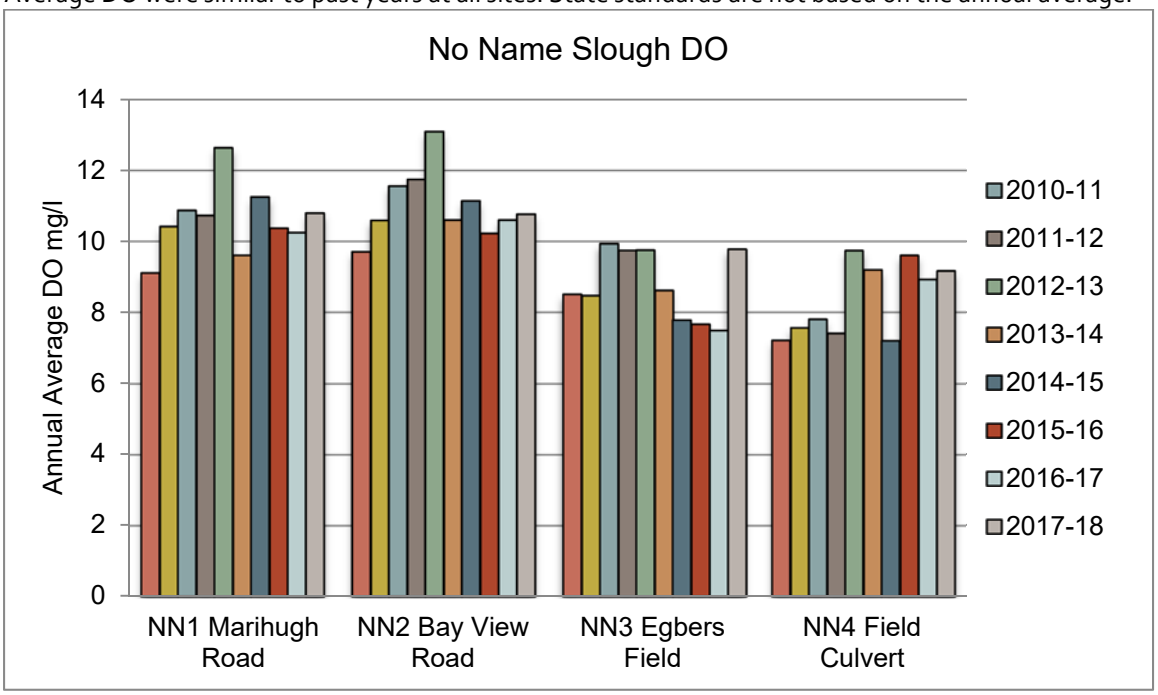

Figure 43. No Name Slough DO: Ten-year comparison

Temperatures at No Name Sites 1-3 were within the optimum range of <17.5°C throughout the sampling period. Site 4 was above this temperature in May and June. No samples were taken during the warmest summer season when temperatures were most likely to be warmer than the state standard.

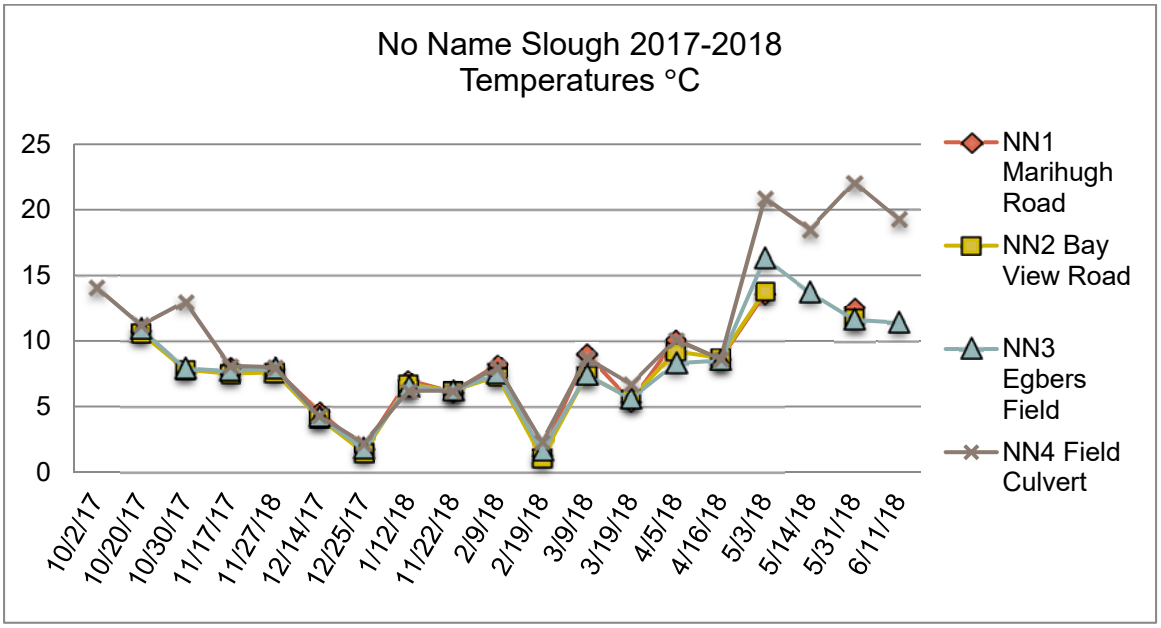

Figure 44 No Name Slough Temperature: 2017-2018

Average temperatures were higher than last year's unusually cool levels and more in line with previous years. State standards are not based on the annual average.

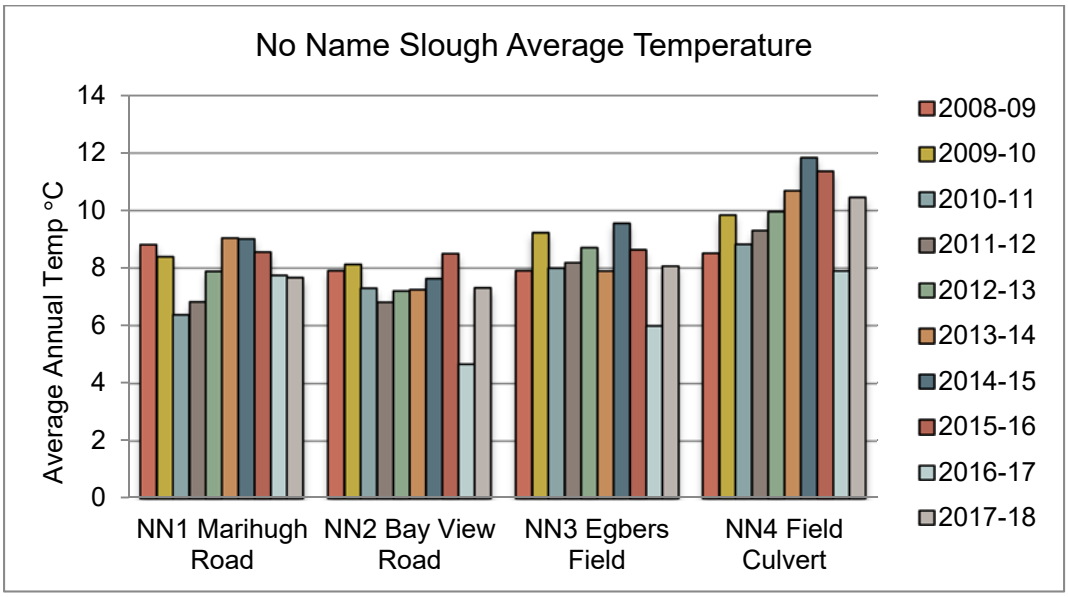

Figure 45. No Name Slough Temperature: Ten-year comparison

No Name Site 4 (Figure 47 below) showed the highest variability in turbidity during 2017-2018 .

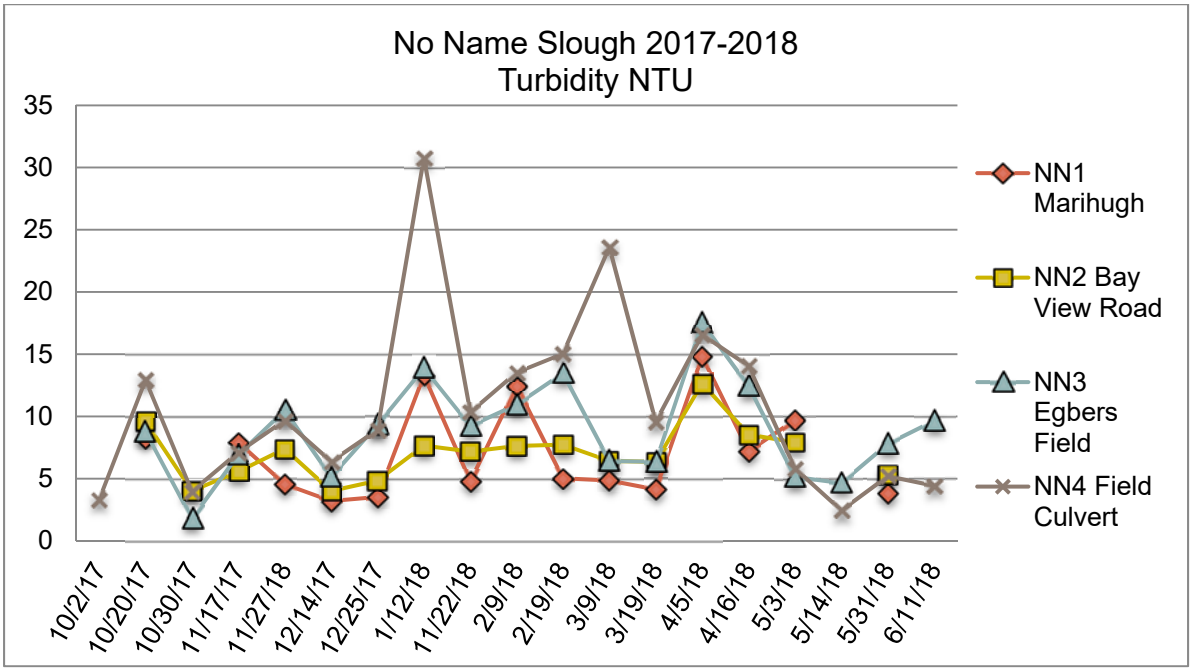

Figure 46. No Name Slough Turbidity: 2017-2018

Figure 47 below shows average turbidity levels that are comparatively low. Sites 3 and 4 have benefitted from extensive plantings along the slough.

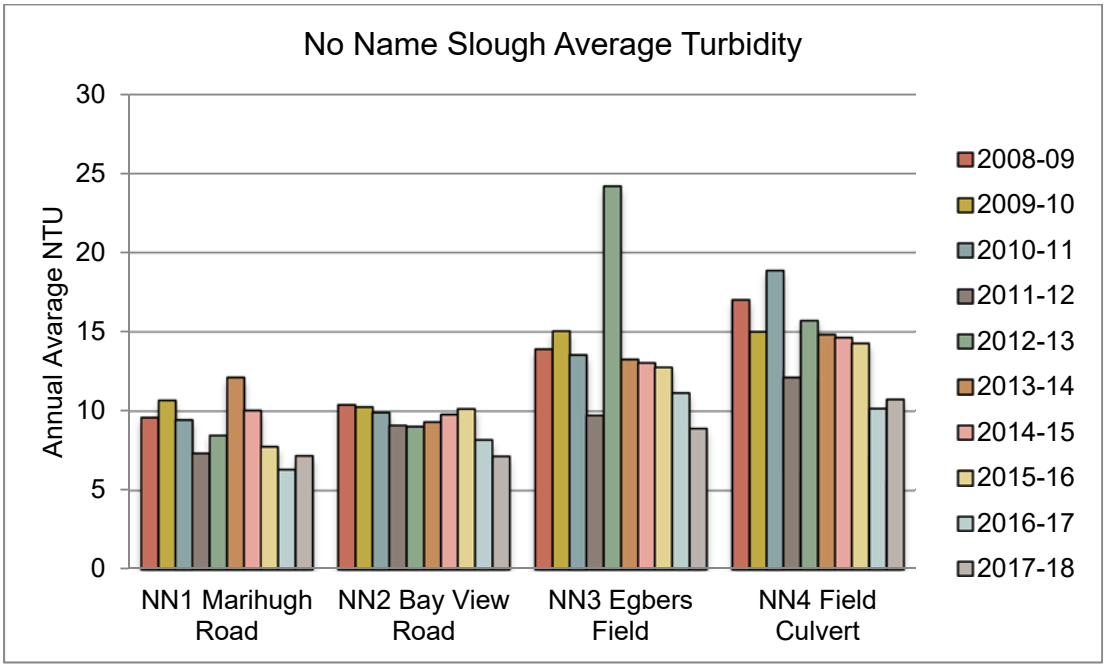

Figure 47. No Name Slough Turbidity: Ten-year comparison

All No Name Slough sites had instances of very high fecal coliform levels in 2017-2018 . None of the sites met the <10% over 200 CFU/100ml standard.

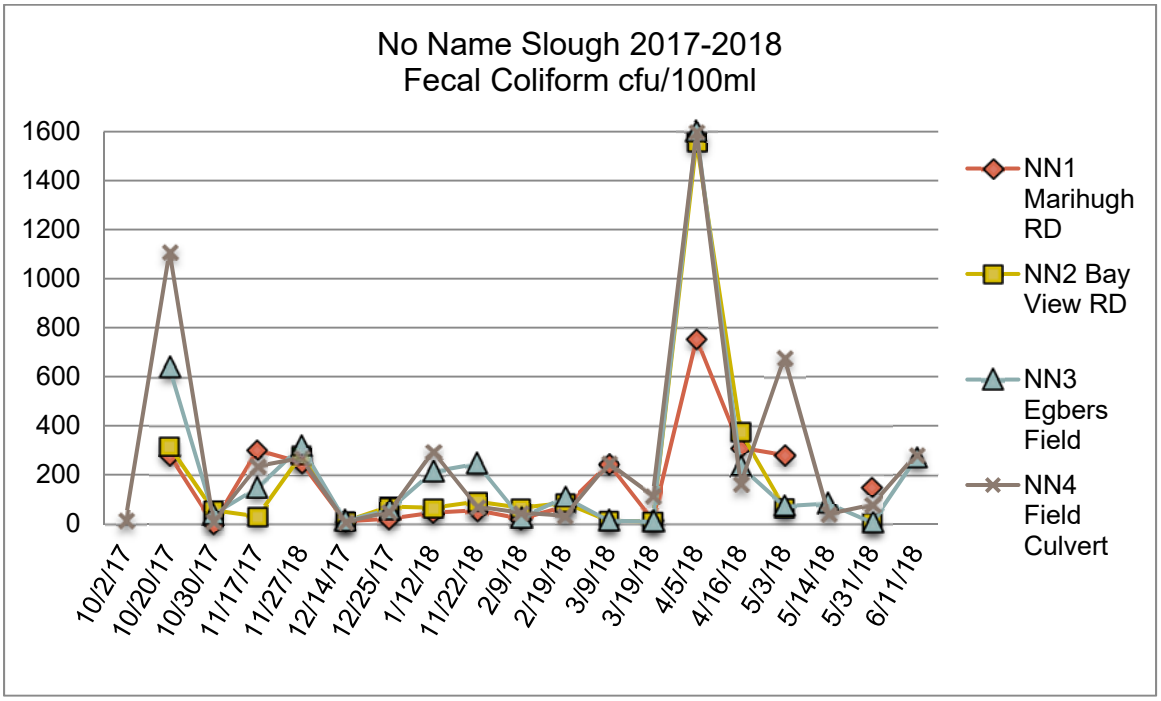

Figure 48. No Name Slough Fecal Coliform: 2017-2018

Average fecal coliform was just above the standard of 100CFU/100 ml at Sites 1, 3, and 4.

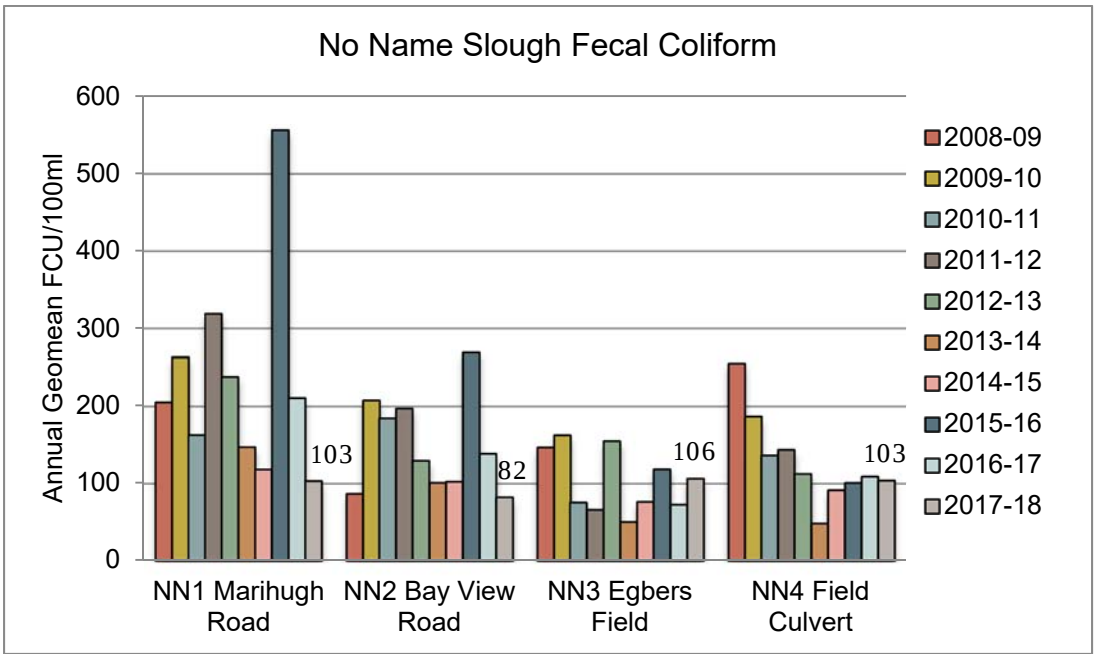

Figure 49. No Name Slough Fecal Coliform: Ten-year comparison

Bay View Drainage Results

Figures 50 through 57 below present results from Bay View Drainage sampling. Sites 1-3 are roadside ditches that dry up between rainy periods. Site 4 is often without water due to low tide.

Dissolved oxygen measurements are limited for Bay View.

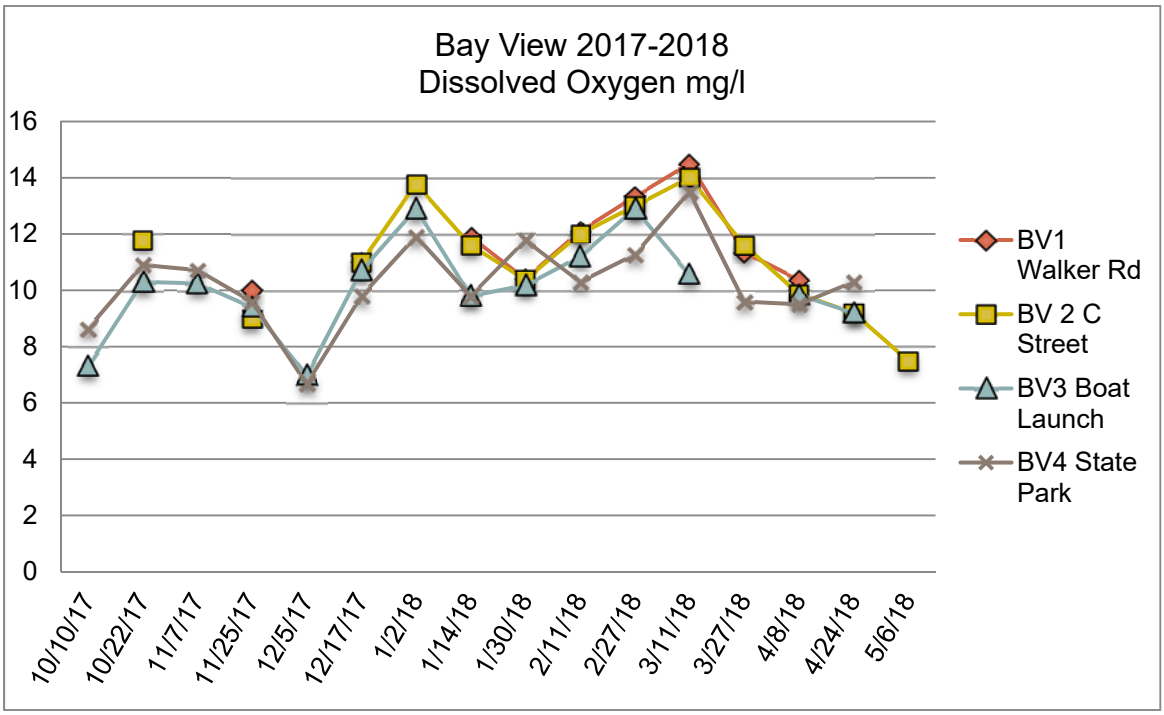

Figure 50. Bay View Drainage DO: 2017-2018

Average dissolved oxygen levels are similar between sites and across years. State standards are not based on averages.

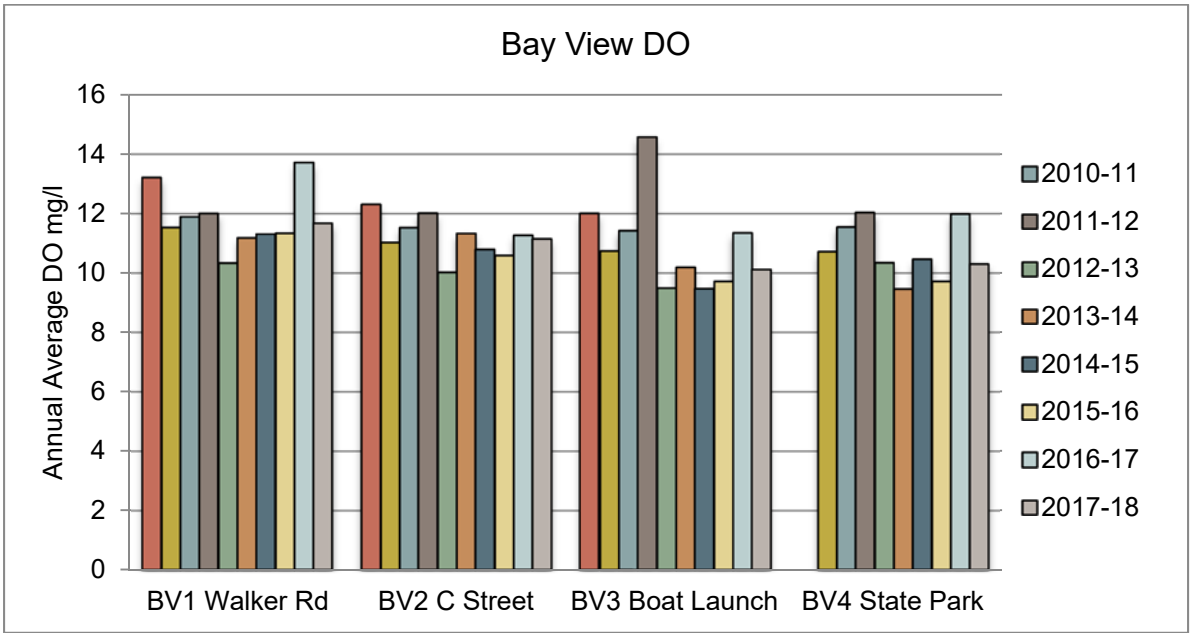

Figure 51. Bay View Drainage DO: Nine-year comparison

Temperatures in 2017-2018 were below the maximum of 17.5C. Sites dry up during the dry season.

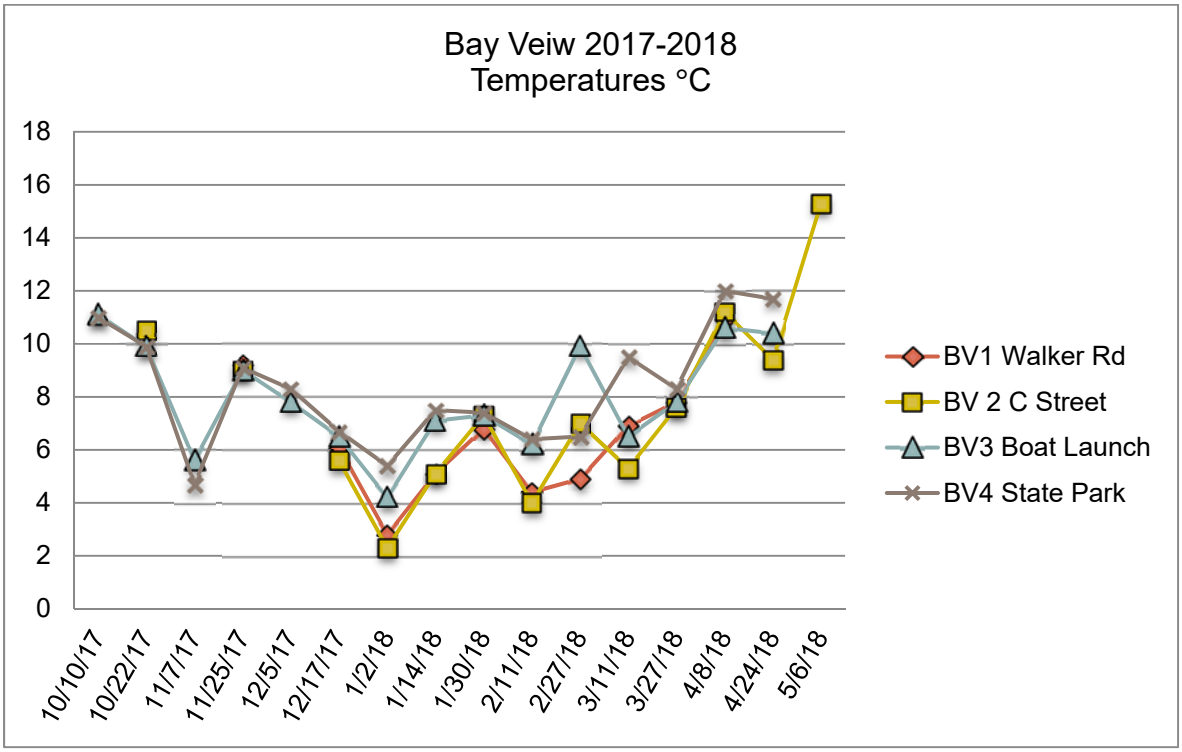

Figure 52. Bay View Drainage Temperature: 2017-2018

Average annual temperatures were higher than last year, but lower than average for these streams.

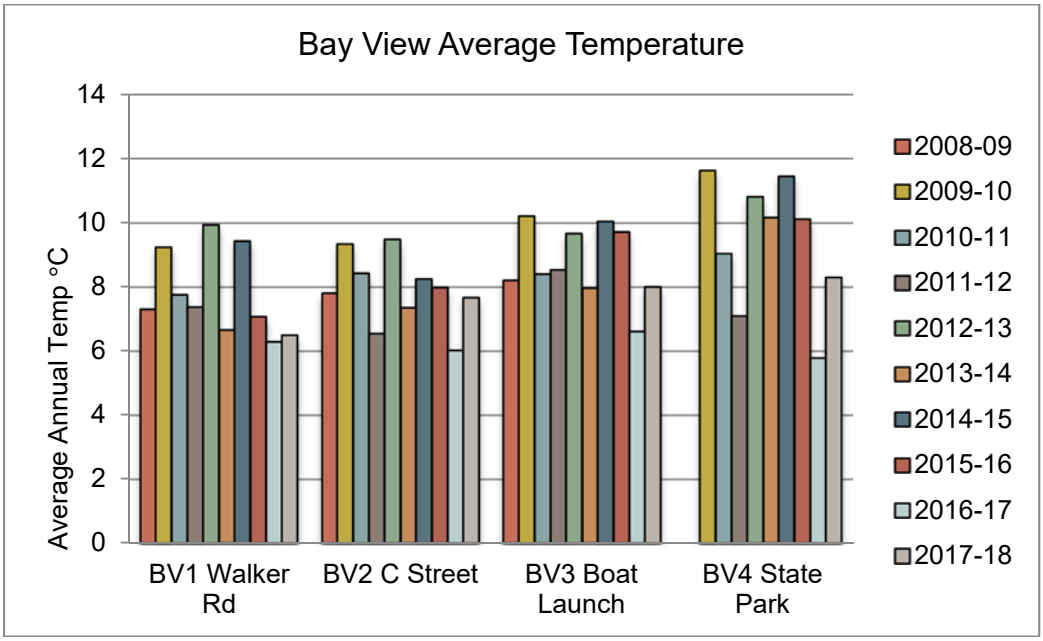

Figure 53. Bay View Drainage Temperature: Ten-year comparison

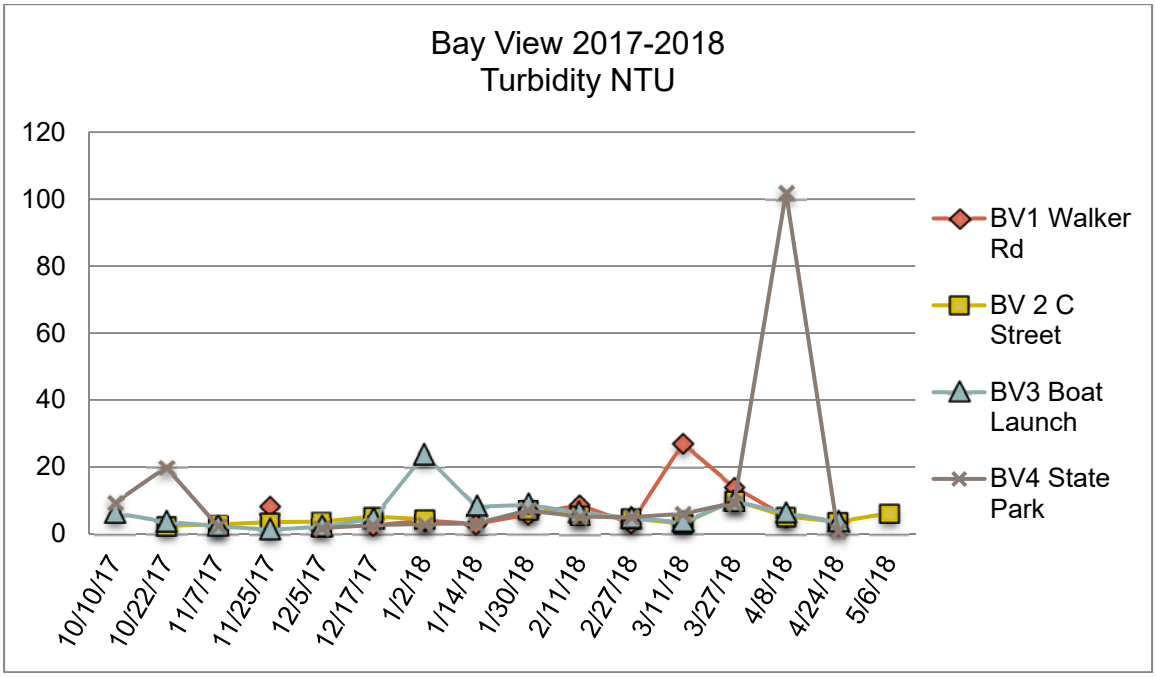

Figure 54. Bay View Turbidity: 2017-2018

Average turbidity levels (Figure 55 below) at site 2 were the lowest in ten years.

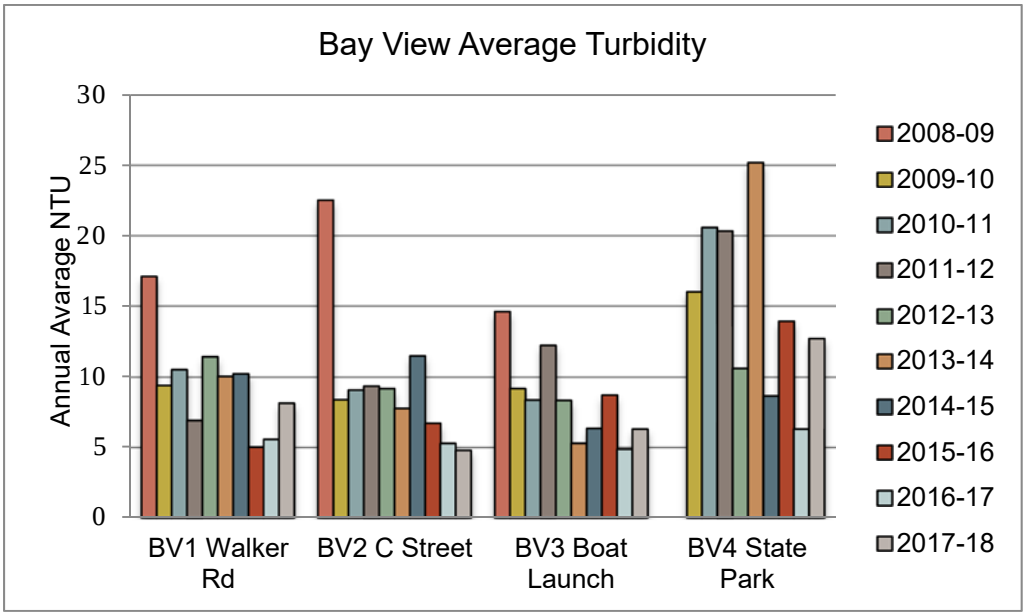

Figure 55. Bay View Drainage Turbidity: Ten-year comparison

All Bay View sites met part 1 of the state standards for fecal colifor, but none met part 2.

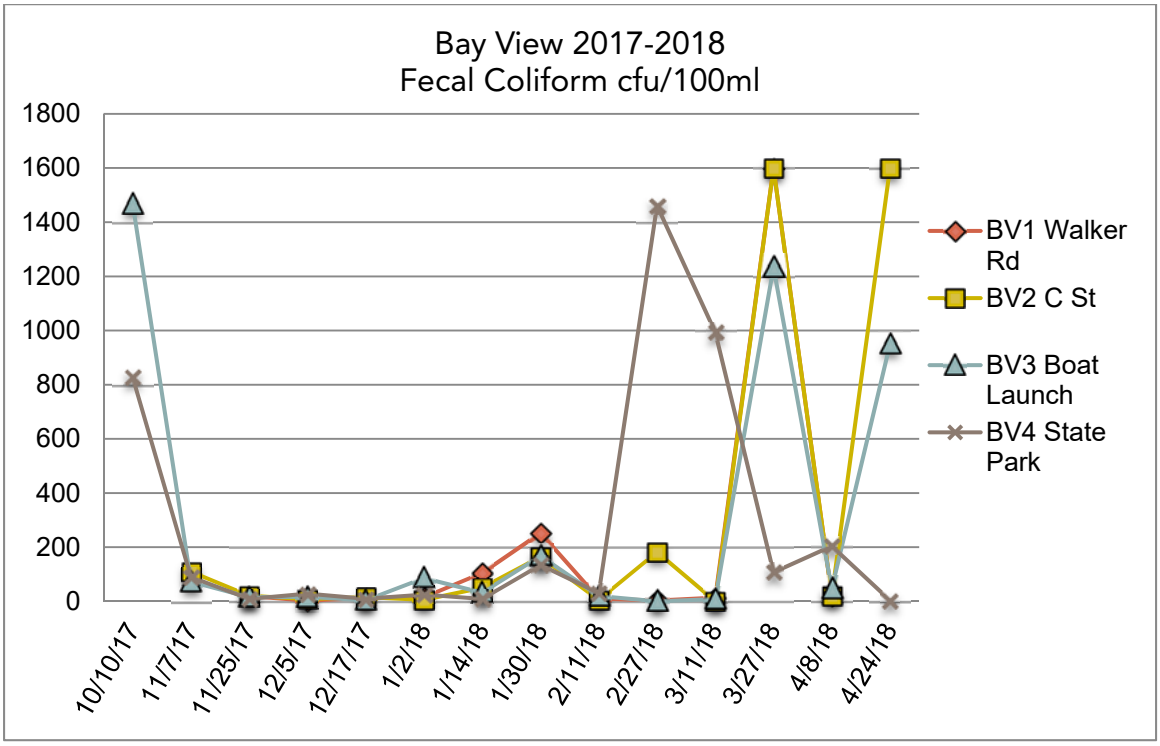

Figure 56. Bay View Drainage Fecal Coliform: 2017-2018

Annual geometric means for Bay View fecal coliform (Figure 57 below) were very low.

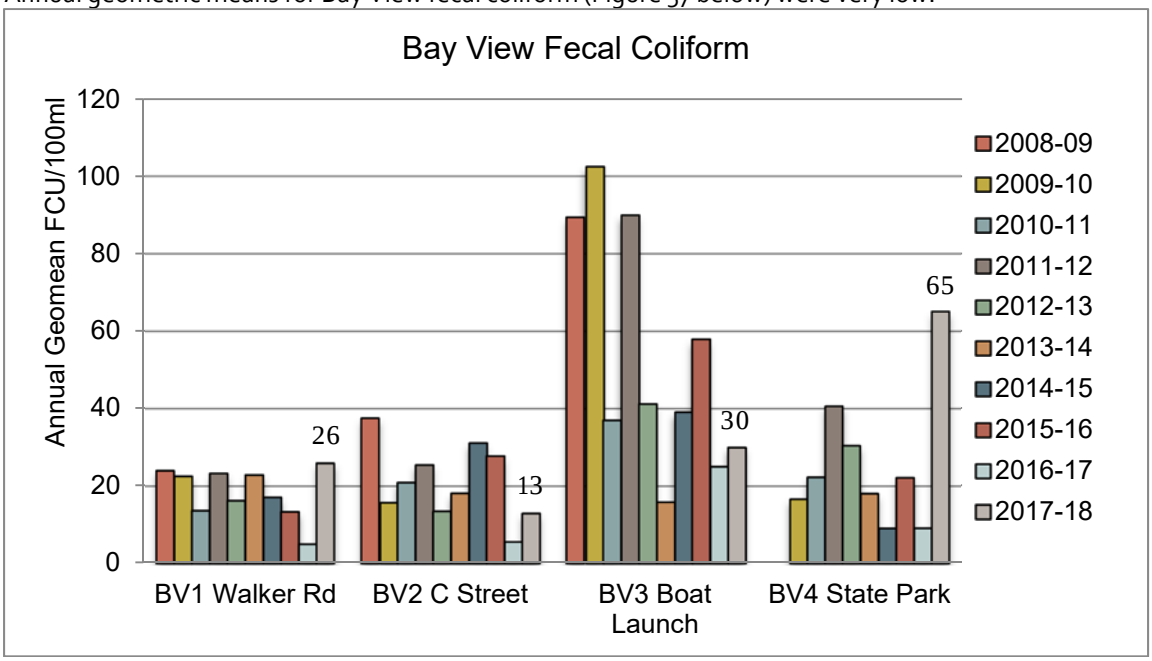

Figure 57. Bay View Drainage Fecal Coliform: Ten-year comparison

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.

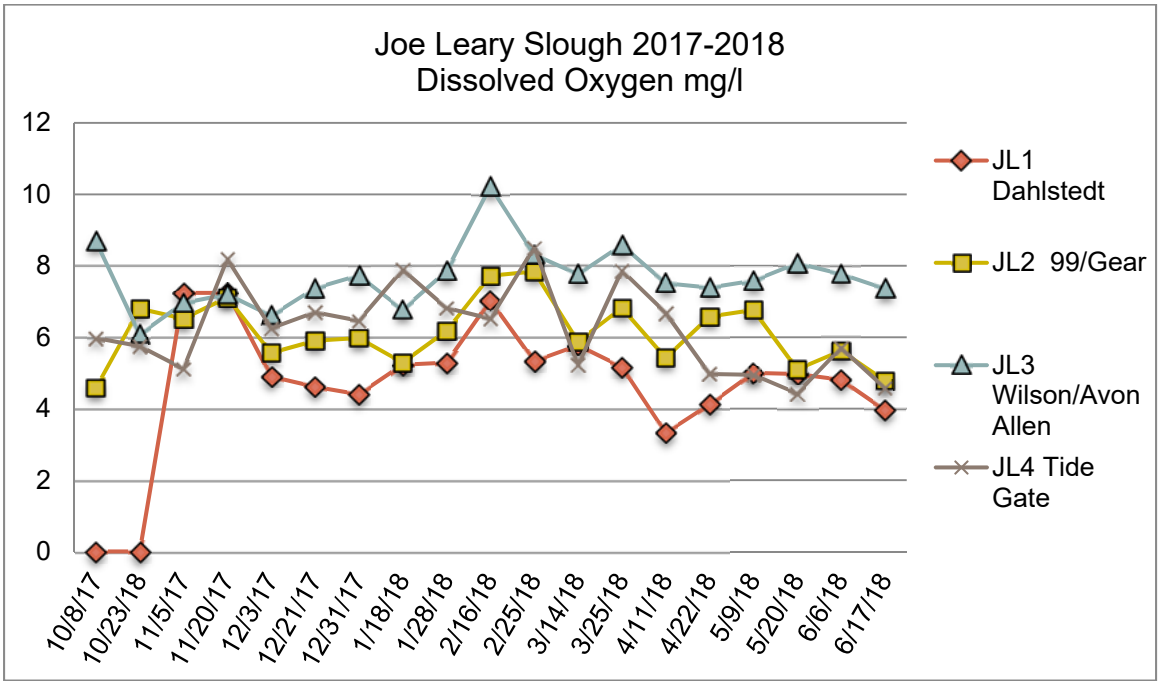

Figure 58. Joe Leary Slough DO: 2017-2018

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

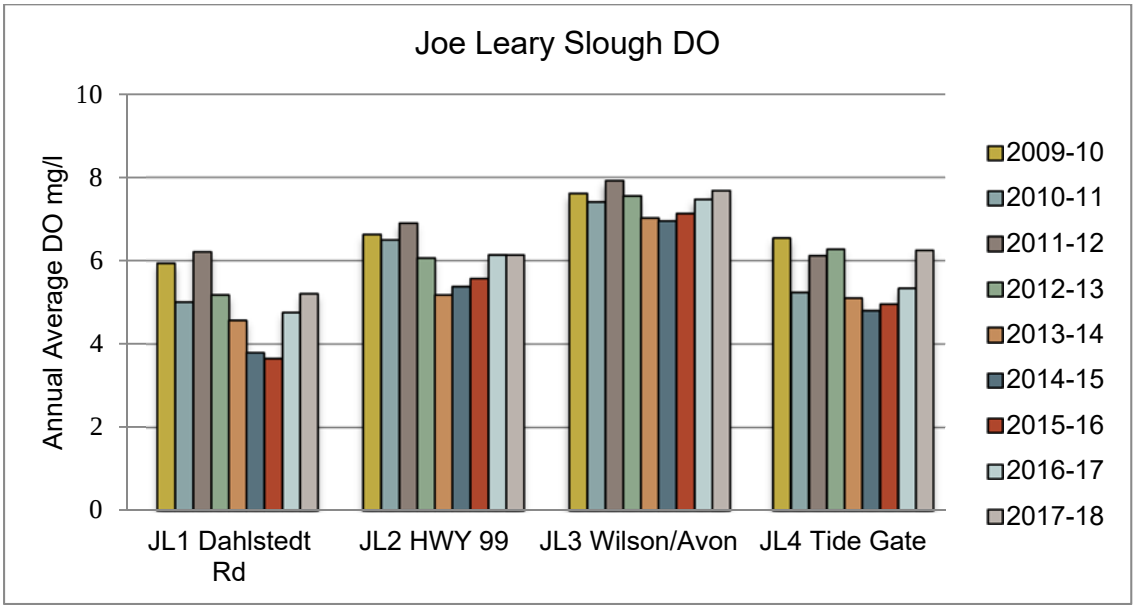

Figure 59. Joe Leary Slough DO: Nine-year comparison

Sites 3 and 4 temperatures were above 17.5 °C in June. No samples were taken during the warmest summer season when temperatures may have risen above the standard.

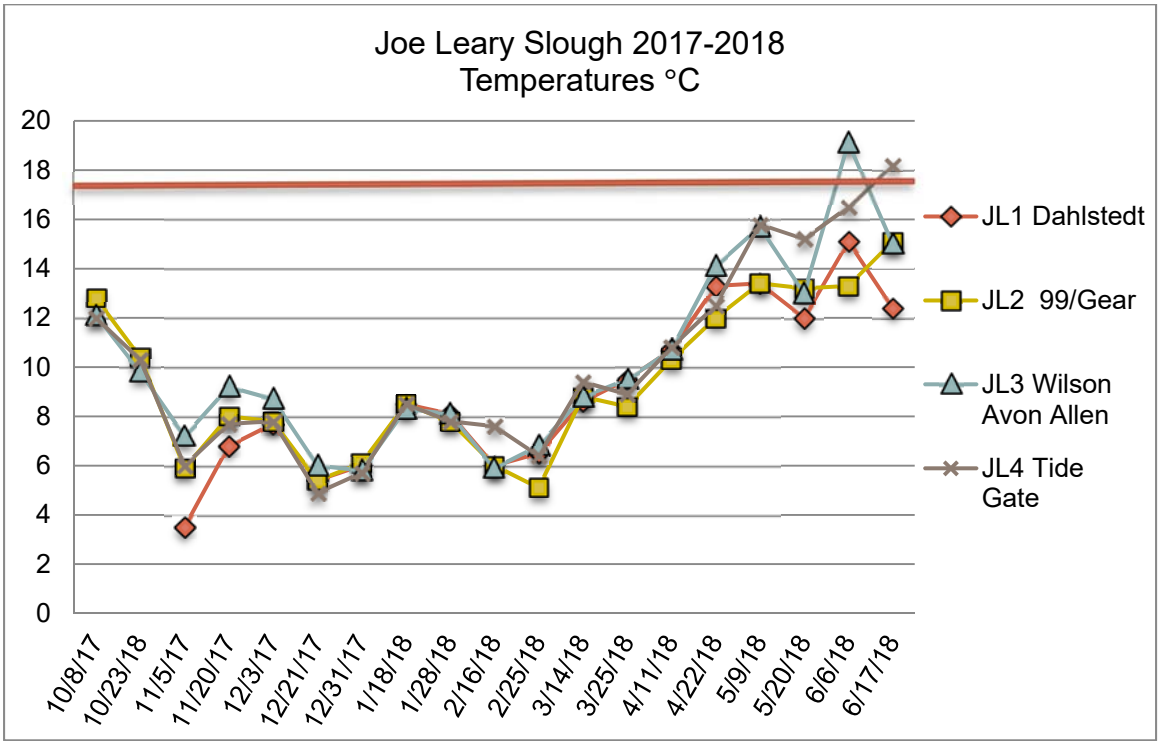

Figure 60. Joe Leary Slough Temperature: 2017-2018

Average annual temperatures (Figure 61 below) for all sites were similar to past years. Standards are not based on average temperature.

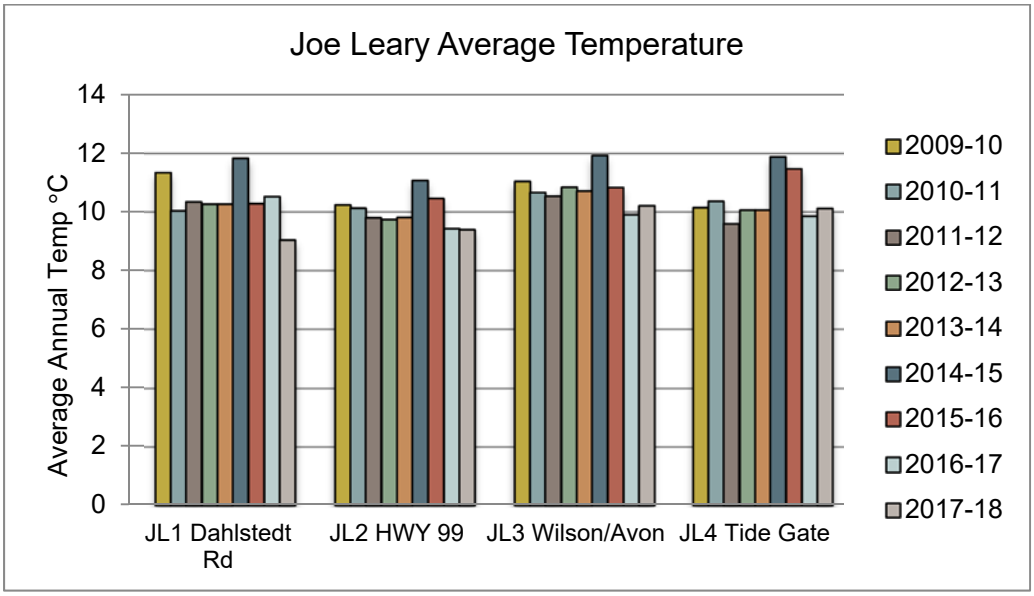

Figure 61. Joe Leary Slough Temperature: Nine-year comparison

Joe Leary Slough maintains its distinction of having the highest turbidity of all the stream team sites, with Sites 1 and 3 extremely high at times.

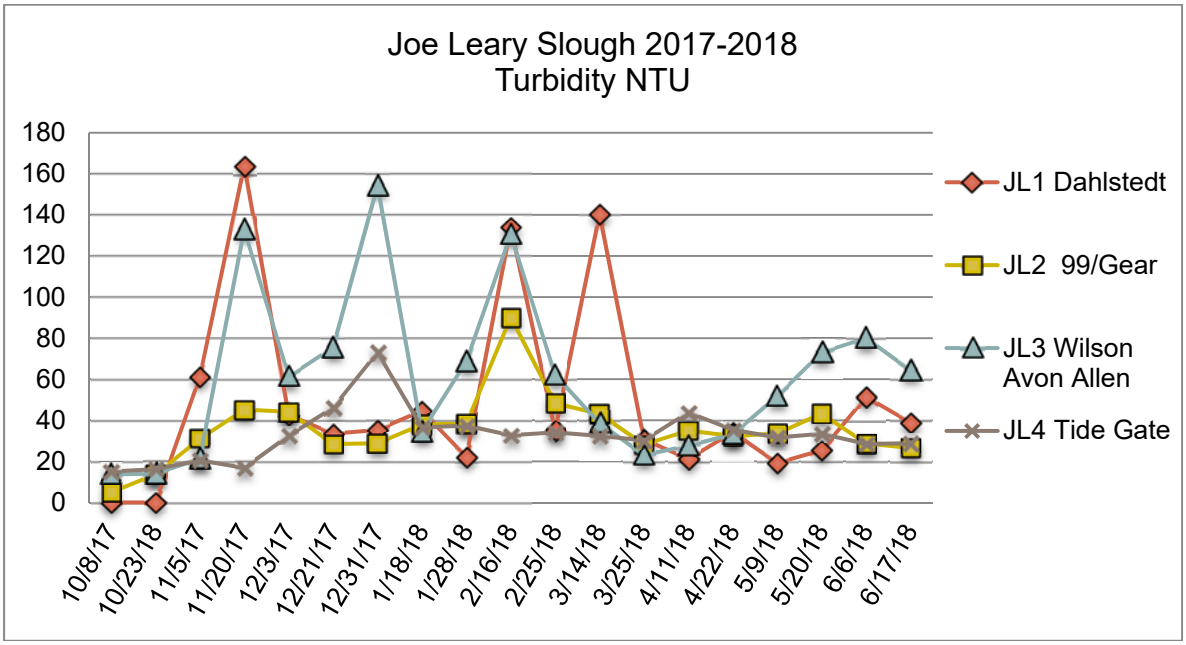

Figure 62. Joe Leary Slough Turbidity: 2017-2018

Average turbidity in Joe Leary Slough was the highest in ten years at Site 1.

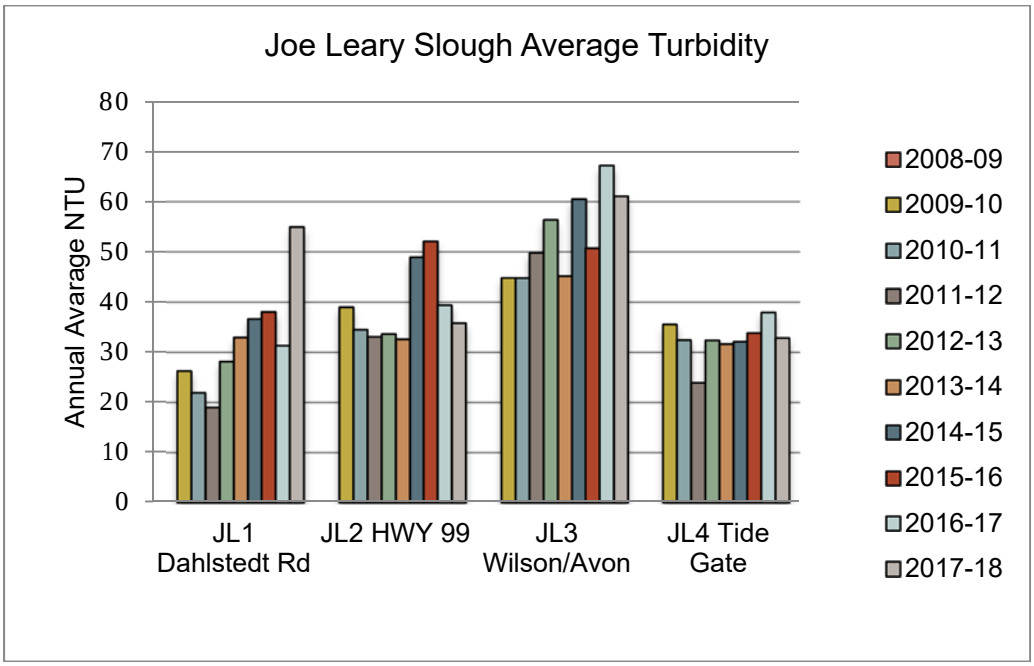

Figure 63. Joe Leary Slough Turbidity: Ten-year comparison

In 2017-2018 , 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. At Site 2, over half of the samples were higher than 200CFU/100ml.

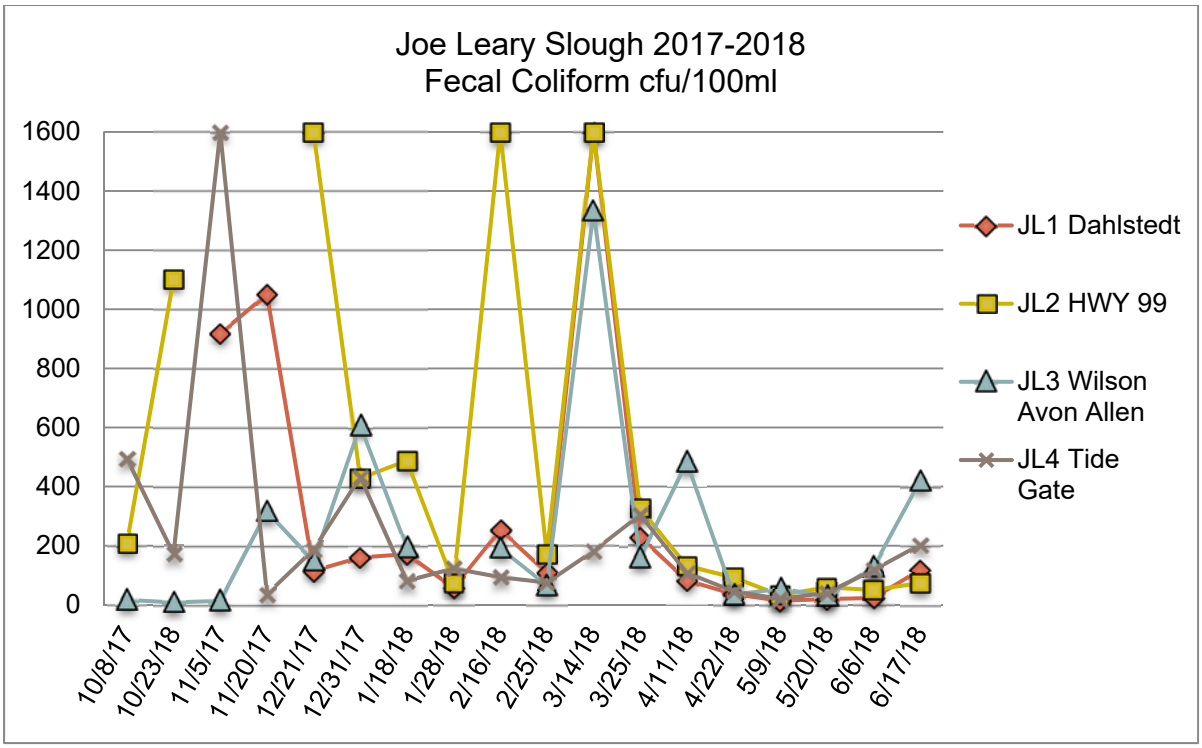

Figure 64. Joe Leary Slough Fecal Coliform: 2017-2018

None of the sites met either of the state requirements.

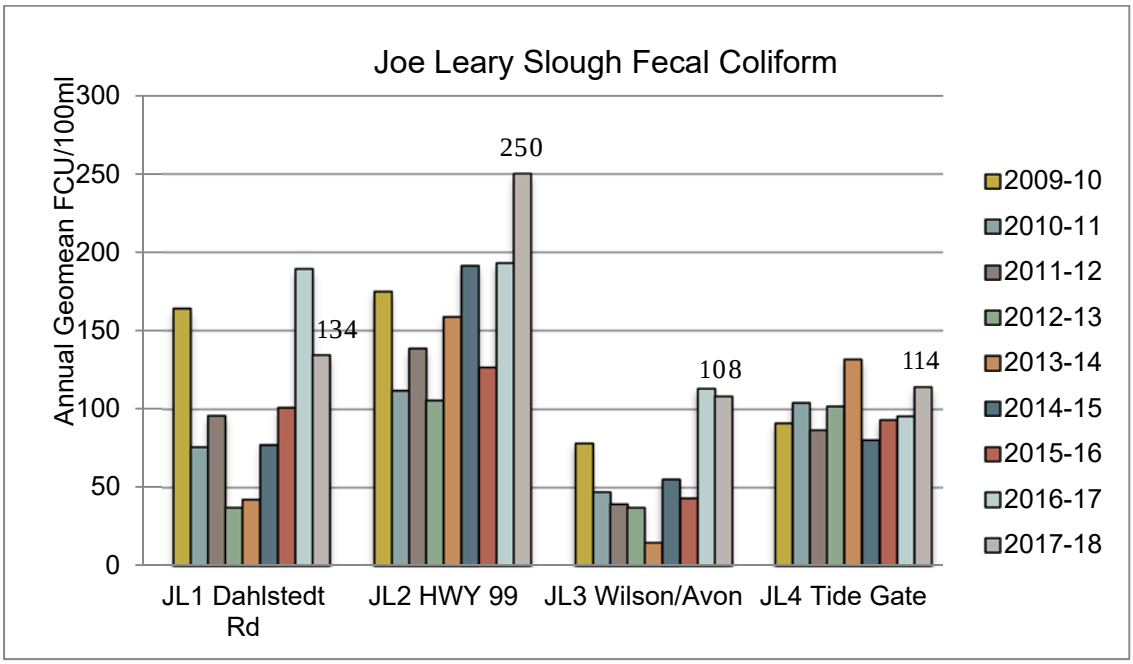

Figure 65. Joe Leary Slough Fecal Coliform: Nine-year comparison

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 all sites.

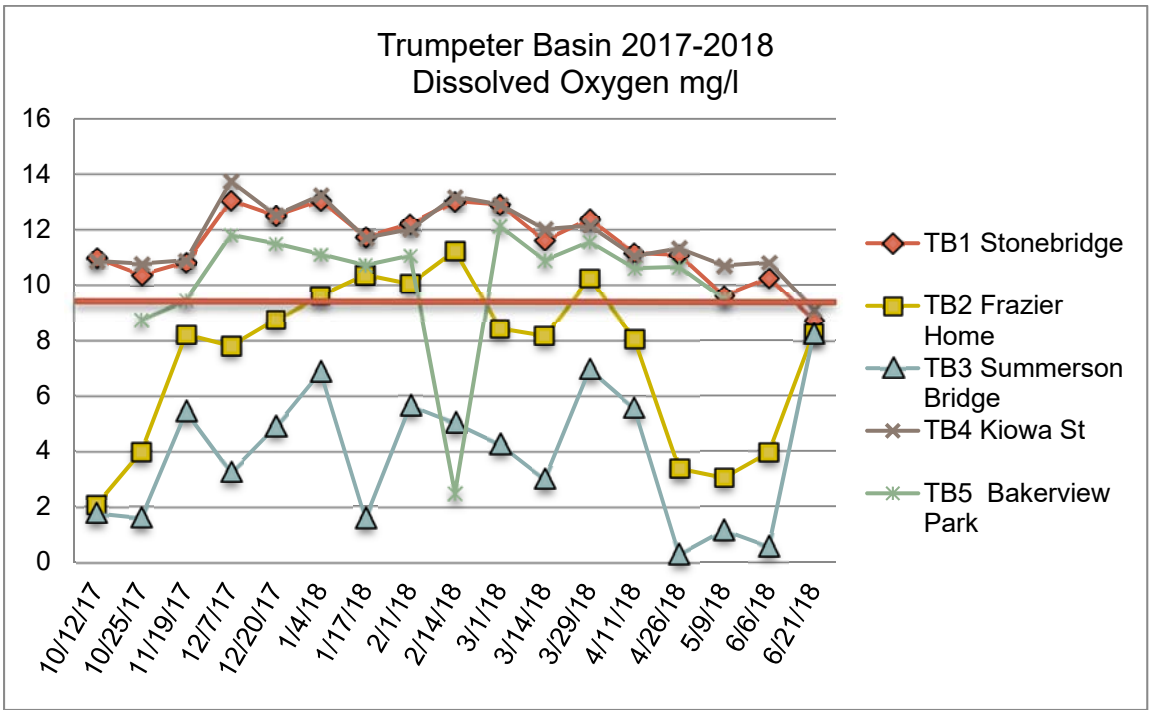

Figure 66. Trumpeter Basin DO: 2017-2018

Average annual dissolved oxygen levels (Figure 67 below) were similar to past years and similar across all sites. State standards are not based on annual averages.

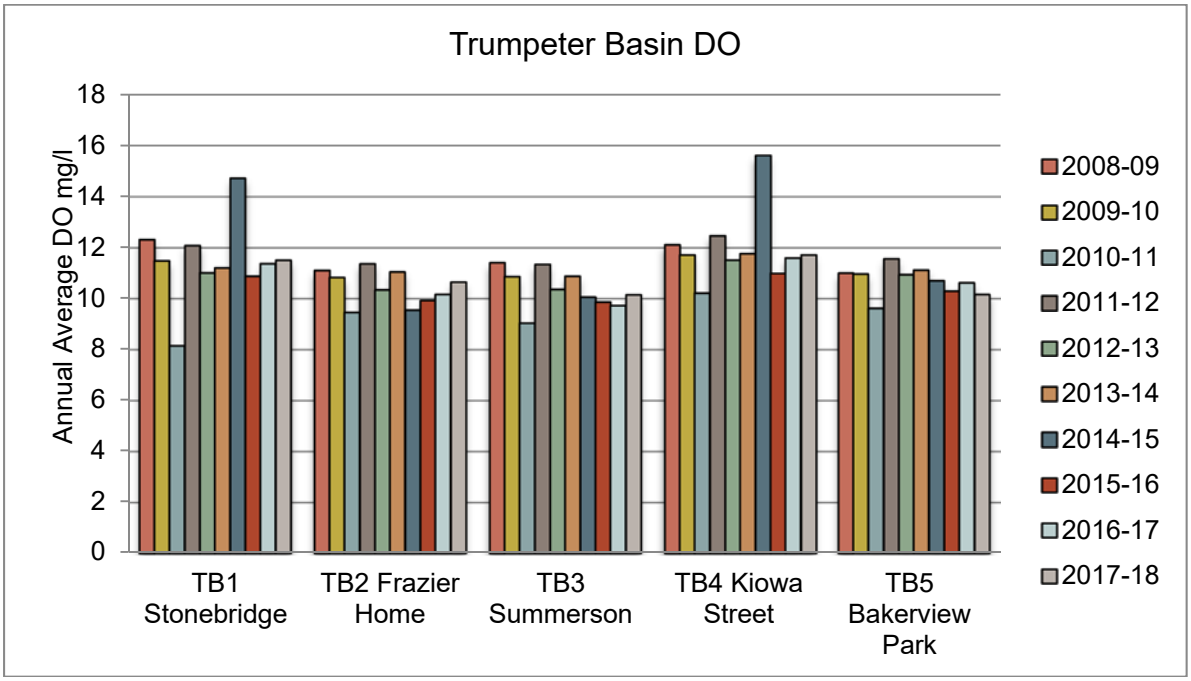

Figure 67. Trumpeter Basin DO: Ten-year comparison

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

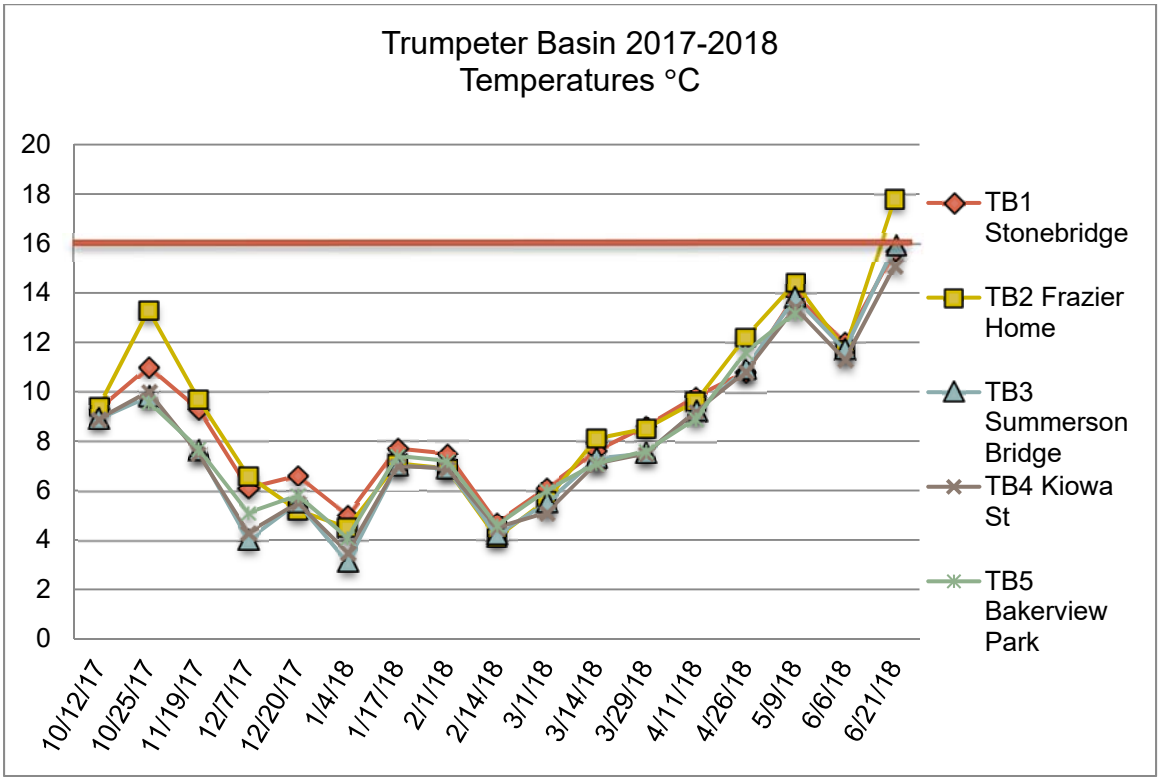

Figure 68. Trumpeter Basin Temperature: 2017-2018

Trumpeter Basin, follows the pattern of other streams with more normal temperatures in 2017-2018 after a cooler than usual year in 2016-2017. State standards are not based on the annual averages.

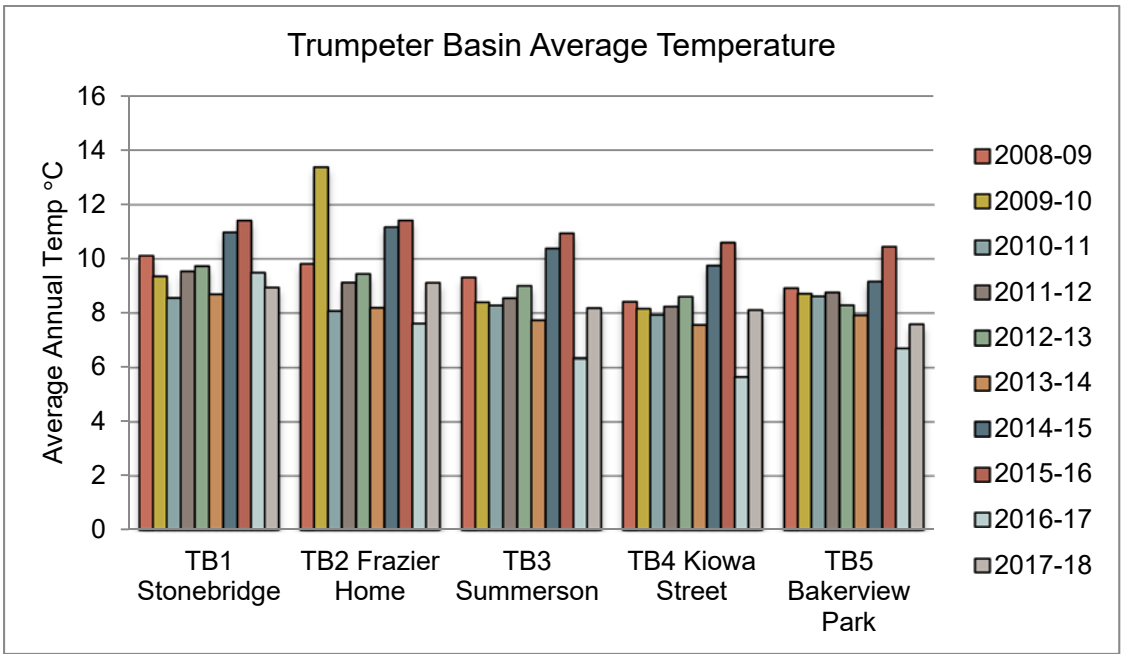

Figure 69. Trumpeter Basin Temperature: Ten-year comparison

Turbidity levels for Trumpeter Basin were highest at Site 2.

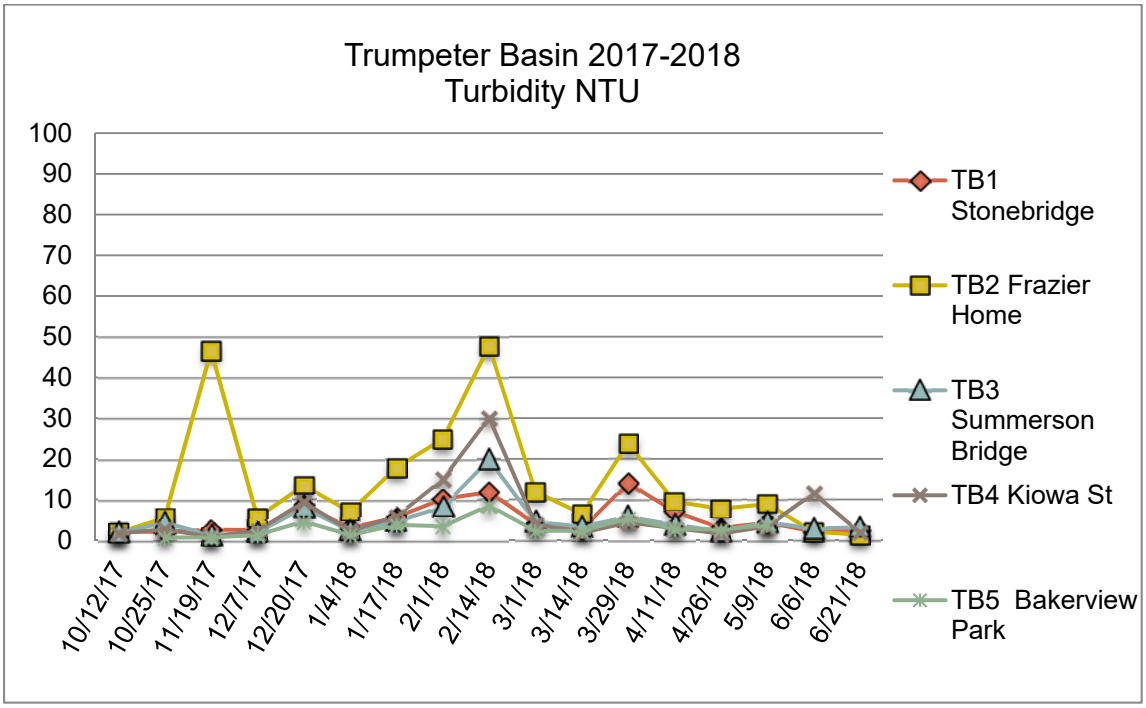

Figure 70. Trumpeter Basin Turbidity: 2017-2018

Except for Site 2, average turbidity levels in Trumpeter Basin (Figure 71 below) continued to be lower than the high numbers of 2015-2016, and more in line with past years.

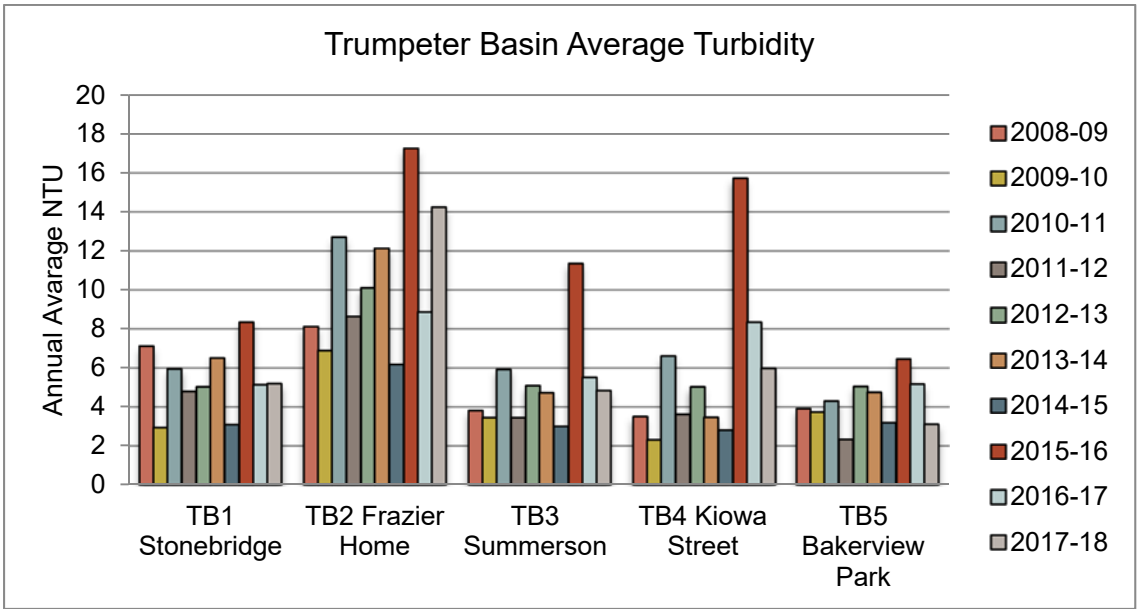

Figure 71. Trumpeter Basin Turbidity: Ten-year comparison

Sites 1 and 2 had high spikes of fecal coliform throughout the season. Sites 3 and 4 passed the standard of <10% of counts under 200 CFU/100ml.

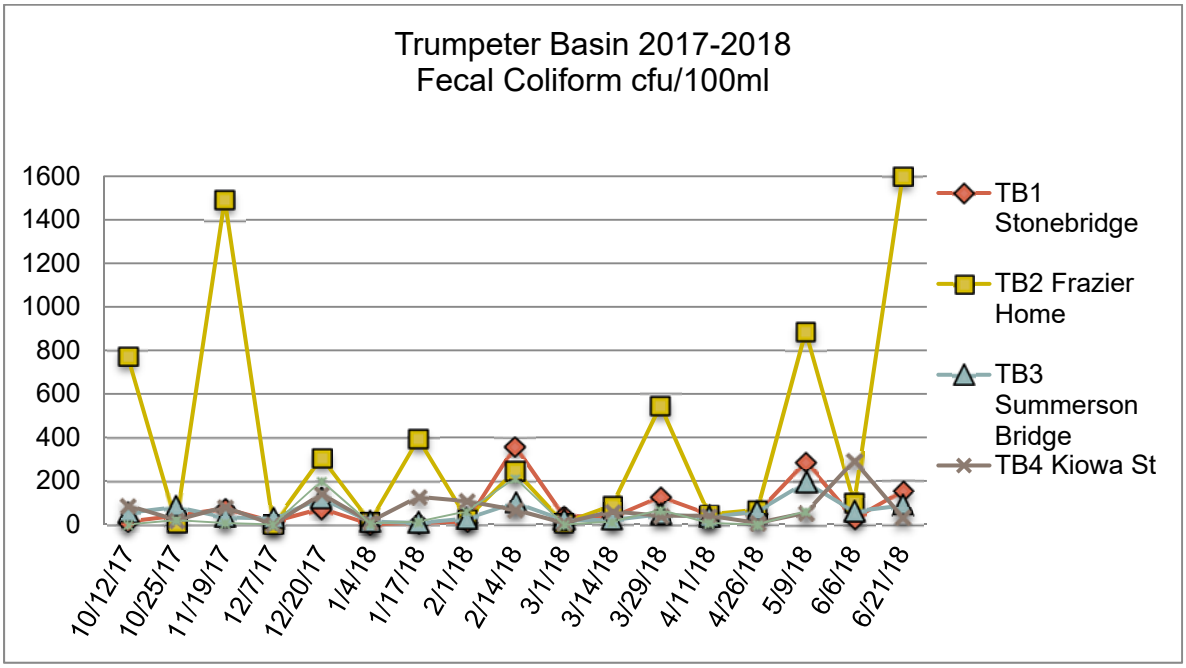

Figure 72. Trumpeter Basin Fecal Coliform: 2017-2018

Fecal coliform geometric means for 2017-2018 were again lower than the high numbers in the past. Sites 1 and 5 had the lowest numbers since monitoring began. (Figure 73 below) All Sites met Part I of the state standard: geometric mean <100CFU/100ml.

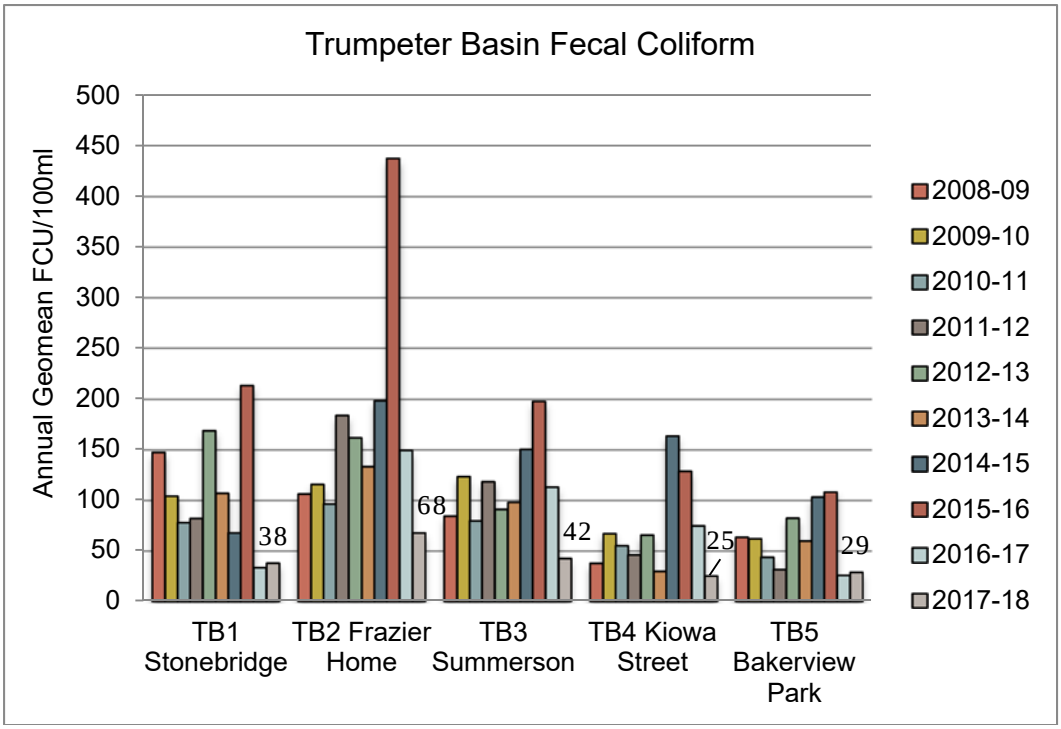

Figure 73. Trumpeter Basin Fecal Coliform: Ten-year comparison

Kulshan Creek Results

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

As in past years, 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.

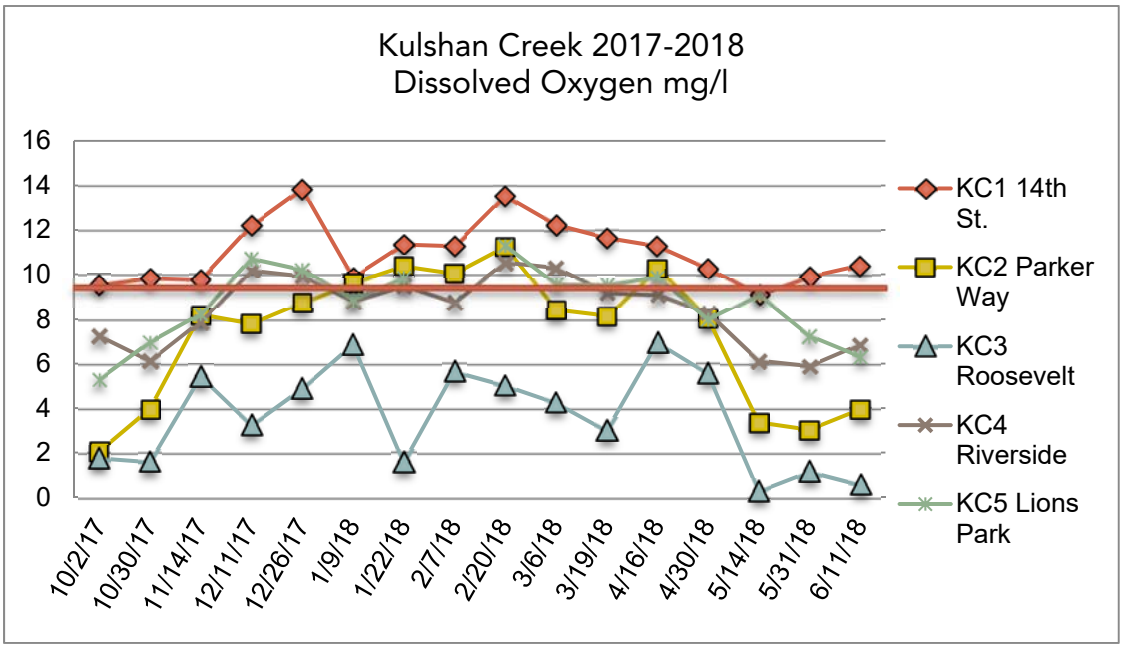

Figure 74. Kulshan Creek DO: 2017-2018

Average dissolved oxygen levels were higher compared to the past 2-3 years, they were still below the state standard at Sites 2-5. Dissolved oxygen should not drop below 9.5 mg/l even once. Standards are not based on annual average measurements.

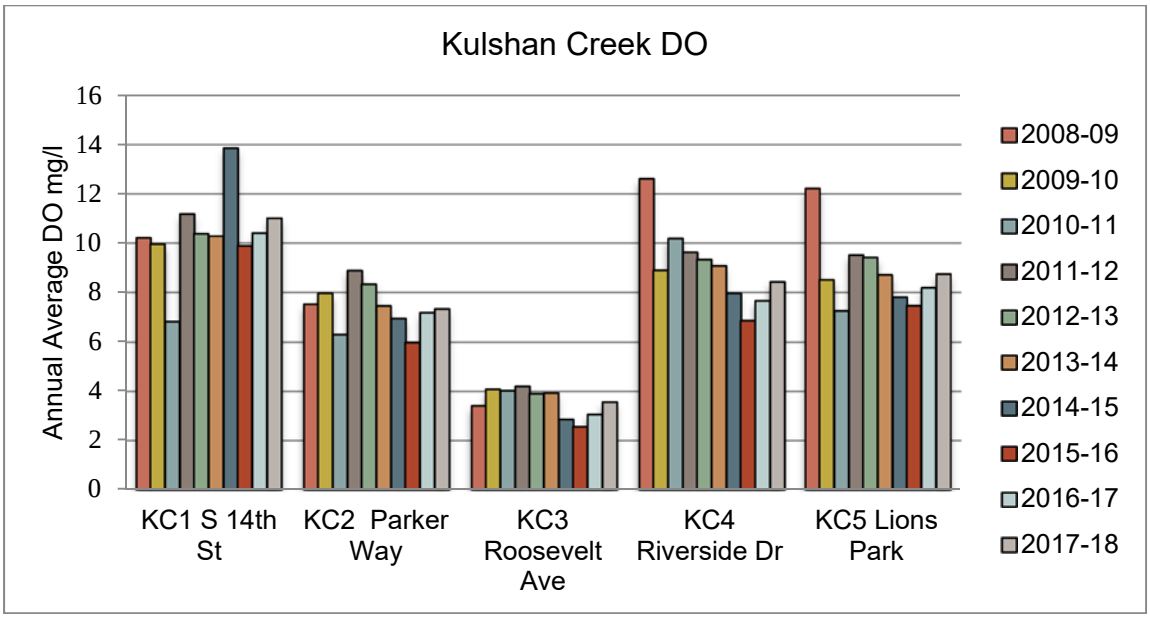

Figure 75. Kulshan Creek DO: Ten-year comparison

Site 4 rose above 16°C in May. Kulshan Creek was not monitored after July 10 when temperatures may have been even warmer.

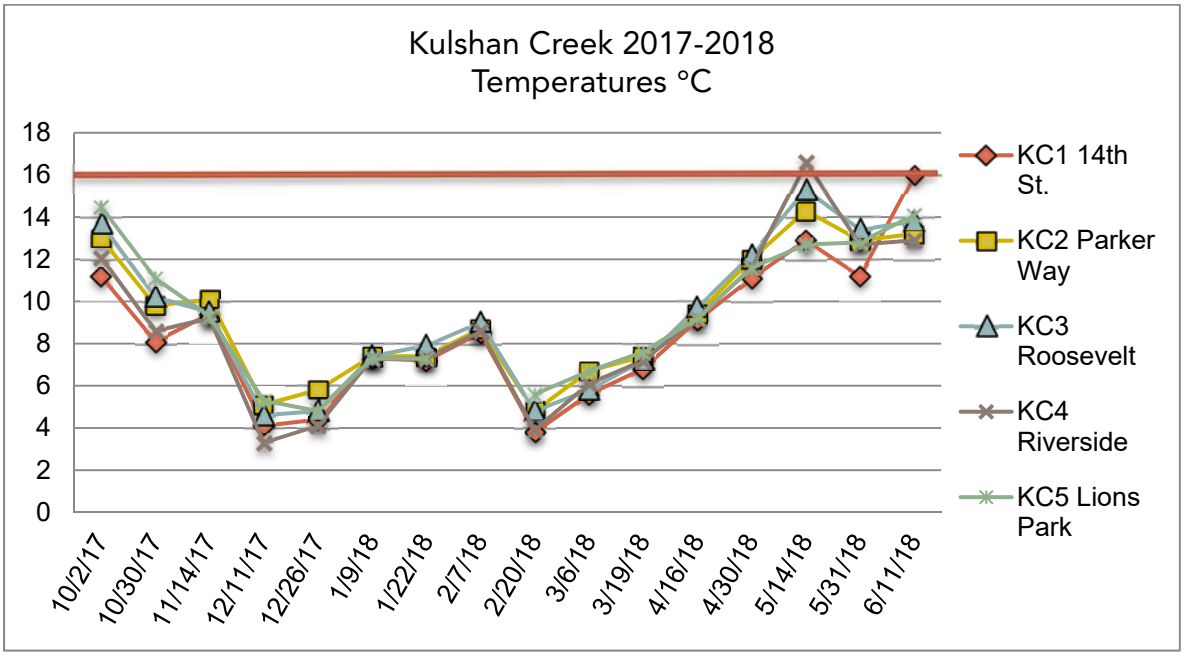

Figure 76. Kulshan Creek Temperature: 2017-2018

In 2017-2018 , the cooling trend for Kulshan Creek continued, though standards are not based on average temperature, but on single sampling events.

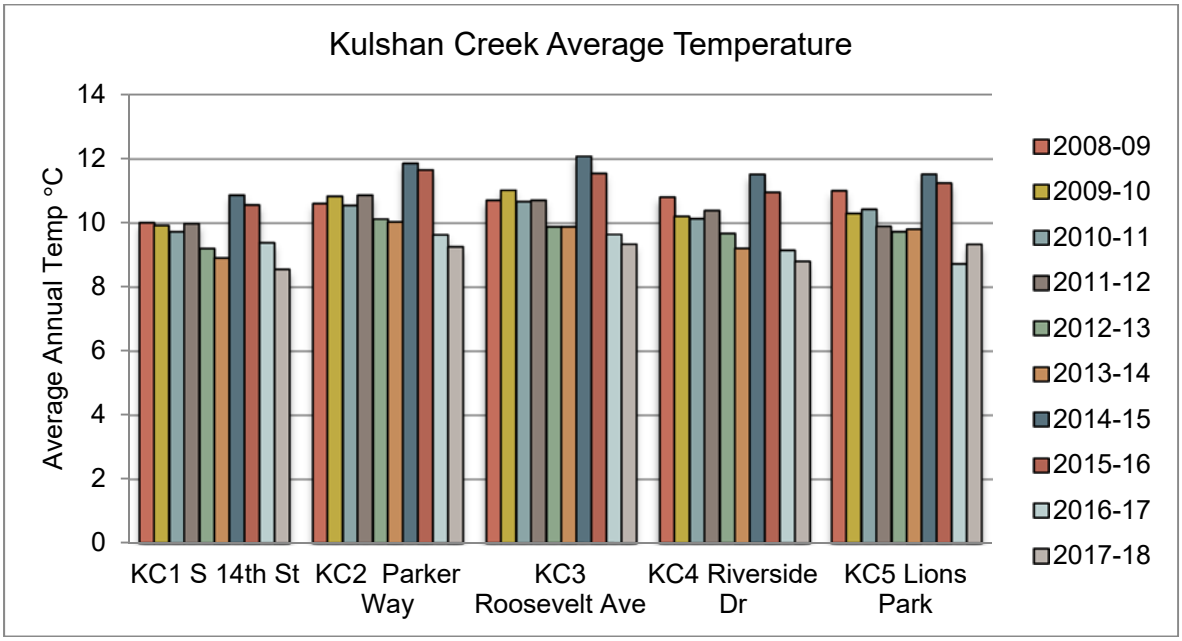

Figure 77. Kulshan Creek Temperature: Ten-year comparison

Turbidity for Kulshan Creek was generally lower than most streams, with a few spikes spring and summer.

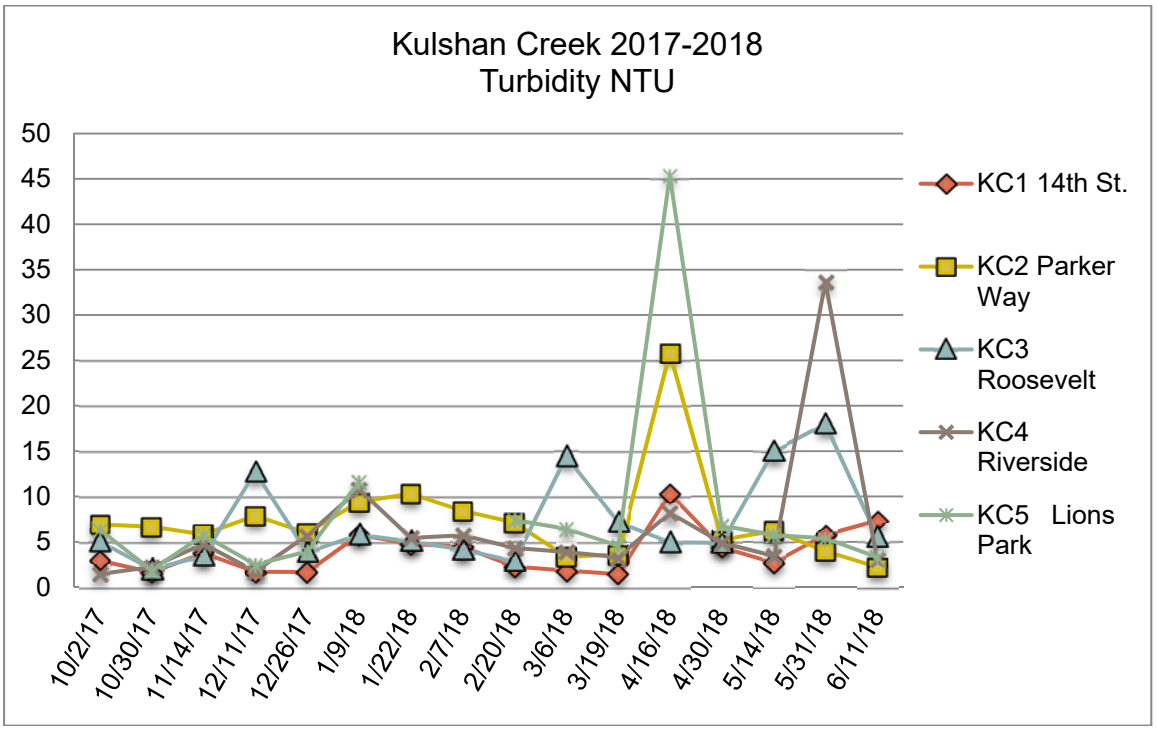

Figure 78. Kulshan Creek Turbidity: 2017-2018

Average turbidity in Kulshan Creek (Figure 79 below) showed little change the past 4 years.

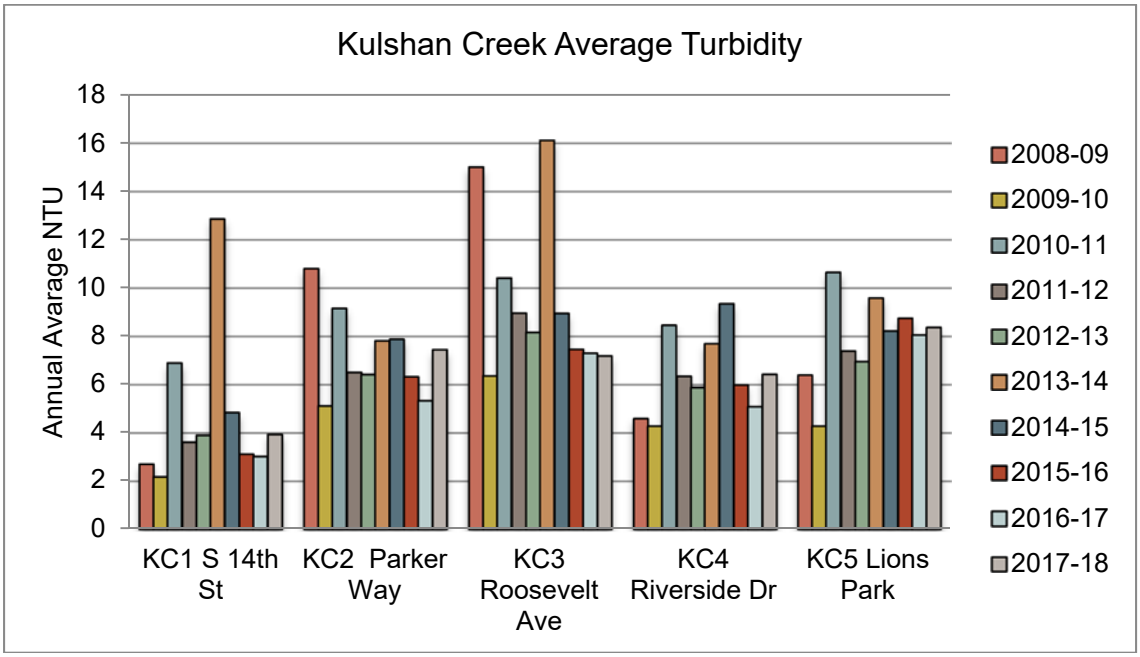

Figure 79. Kulshan Creek Turbidity: Nine-year comparison

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.

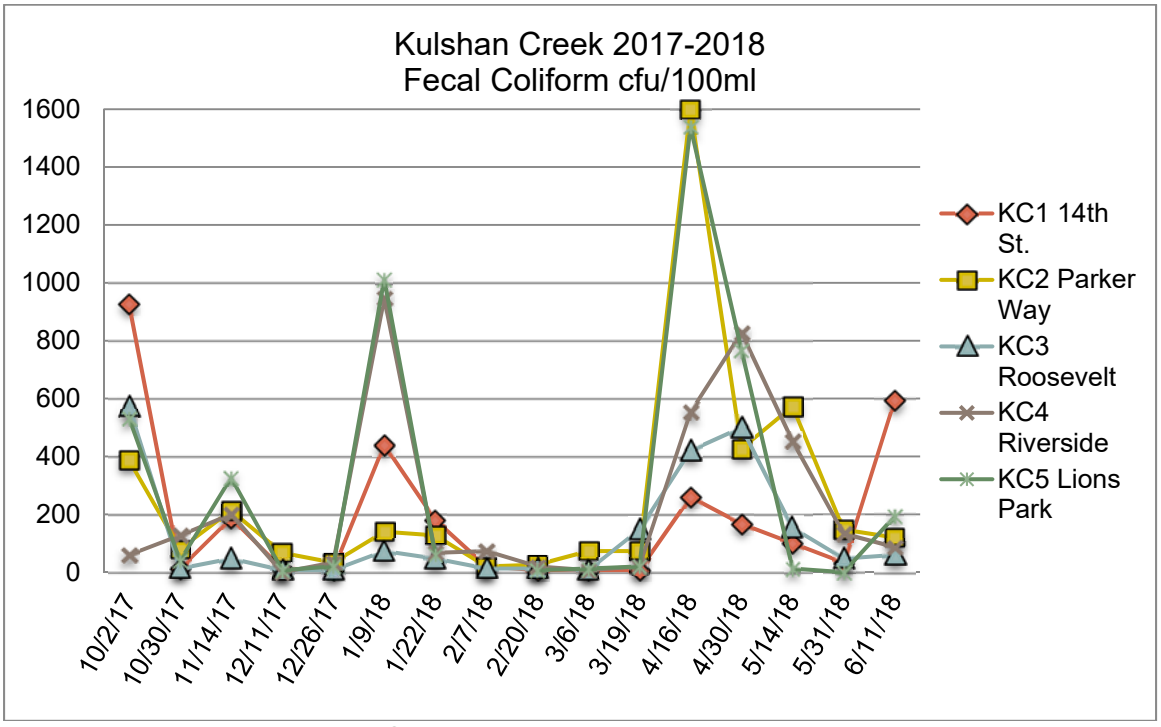

Figure 80. Kulshan Creek Fecal Coliform: 2017-2018

Site 2 had annual geometric means higher than last year and above the standard of 100 CFU/100ml. Other sites were lower than last year and met the standard..

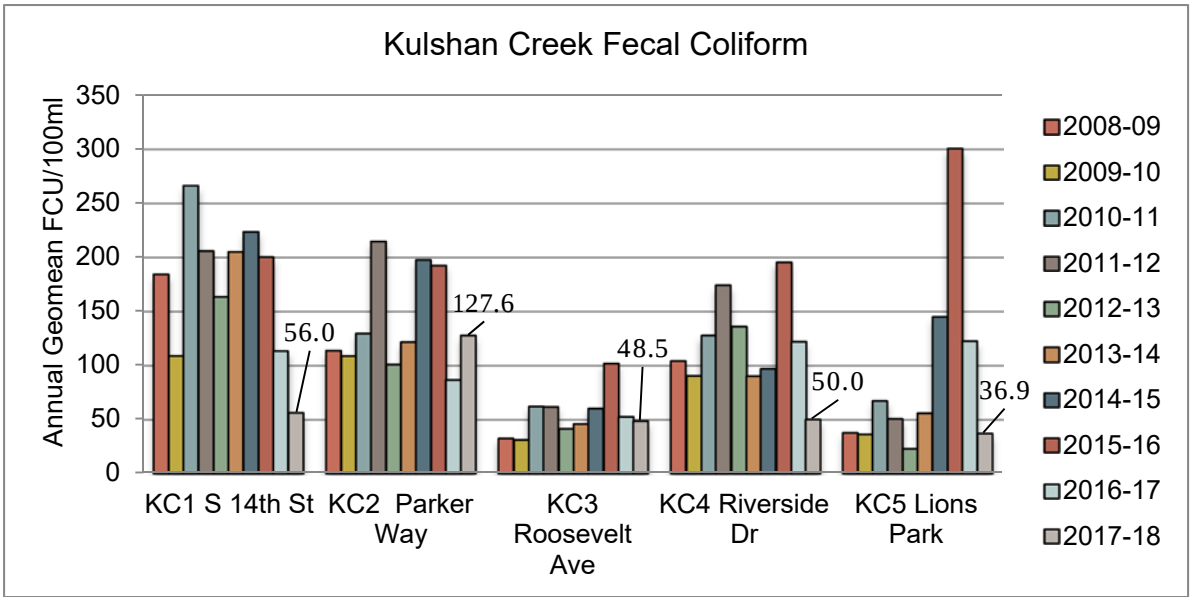

Figure 81. Kulshan Creek Fecal Coliform: Ten-year comparison

Ace of Hearts/Happy Valley Creeks

Figures 82 through 91 below present results from Ace of Hearts and Happy Valley Creek sampling. This was the second year of sampling these sites.

Dissolved oxygen for all sites was above the standard throughout the sampling season, but it was not monitored during the warmest months.

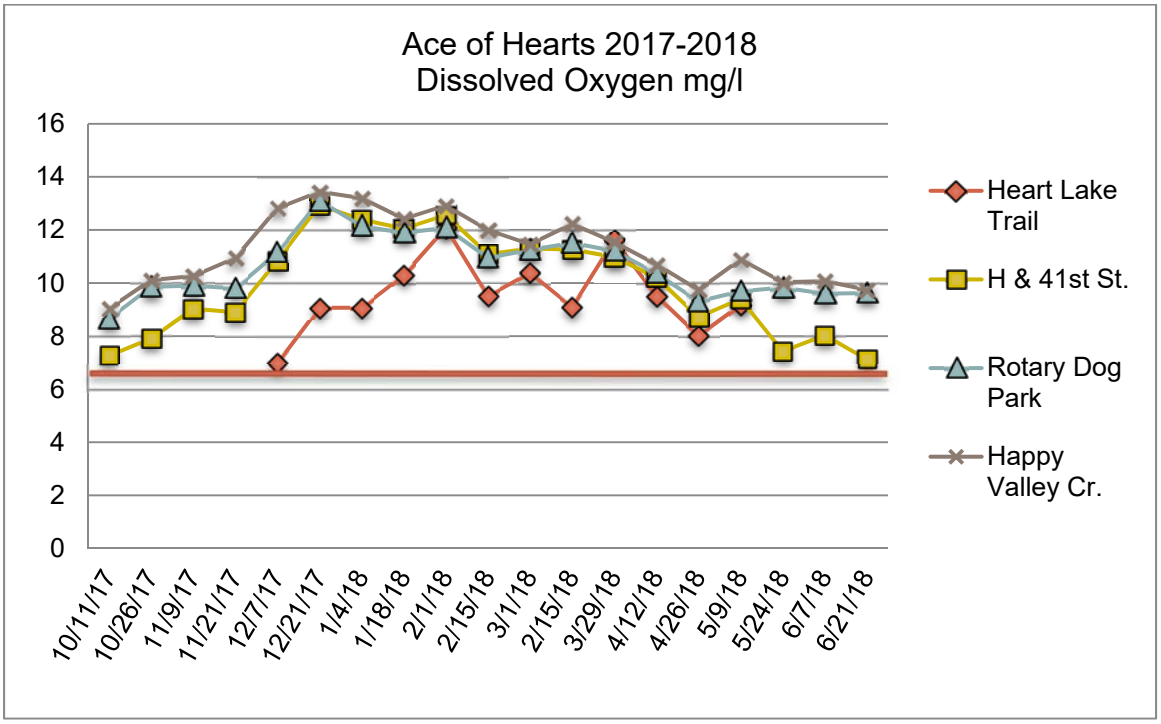

Figure 82. Ace of Hearts DO: 2017-2018

Average dissolved oxygen levels were above 6.5 mg/l, but state standards for DO are not based on the annual average.

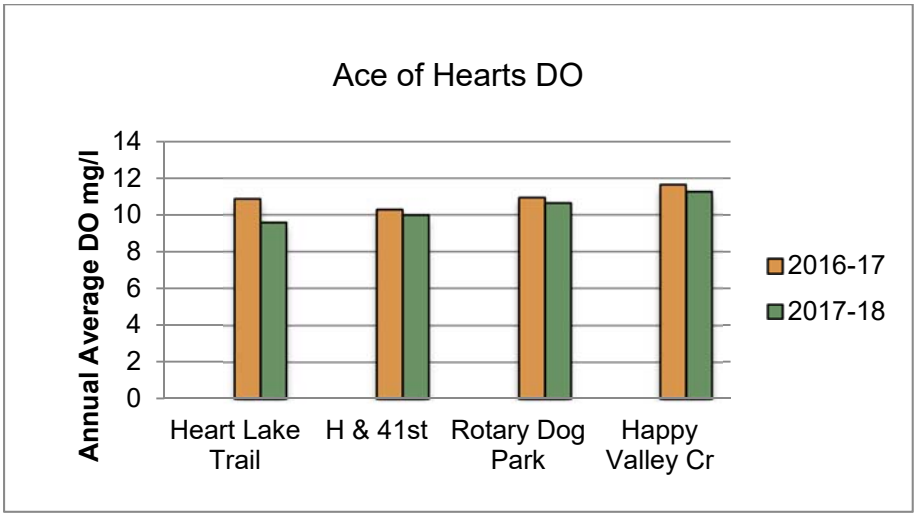

Figure 83. Ace of Hearts Average DO

Temperatures for Site 1 went just above 17.5°C in May, the last day with water at the site. Ace of Hearts sites were not sampled in summer months because water dries up completely.

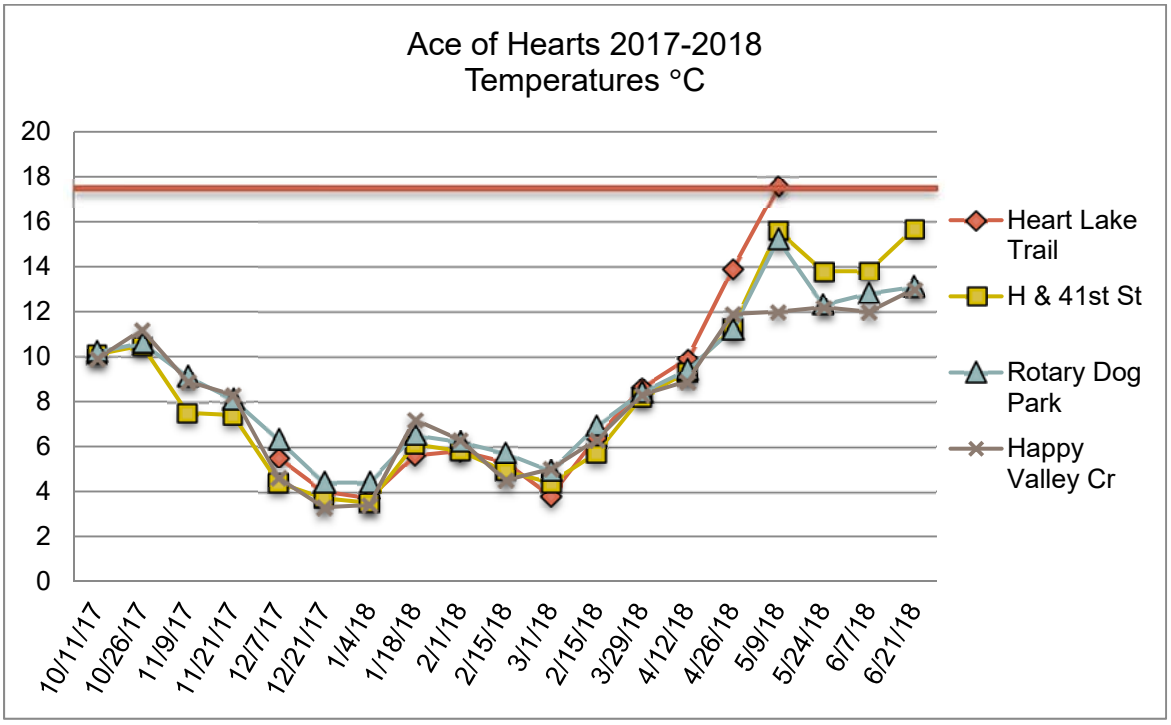

Figure 84. Ace of Hearts Temperature: 2017-2018

Average annual temperatures (Figure 85 below) were significantly higher than the previous year. State standards are not based on the annual averages.

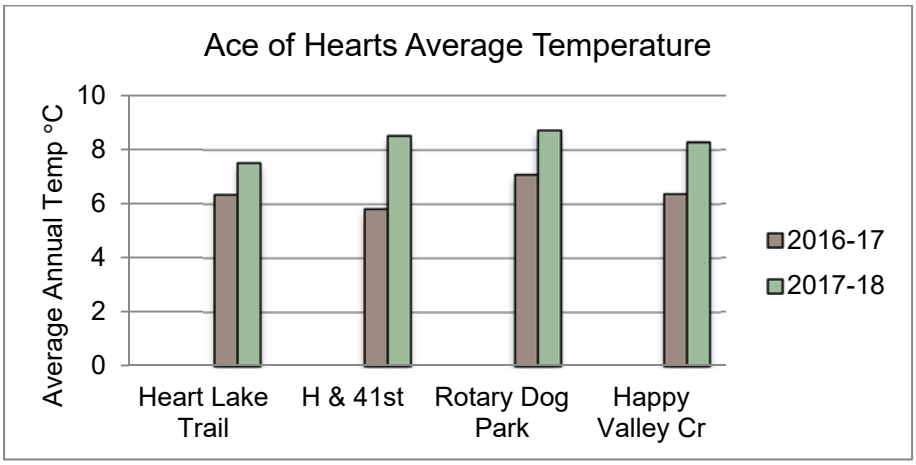

Figure 85. Acr of Hearts Average Temperature

Turbidity levels for Ace of Heart and Happy Valley Creeks were relatively low with the exception of November 21, 2017.

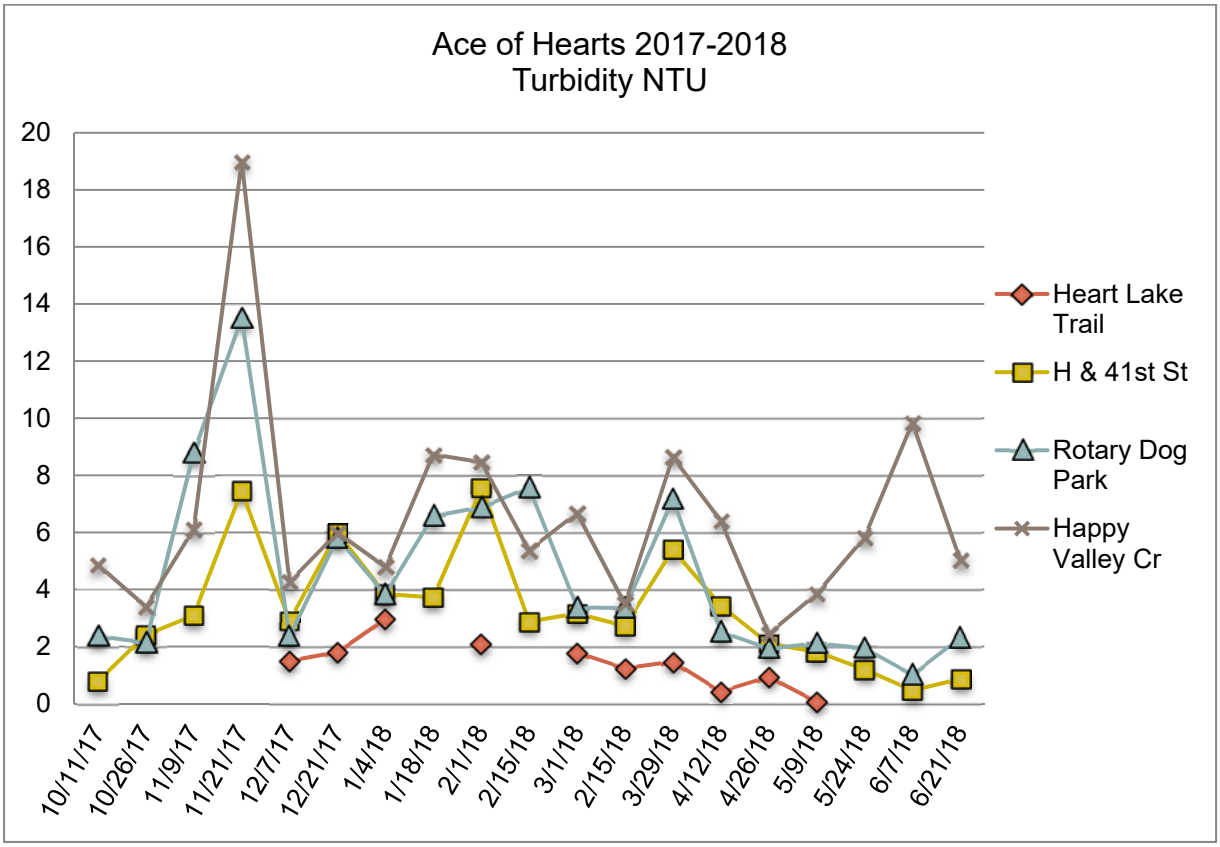

Figure 86. Ace of Hearts Turbidity: 2017-2018

Turbidity levels increased from the headwaters towards the bay.(Figure 87 below)

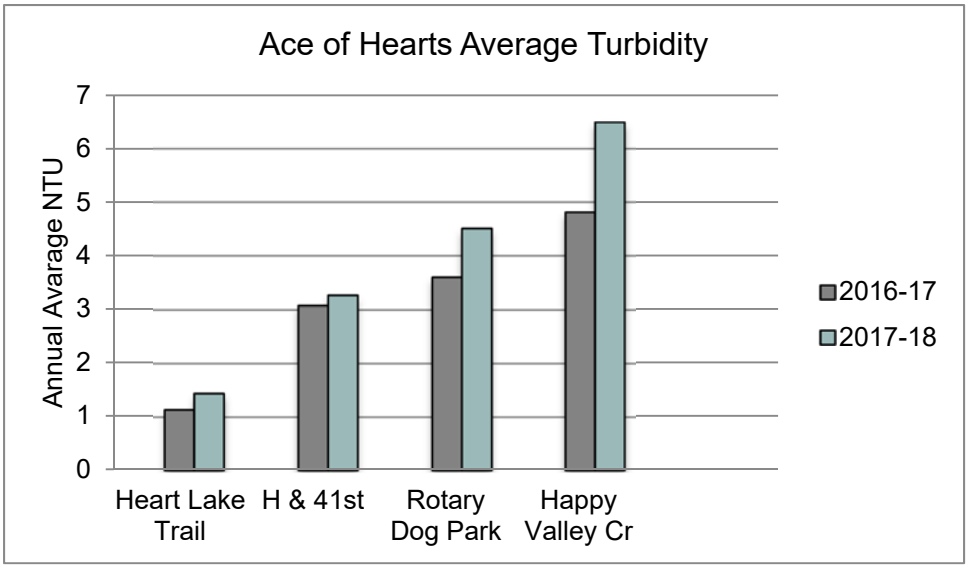

Figure 87. Ace of Hearts Average Turbidity

Both Happy Valley Creek and Site 2 had very high fecal coliform levels on May 9. Sites 1 and 2 met Part II of the standard, with fewer than 10% of the counts higher than 200CFU/100ml.

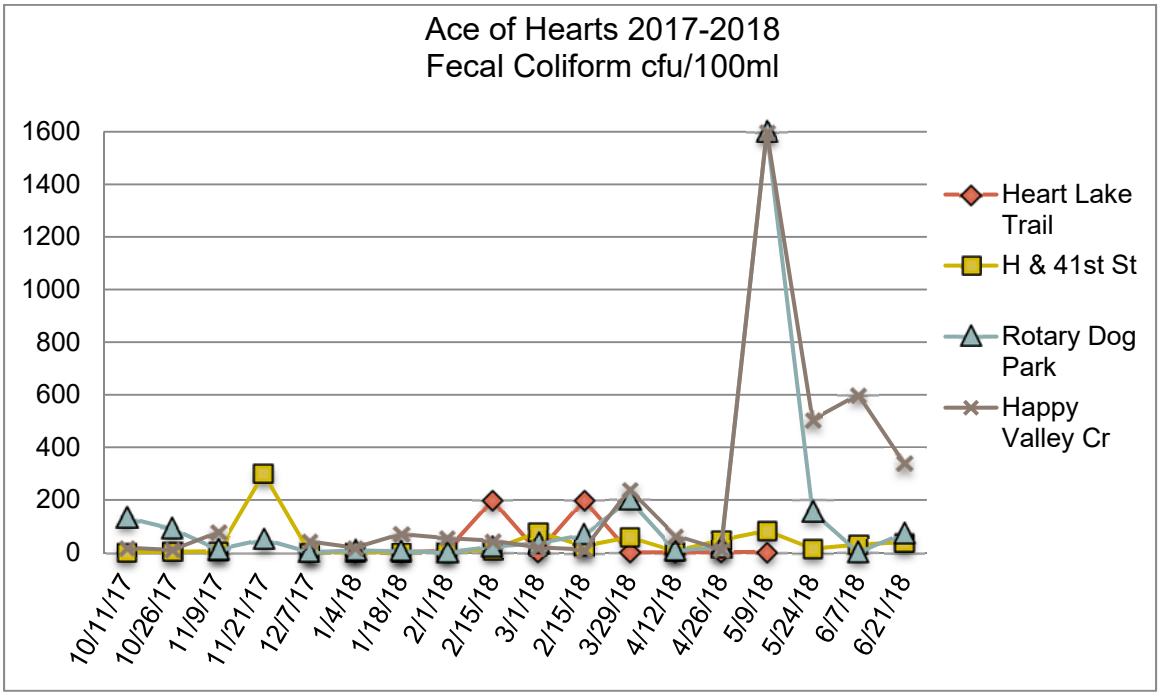

Figure 88. Ace of Hearts Fecal Coliform: 2017-2018

Geometric means (Figure 89 below) for all Ace of Hearts sites were lower than the 100 CFU/100ml standad.

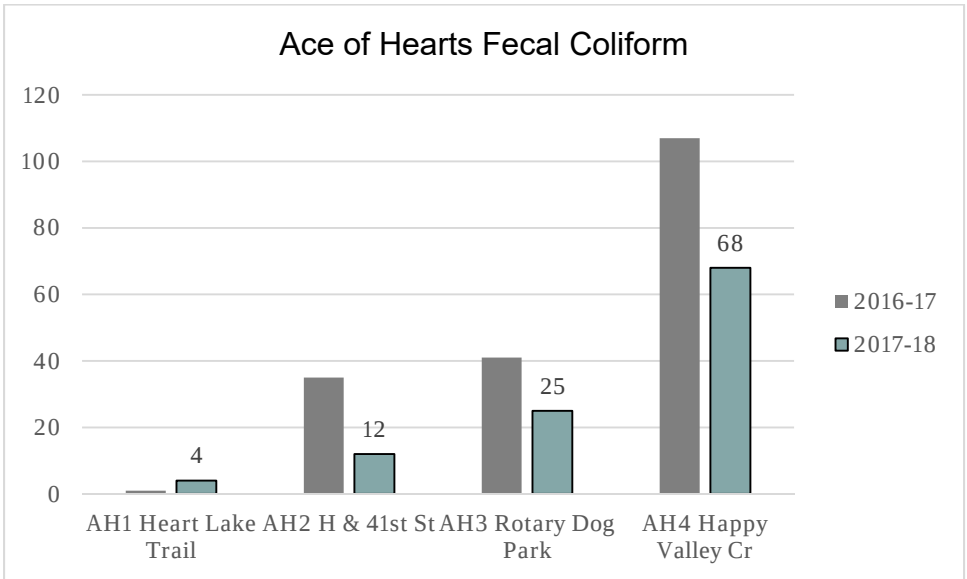

Figure 89. Ace of Hearts Fecal Coliform: Annual Geomean

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.

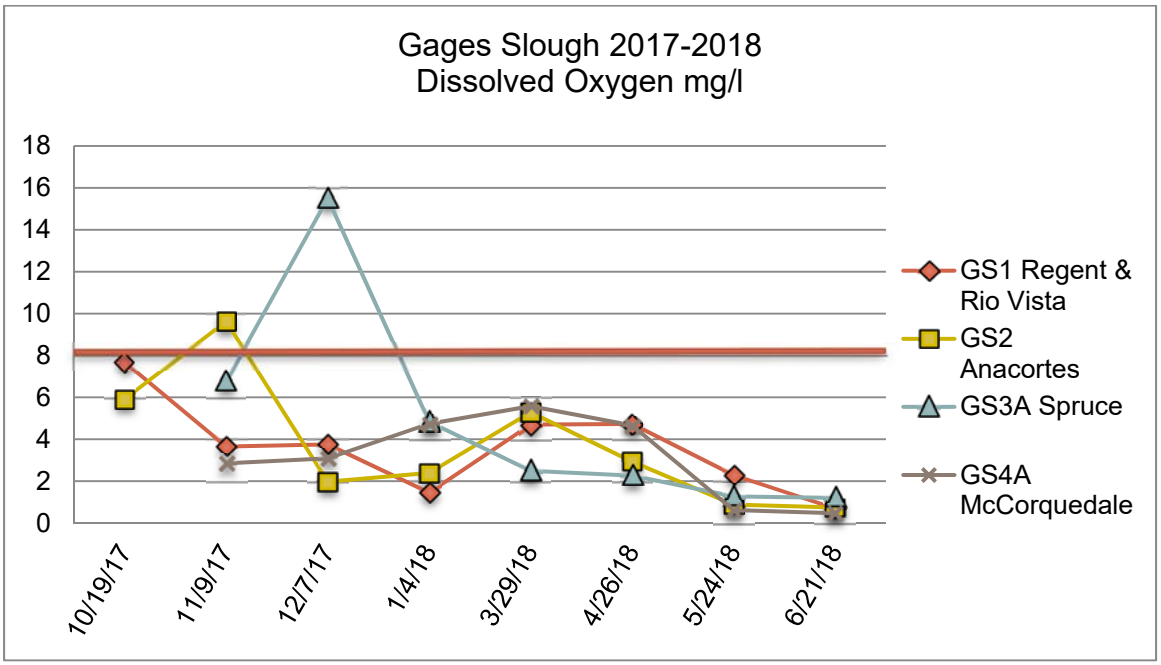

Figure 90. Gages Slough DO: 2017-2018

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

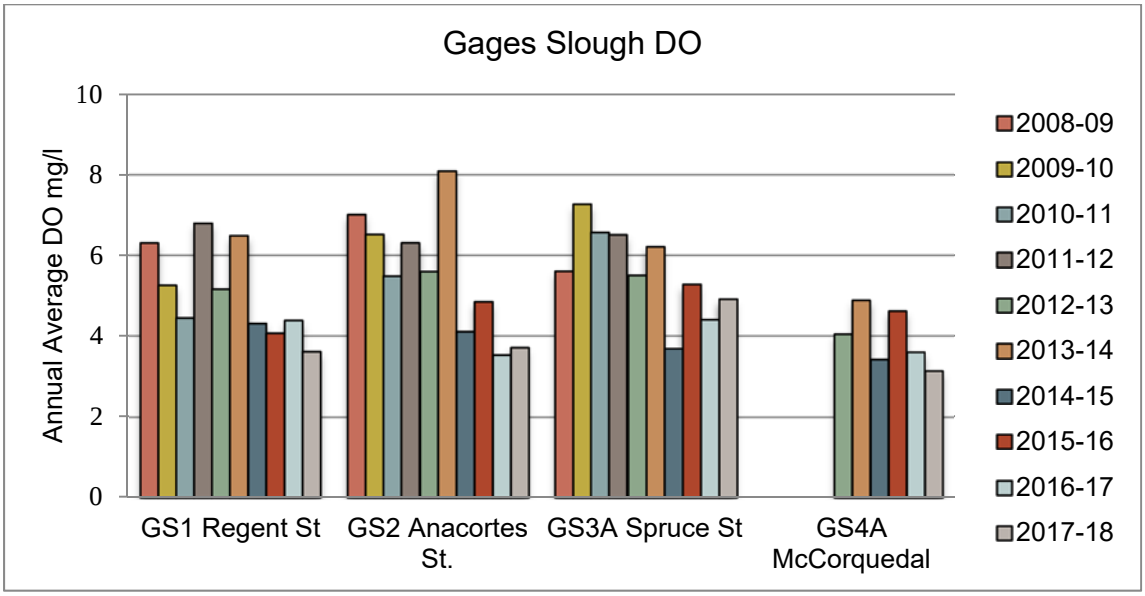

Figure 91. Gages Slough DO: Ten-year comparison

All Gages Slough sites were cooler than 17.5°C throught the sampling period, with a single exception at Site 4. Sites were not sampled in the warmest months.

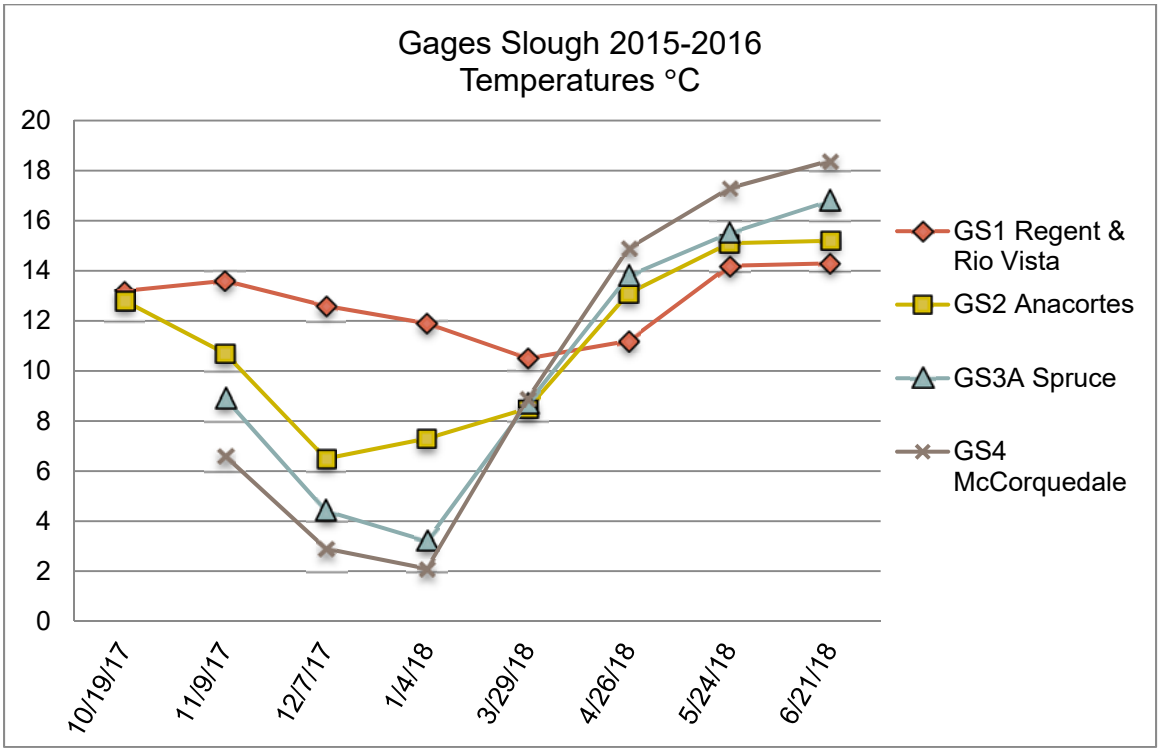

Figure 92. Gages Slough Temperature: 2017-2018

Average temperatures in Gages Slough were warmer than last year, and similar to past years. The state standard is not based on average temperature.

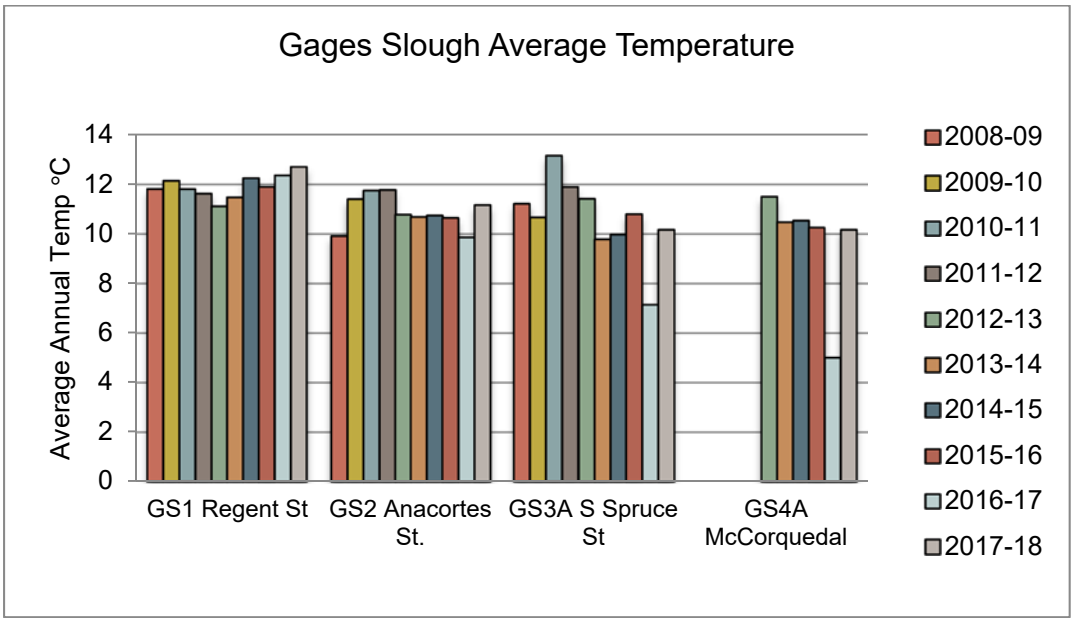

Figure 93. Gages Slough Temperature: Ten-year comparison

Site 2 again had the highest turbidity levels.

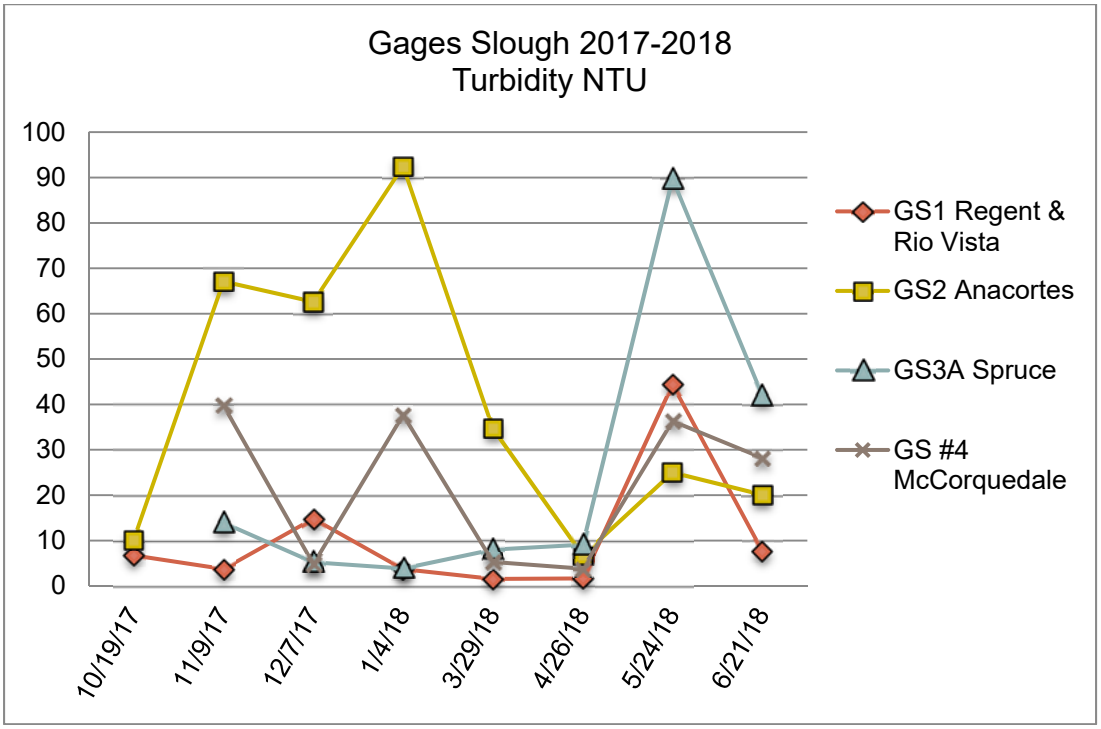

Figure 94. Gages Slough Turbidity: 2017-2018

Sites 2-4 had turbidity levels much higher than typical for this stream.

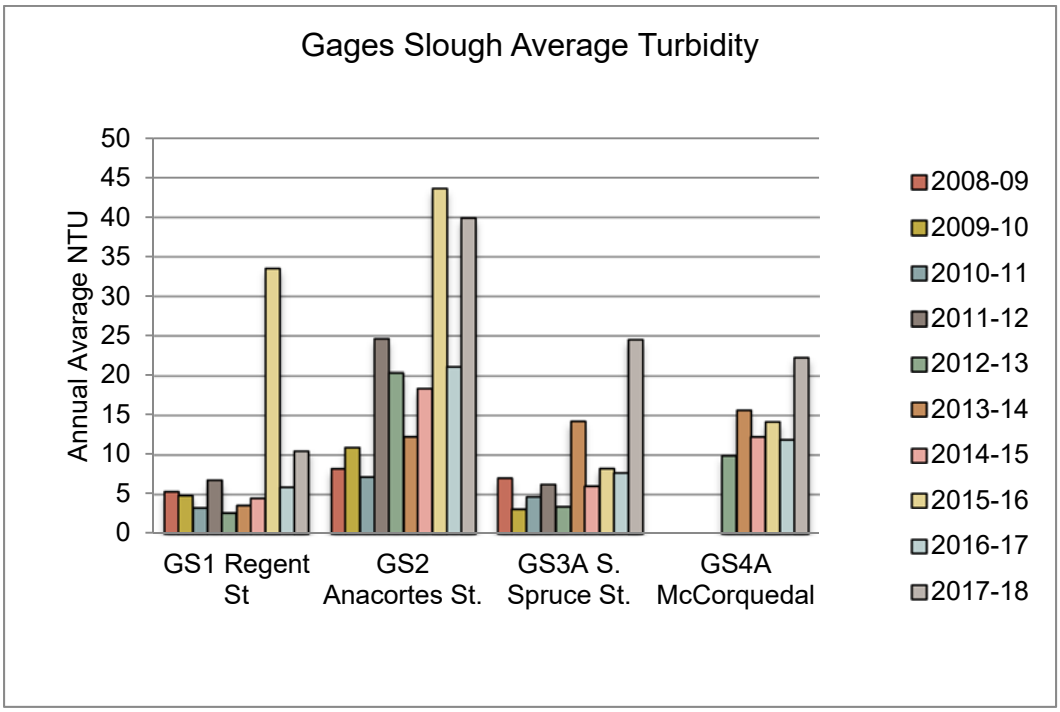

Figure 95. Gages Slough Turbidity: Ten-year comparison

All sites had more than 10% of the samples >200CFU.100 ml.

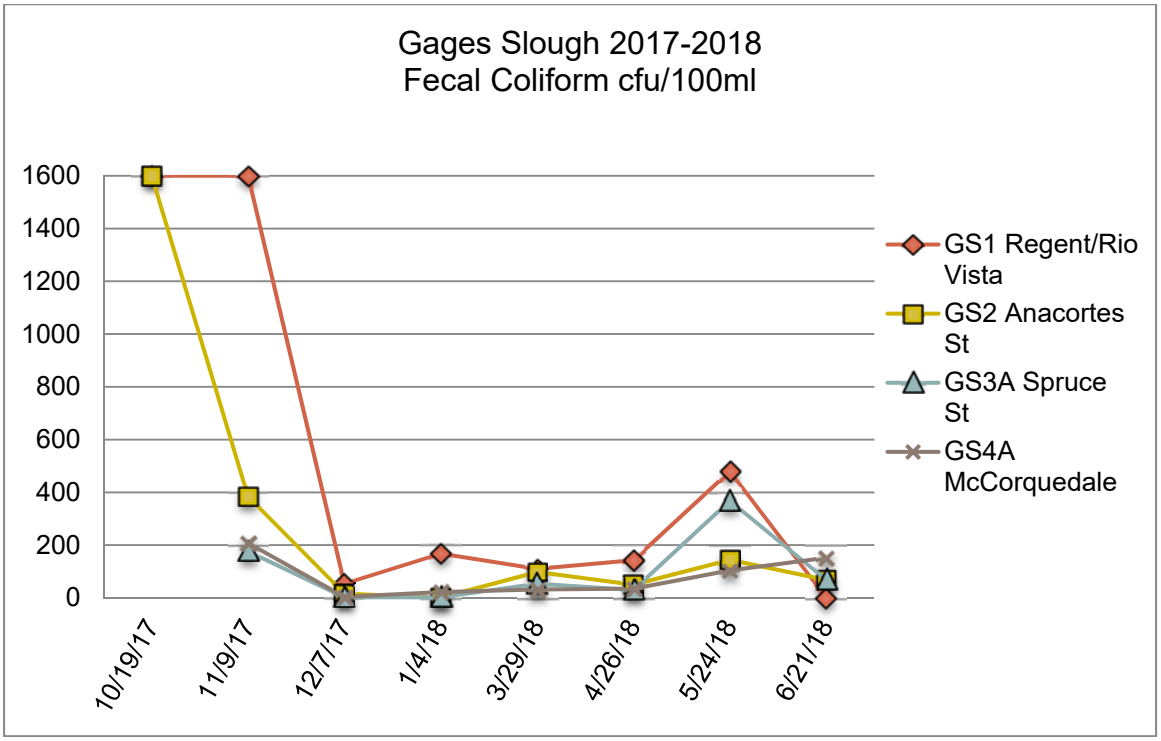

Figure 96. Gages Slough Fecal Coliform: 2017-2018

In spite of very high numbers in the fall, Sites 2-4 met Part 1 standard with annual geometric mean less than 100CFU 100ml, though the standard requires at least 10 samples.

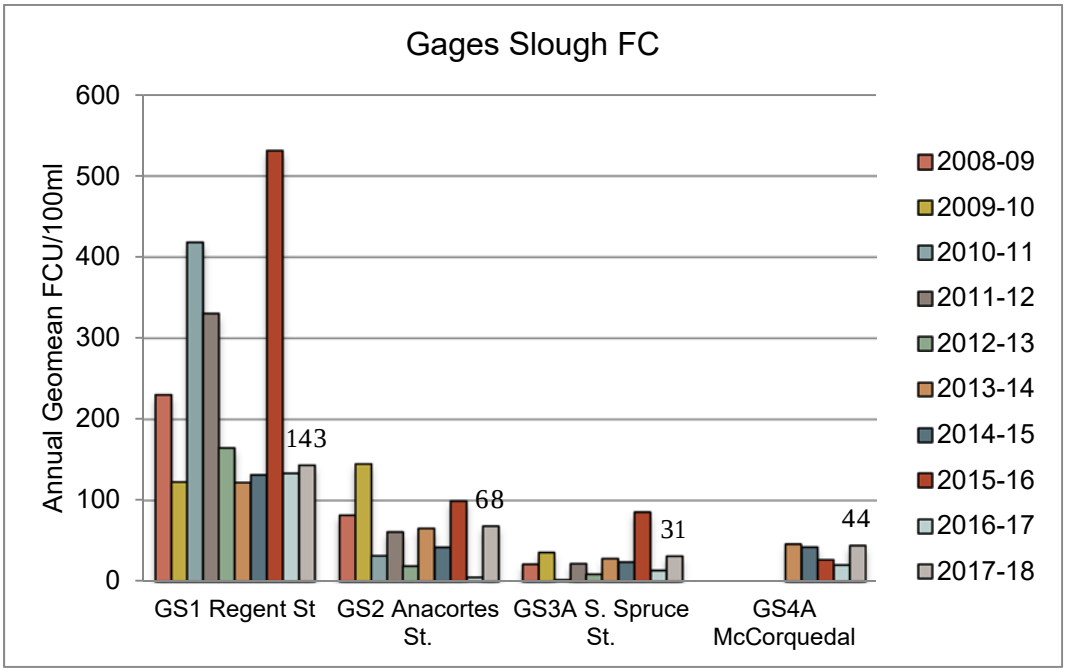

Figure 97. Gages Slough Fecal Coliform: Ten-year comparison

Stream Team 2017-2018 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 98) 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 Nookachamps 4, all Joe Leary sites, Kulshan Creek 3 and all Gages Slough sites have low DO levels.

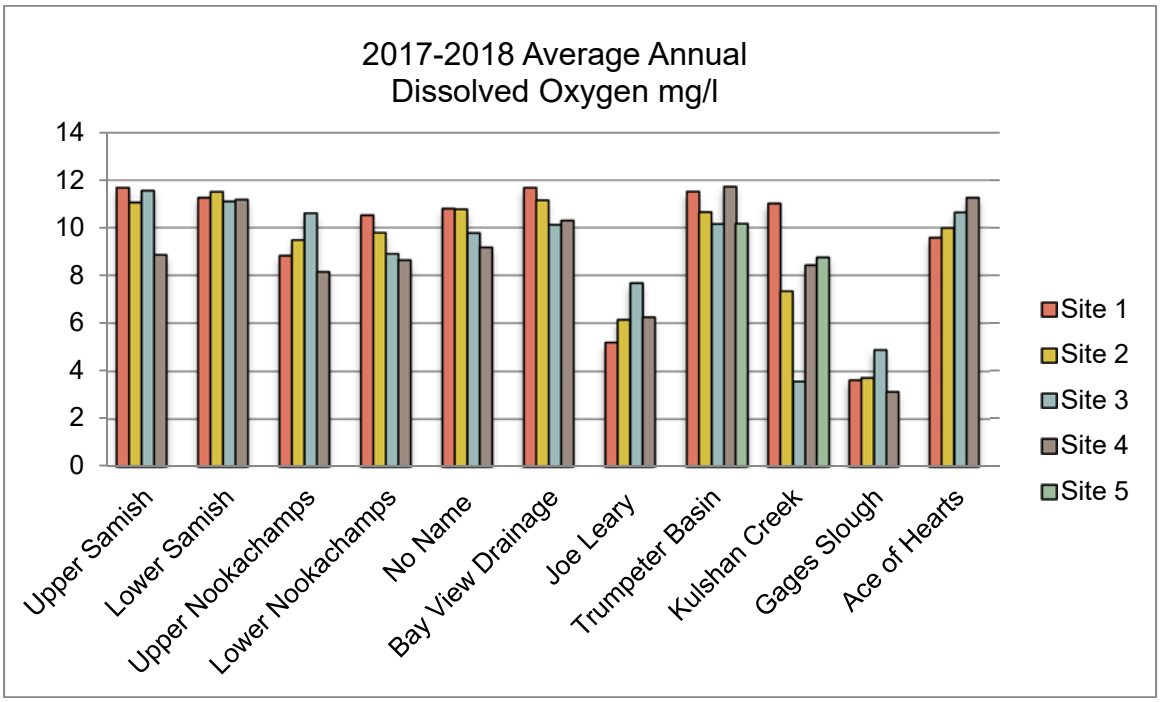

Figure 98. Annual Average Dissolved Oxygen: All sites

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.

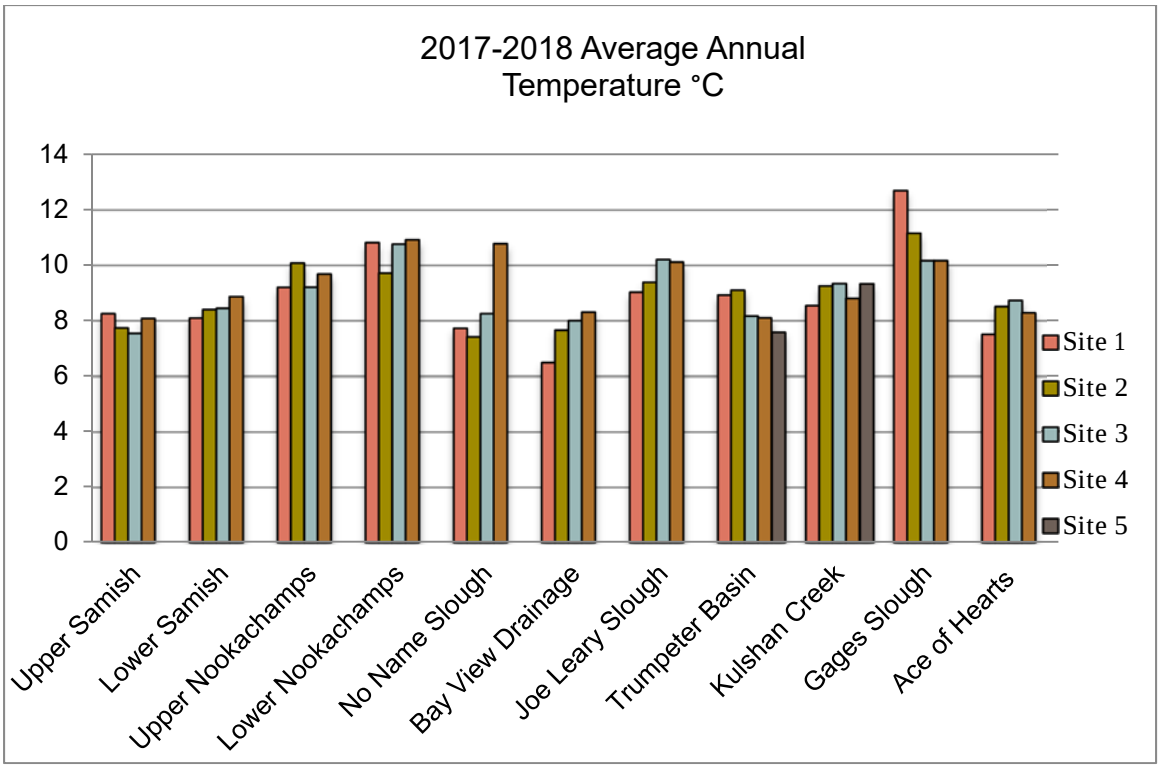

Figure 99. Annual Average Temperature: All sites

Turbidity is the parameter with the greatest naturally occurring variability. Comparing all streams, Gages Slough Site 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.

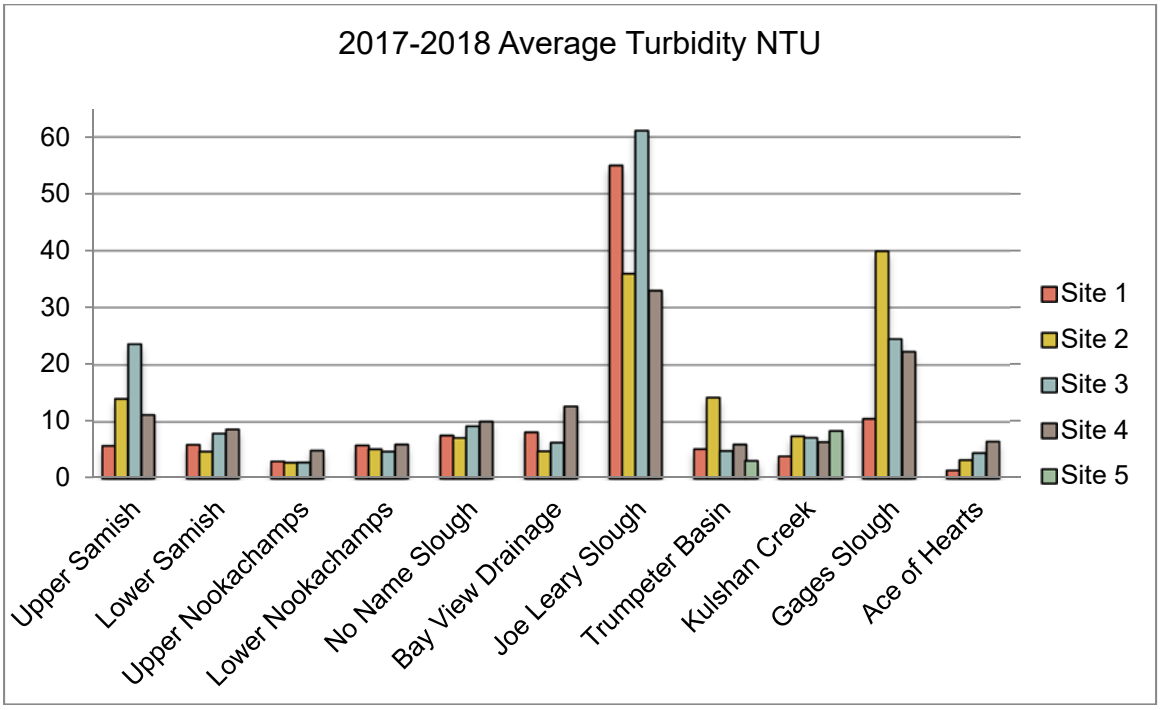

Figure 100. Annual Average Turbidity: All sites

Fecal coliform (Figure 101) is the parameter of greatest interest to regulators, health officials, and shellfish growers. In 2015-2016, 18 out of 46 sites did not meet Part I of the standard. In 2016-2017 , 13 out of 46 sites averaged above 100CFU/100ml. In 2017-2018 only 9 out of 46 sites did not meet the standard, which shows a steady, if slow improvelment. No Name Slough has historically had the highest fecal coliform numbers, but looked much better this year. Upper Samish 3, all Joe Leary Slough sites, Kulshan Creek Site 2, and and Gages Slough Site 1 all failed to meet Part 1 of the State Standard.

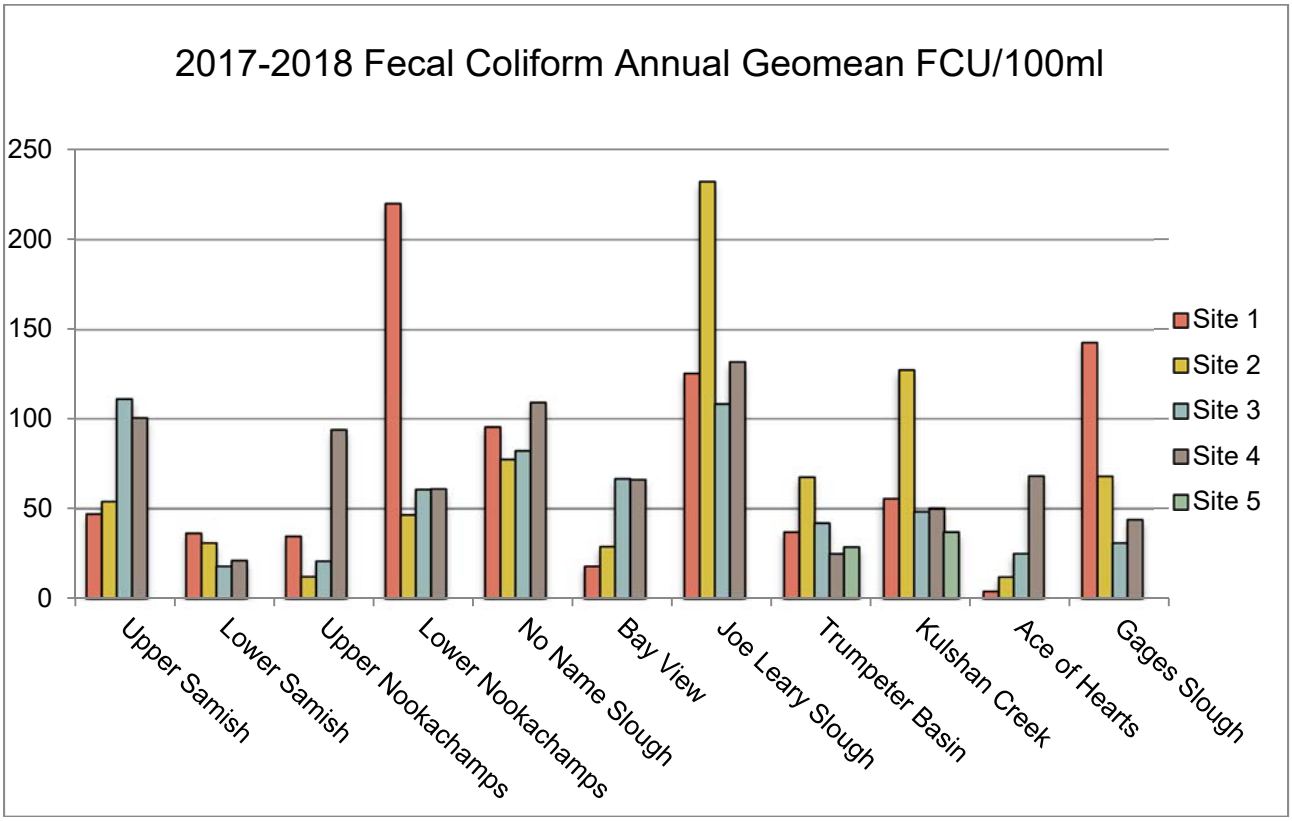

Figure 101. Fecal Coliform Annual Geomean: All sites

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. Three years ago,in 2014-2015, fifteen sites met both standards. The following two years , 13 out of 46 sites met both standards. In 2017-2018, only 10 of 46 sites met both standards – shown in bold below.

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	no	no	no	yes	no		
Lower Samish	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**	**yes**		
Upper Nookachamps	yes	no	yes	no	yes	no	yes	no		
Lower Nookachamps	no	no	yes	no	**yes**	**yes**	yes	no		
No Name Slough	yes	no	yes	no	yes	no	no	no		
Bay View	yes	no	yes	no	yes	no	yes	no		
Joe Leary Slough	no	no	no	no	no	no	no	no		
Trumpeter Basin	yes	no	yes	no	**yes**	**yes**	**yes**	**yes**	yes	no
Kulshan Creek	yes	no	no	no	yes	no	yes	no	yes	no
Ace of Hearts Creek	**yes**	**yes**	**yes**	**yes**	yes	no	no	no		
Gages Slough	no	no	yes	no	yes	no	yes	no		

Storm Team Results

2017-2018 the Storm Team completed a second year of sampling in the Padilla Baywatershed. Volunteers sampled 12 sites, 6 of which were also sampled in 2016-2017. Four sites were on Joe Leary Slough, the largest fresh water input to Padilla Bay. Other sites were on No Name Slough, Little Indian Slough, and in the village of Bay View. Volunteers sampled 12 sites during 8 rain events, half as many events as the previous year. Storm team data should be viewed differently from the rest of the stream team data. They do not represent typical conditions. Even a healthy stream 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.

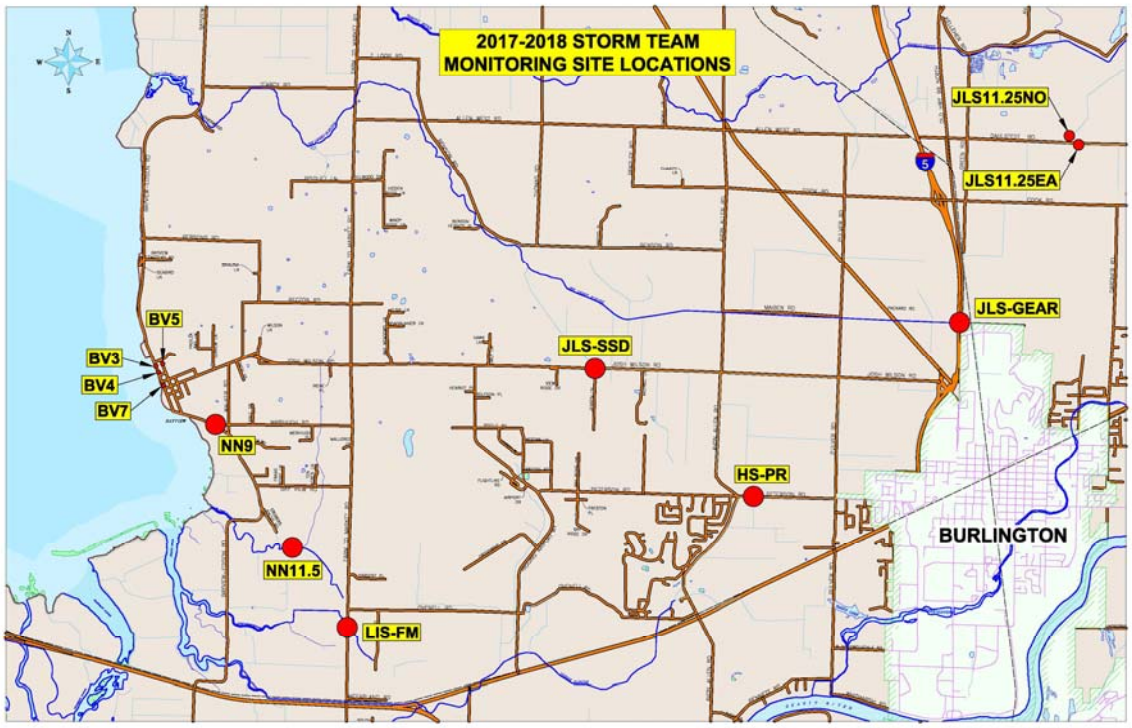

Figure 102. Padilla Bay Storm Team Sampling Sites 2017-2018

Table 12. Storm Team Site Names and Location

Site ID	Location	Lat	Long
JLS-SSD	South Spur Ditch (JLS) at Josh Wilson Rd	48.486785	-122.400550
JLS11.25NO	Joe Leary Slough N side of Dahlstedt Rd at v-ditch	48.515290	-122.316760
JLS11.25EA	Joe Leary Slough S side of Dahlstedt Rd , E of culvert	48.514820	-122.316120
JLS-GEAR	Joe Leary Slough at Gear Rd (car lots)	48.493169	-122.334936
HS-PR	Higgins Slough at Peterson Road	48.471939	-122.372181
LIS-FM	Little Indian Slough at Farm-Market Road	48.455794	-122.444279
NN9	Marihugh and Bayview-Edison Road	48.479283	-122.468683
NN11.5	No Name Slough at end of Egbers-Kalso Road	48.465098	-122.455329
BV3	Culvert South of Bay View State Park	48.485931	-122.479358

BV4	B Street Culvert (Bay View)	48.485154	-122.478814
BV5	Second St at south end of board fence (Bay View)	48.486494	-122.478086
BV7	Boat Launch Culvert (Bay View)	48.484440	-122.478754

Figures 103-105 below show actual fecal coliform counts for all sites. Each graph shows 5 sites.

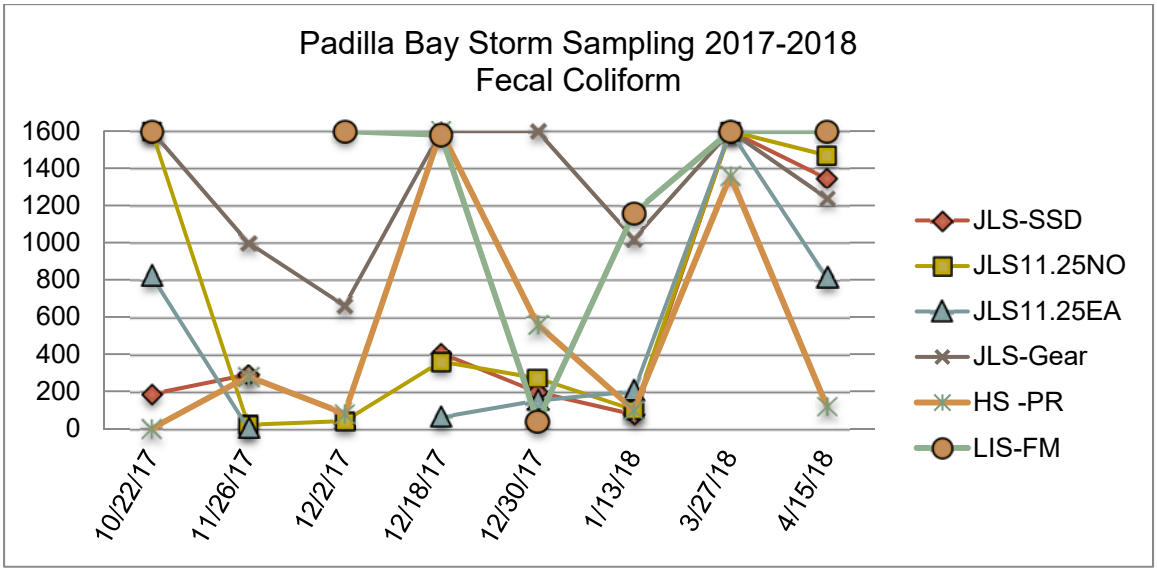

Figure 103. Storm Team: Padilla Bay Fecal Coliform, Joe Leary/Little Indian Slough Sites

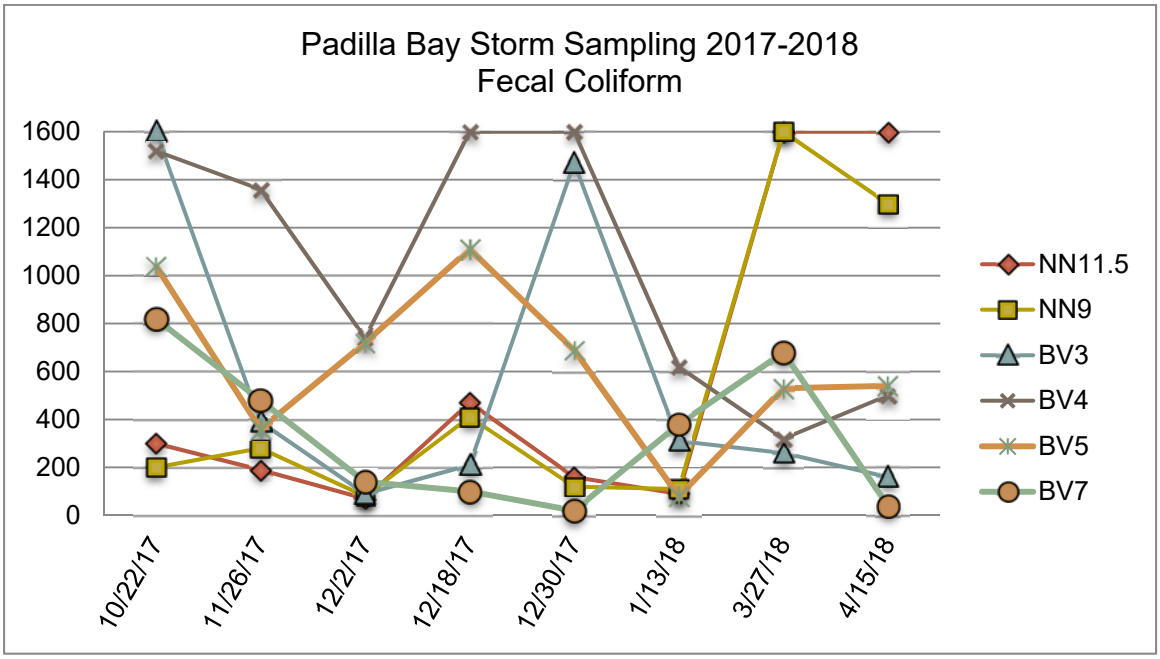

Figure 104. Storm Team: Padilla Bay Fecal Coliform, No Name Slough and Bay View Sites

Figure 105 (below) shows geometric means for the 2017-2018 sampling season. Only 2 sites were below the state standard of 100cfu/100ml of water. It is important to remember that sampling only occurred

during heavy rain events. In Bay View, the B Street culvert (BV 4) continued to have higher counts than nearby Bay View sites. Like last year, two other sites stand out with extremely high counts, Joe Leary Slough at Gear Road and Little Indian Slough at Farm-to-Market Road.

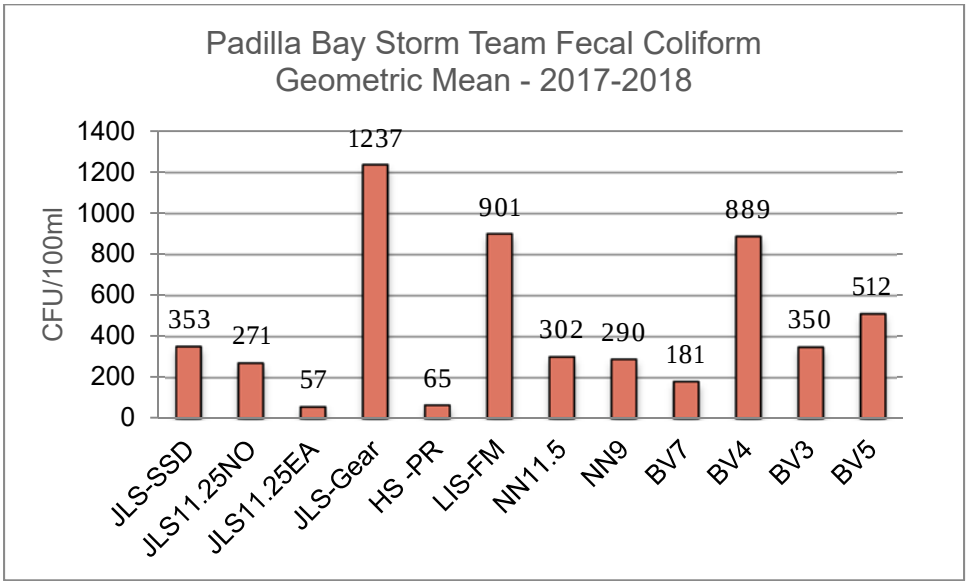

Figure 105. Storm Team: All Sites, Fecal Coliform Geometric Means

VI. Conclusion

The 2017-2018 Stream Team volunteers built upon the success of previous years, and provided the twentieth 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 Padilla Bay watershed during heavy rain events.

Sixty-eight 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 1,190 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**	**7.7**	**7.6**	**90.7**	**10.9**	**96**
-	10/2/2017	-	-	-	-	-
-	10/20/2017	10.8	8.28	88.2	8.9	280
-	10/30/2017	-	-	-	--	-
-	11/17/2017	8	7.91	85.6	10.7	300
-	11/27/2018	7.9	4.56	104.5	12.35	250
-	12/14/2017	4.6	3.2	88.6	11.27	10
-	12/25/2017	1.8	3.52	103.7	14.43	20
-	1/12/2018	7	13.3	92.5	11.39	45
-	11/22/2018	6.1	4.78	90.2	11.33	55
-	2/9/2018	8.2	12.43	88.9	10.62	20
-	2/19/2018	1.3	5.03	99.8	13.92	70
-	3/9/2018	9.0	4.85	96.00	10.96	245
-	3/19/2018	5.4	4.13	74.50	8.95	15
-	4/5/2018	10.1	14.82	85.7	9.58	755
-	4/16/2018	8.6	7.2	88.1	10.3	310
-	5/3/2018	13.6	9.71	94	9.85	280
-	5/14/2018					-
	5/31/2018	12.5	3.82	69.5	7.25	150
						-
NN2 Bay View Road	**Average/Geomean**	**7.4**	**7.1**	**87.4**	**10.8**	**64**
-	10/2/2017	-	-	-	-	-
-	10/20/2017	10.6	9.61	90.5	10.13	315
-	10/30/2017	7.8	4.02	54.4	7.37	55
-	11/17/2017	7.5	5.57	92	11.07	30
-	11/27/2018	7.6	7.39	97.5	11.76	280
-	12/14/2017	4.1	4.02	94	12.29	10
-	12/25/2017	1.5	4.84	100.9	14.3	70
-	1/12/2018	6.7	7.65	94.2	11.61	65
	11/22/2018	6.2	7.18	96.2	11.91	90
-	2/9/2018	7.3	7.63	95.6	11.56	65
-	2/19/2018	1.1	7.73	104.1	15.02	85
-	3/9/2018	7.4	6.42	97.70	11.78	12
	3/19/2018	5.6	6.35	74.50	9.63	10
-	4/5/2018	9.2	12.65	91.8	10.59	1560
-	4/16/2018	8.7	8.54	93.6	10.91	375
-	5/3/2018	13.8	7.92	102.9	10.23	65
	5/14/2018	-	-	-	-	-
	5/31/2018	11.7	5.3	16.4	1.95	5

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
NN3 Egbers Field	**Average/Geomean**	**8.1**	**8.9**	**77.2**	**9.8**	**82**
-	10/2/2017	-	-	-	-	-
-	10/20/2017	10.9	8.79	70.7	7.73	637
-	10/30/2017	7.9	1.8	41.4	5.05	38
-	11/17/2017	7.7	6.91	75.7	8.91	147
-	11/27/2018	7.9	10.48	79.9	9.89	315
-	12/14/2017	4.2	5.14	82.3	10.66	12
-	12/25/2017	1.8	9.32	84.5	11.57	56
-	1/12/2018	6.5	13.88	89.99	11.28	213
-	11/22/2018	6.2	9.23	80.2	9.94	244
-	2/9/2018	7.5	10.94	95.1	20.55	24
-	2/19/2018	1.6	13.46	94.5	13.19	107
	3/9/2018	7.4	6.42	97.70	11.78	12
	3/19/2018	5.6	6.35	74.50	9.63	10
-	4/5/2018	8.3	17.52	83.9	10	1600
	4/16/2018	8.5	12.43	85.4	10.42	234
-	5/3/2018	16.3	5.13	103.5	10.21	72
-	5/14/2018	13.7	4.65	59.9	6.14	83
-	5/31/2018	11.6	7.8	53.3	4.84	5
-	6/11/2018	11.4	9.65	38	4.07	268
NN4 Field Culvert	**Average/Geomean**	**10.4**	**10.7**	**83.2**	**9.2**	**109**
-	10/2/2017	14.1	3.31	33.1	2.67	15
-	10/20/2017	11.2	12.93	45.5	7.11	1110
-	10/30/2017	13	3.98	30.2	2.74	10
-	11/17/2017	8.1	7.11	76.1	8.74	235
-	11/27/2018	8	9.69	72.3	8.76	269
-	12/14/2017	4.3	6.38	74	9.41	8
-	12/25/2017	2.2	8.93	73.3	10.06	48
-	1/12/2018	6.2	30.8	85.1	10.96	295
-	11/22/2018	6.2	10.34	72.2	9.33	70
-	2/9/2018	8	13.53	81.8	11.33	45
-	2/19/2018	2.3	15.03	87	12.81	33
-	3/9/2018	8.7	23.60	94.80	11.02	248
-	3/19/2018	6.7	9.57	79.20	9.52	115
-	4/5/2018	10.1	16.57	92.5	9.07	1600
-	4/16/2018	8.6	14.05	82.9	9.25	163
-	5/3/2018	20.9	5.83	169.5	14.18	678
-	5/14/2018	18.5	2.45	62.9	5.89	40
-	6/11/2018	19.3	4.42	120.8	9.56	283

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
Upper Samish						
US1 PomonaGrange	**Average/Geomean**	**8.3**	**5.7**	**99.9**	**11.7**	**48**
-	10/13/2017	8.3	4.2	100.5	11.75	55
-	10/28/2017	9.5	5.46	103.6	11.79	7
-	11/10/2017	7.7	2.6	102.3	12.12	36
-	11/25/2017	8.9	5.86	96	11.22	44
-	12/8/2017	5	2.7	98	9.25	6
-	12/23/2017	3.3	3.86	89	11.85	31
-	1/5/2018	5.1	2.6	101.2	12.86	19
-	1/20/2018	6.1	4.25	102.3	12.66	63
-	2/2/2018	6.4	6.9	104.7	12.81	34
-	2/17/2018	5.2	29.8	98	12.47	150
-	3/2/2018	4.2	4.54	100	13.14	19
-	3/17/2018	5.7	4.08	103	12.91	25
-	3/30/2018	7	6.8	100.5	-	122
-	4/14/2018	8	6.12	104.5	12.28	83
-	4/27/2018	12.5	3.77	101.5	10.77	190
-	5/12/2018	11.9	2.33	100.5	10.84	169
-	5/25/2018	13.7	5.9	98.5	10.22	27
-	6/9/2018	12.7	5.55	-	-	662
-	6/23/2018	15.6	1.9	94.1	9.4	41
US2 Swede Creek	**Average/Geomean**	**7.7**	**14.0**	**91.2**	**11.0**	**54**
-	10/13/2017	7.8	7.3	81.9	9.71	64
-	10/28/2017	7.5	9.82	83.2	9.92	26
-	11/10/2017	6.4	8.6	87.7	10.79	23
-	11/25/2017	8.6	10.52	89.2	10.43	154
-	12/8/2017	2.5	6.7	93.2	12.6	27
-	12/23/2017	1.6	7.86	101.6	14.14	25
-	1/5/2018	-	-	-	-	-
-	1/20/2018	6	16.35	90.5	11.26	135
-	2/2/2018	6.4		96.4	11.83	44
-	2/17/2018	4.9	86.1	97.7	12.52	247
-	3/2/2018	3.9	8.85	92.9	12.15	13
-	3/17/2018	4.7	6.43	96.3	12.44	18
-	3/30/2018	7.1	11.7	98.2	11.83	79
-	4/14/2018	8.2	20.1	97.2	11.4	134
-	4/27/2018	11.5	8.12	92.4	10.06	48
-	5/12/2018	11.6	5.05	87.5	9.53	65
-	5/25/2018	13.3	2.9	84.8	8.87	16
-	6/9/2018	12.4	9.78	-	-	264
-	6/23/2018	14.9	3.4	80	8.14	78

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
US3 Thomas Creek	**Average/Geomean**	**7.5**	**23.6**	**95.5**	**11.5**	**111**
-	10/13/2017	8.2	7.1	93.9	11.05	352
-	10/28/2017	8	15.72	90.2	10.66	30
-	11/10/2017	7.2	11.5	92.8	11.18	17
-	11/25/2017	8.7	16.93	93.9	10.92	34
-	12/8/2017	3.7	12.6	81.4	10.76	27
-	12/23/2017	2.7	13.05	98.5	13.35	72
-	1/5/2018	5.4	15.4	98.8	12.46	115
-	1/20/2018	6.3	28.8	94.1	11.39	408
-	2/2/2018	6.6	33.5	99	12.12	266
-	2/17/2018	5	170.8	100.5	12.85	337
-	3/2/2018	4.3	12	99.1	12.73	39
-	3/17/2018	4.7	12.56	95.3	12.24	82
-	3/30/2018	7.1	21.1	96.2	11.63	163
-	4/14/2018	8.1	36.3	99.8	11.73	433
-	4/27/2018	10.2	8.19	96.3	10.82	42
-	5/12/2018	10.5	6.72	92.5	10.85	98
-	5/25/2018	11.9	4.2	103.2	11.2	58
-	6/9/2018	11.3	17.56	-	-	707
-	6/23/2018	13.3	4.6	93.4	9.79	370
US4 Willard Creek	**Average/Geomean**	**8.1**	**11.2**	**72.2**	**8.9**	**100**
-	10/28/2017	-	-	-	-	-
-	11/10/2017	6.2	4	18.8	2.61	8
-	11/25/2017	8.4	4.21	76.1	9.05	52
-	12/8/2017	3.5	4.2	96.7	12.78	26
-	12/23/2017	2.6	4.05	84.9	11.53	51
-	1/5/2018	6.2	4.8	85.8	10.61	219
-	1/20/2018	6.5	8.42	82.4	10.09	81
-	2/2/2018	6.6	10.1	88.1	10.76	191
-	2/17/2018	5.1	84.9	96.2	12.25	471
-	3/2/2018	6.4	4.95	83.2	10.5	18
-	3/17/2018	6.1	7.62	82.5	10.24	45
-	3/30/2018	7.6	6.8	84.4	10.67	60
-	4/14/2018	8.4	15.5	88	10.32	514
-	4/27/2018	11.4	3.7	79.7	8.7	64
-	5/12/2018	11.6	4.33	72.6	7.88	1405
-	5/25/2018	13.2	4.5	32.1	3.32	172
-	6/9/2018	12.5	7.22	-	-	98
-	6/23/2018	14.9	10.6	3	0.33	316

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
Lower Samish						
LS1 99 Bridge	**Average/Geomean**	**8.1**	**6.0**	**100.2**	**11.2**	**37**
-	10/1/2017	11.8	2.65	100	10.8	186
-	10/18/2017	9.6	3.67	93.7	10.68	76
-	10/29/2017	9	3.54	100.8	11.6	
-	11/15/2017	7.8	12.6	97.5	11.58	86
-	11/26/2017	9.7	10.14	101.5	11.53	31
-	12/13/2017	4.8	4.32	97.7	12.55	17
-	12/27/2017	4	2.78	97.7	12.7	11
-	1/11/2018	5.8	8.38	99.1	12.45	73
-	1/21/2018	6.7	3.82	100.7	12.1	15
-	2/7/2018	7.4	20.6	98.3	11.8	31
-	2/18/2018	4.8	12.53	102.2	2.94	-
-	3/7/2018	4.6	5.35	96.20	12.32	17
-	3/18/2018	7.0	3.62	103.60	12.43	-
-	4/4/2018	6.9	3.68	105.8	12.7	15
-	4/15/2018	7.6	-	89.8	10.23	-
-	5/2/2018	10.4	4.23	102.3	11.26	16
-	5/13/2018	12.1	2.45	104.7	11.15	74
	5/30/2018	11.8	1.4	107.1	11.5	32
	6/10/2018	11.7	1.6	104.4	11.3	138
LS2 Jolly Rd	**Average/Geomean**	**8.4**	**4.7**	**98.2**	**11.5**	**31**
-	10/1/2017	11.9	2.54	99.3	10.7	296
-	10/18/2017	9.6	2.85	92	10.46	109
-	10/29/2017	9	2.85	99.1	11.46	
-	11/15/2017	7.8	13.7	95.7	11.37	106
-	11/26/2017	9.6	9.5	100.3	11.39	38
-	12/13/2017	4.8	7.31	98.3	12.57	7
-	12/27/2017	4	2.94	94.7	12.39	5
-	1/11/2018	5.9	8.47	98.4	12.29	32
-	1/21/2018	6.7	3.67	96.6	11.76	3
-	2/7/2018	-	-	-	-	-
-	2/18/2018	-	-	-	-	-
-	3/7/2018	4.7	4.51	94.80	12.13	25
-	3/18/2018	7.0	3.52	101.10	12.34	-
-	4/4/2018	6.9	3.65	87.9	10.63	38
-	4/15/2018	-	-	-	-	-
-	5/2/2018	10.5	4.15	99.1	10.85	18
-	5/13/2018	12.3	2.5	104.3	11.12	91
-	5/30/2018	12.2	2.24	105.6	11.22	10

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
LS2 Jolly Rd	6/10/2018	11.9	1.29	104	11.15	164
LS3 Chuckanut Bridge	**Average/Geomean**	**8.4**	**7.9**	**94.4**	**11.1**	**15**
	10/1/2017	12.3	2.62	96.4	10.3	212
-	10/18/2017	9.6	3.42	90.1	10.24	101
-	10/29/2017	9	3.52	94.4	10.88	-
-	11/15/2017	7.8	12.3	93.2	11.08	39
-	11/26/2017	9.5	11.3	97.3	11.2	32
-	12/13/2017	4.9	5.57	96.3	12.23	6
-	12/27/2017	4.1	5.04	91.4	11.89	19
-	1/11/2018	5.7	19.44	94.7	11.95	65
-	1/21/2018	6.8	5.58	92.6	11.28	0
-	2/7/2018	7.5	29.3	92.7	11.09	68
-	2/18/2018	5	16.05	95.9	12.22	-
-	3/7/2018	5.2	6.48	91.2	11.5	60
-	3/18/2018	7.2	3.86	97.2	11.7	-
-	4/4/2018	7.1	4.65	94.6	11.38	23
-	4/15/2018	7.7	-	87.5	10.7	
-	5/2/2018	11.1	4.73	100.3	10.87	8
-	5/13/2018	13.5	3.33	95.7	9.95	15
-	5/30/2018	13.6	2.82	97.4	10.1	34
-	6/10/2018	12.7	2.37	95.1	10.1	101
LS4 Samish at Boat Docks	**Average/Geomean**	**8.9**	**8.6**	**95.9**	**11.2**	**18**
	10/1/2017	14.3	7.4	91.3	9.3	94
-	10/18/2017	9.7	12.88	93.5	10.62	98
-	10/29/2017	9	13.02	84.2	9.7	-
-	11/15/2017	7.8	11.2	97.6	11.61	69
-	11/26/2017	9.4	8.65	98.2	11.23	98
-	12/13/2017	5.1	5.07	97.7	12.17	14
-	12/27/2017	3.9	4.33	91.1	11.88	52
-	1/11/2018	5.9	8.21	100.5	12.5	60
-	1/21/2018	6.7	7.34	94.7	11.56	0
-	1/21/2018	6.7	7.34	94.7	11.56	0
-	2/7/2018	7.6	28	98.8	11.62	34
-	2/18/2018	5.2	18.29	95.4	12.15	-
-	3/7/2018	5.9	5.79	97.9	12.1	20
-	3/18/2018	7.4	5.04	97.1	11.63	-
-	4/4/2018	7.3	3.88	93.6	11.22	17
-	4/15/2018	7.9	-	99.9	11.85	-

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
LS4 Samish at Boat Docks	5/2/2018	12	5.81	97	10.38	23
	5/13/2018	14.9	2.82	99.4	10.66	18
-	5/30/2018	14.6	3.84	99.9	10.1	61
-	6/10/2018	13.7	3.78	94.4	9.8	102
[redacted]						
Gages Slough						
GS1 Regent St. & E Rio Vista St.	**Average/Geomean**	**12.7**	**10.5**	**35.2**	**3.6**	**146.9**
	10/19/2017	13.2	6.71	75.30	7.69	1600
-	11/9/2017	13.6	3.74	36.20	3.65	1600
-	12/7/2017	12.6	14.80	42.50	3.75	54
-	1/4/2018	11.9	3.70	10.80	1.45	168
-	3/29/2018	10.5	1.54	41.50	4.70	110
-	4/26/2018	11.2	1.64	44.10	4.73	143
-	5/24/2018	14.2	44.40	23.10	2.29	480
-	6/21/2018	14.3	7.71	8.40	0.70	<1
GS2 Anacortes St.	**Average/Geomean**	**11.2**	**39.9**	**34.2**	**3.7**	**72**
-	10/19/2017	12.8	10.19	57.70	5.92	1600
-	11/9/2017	10.7	67.10	86.20	9.63	384
-	12/7/2017	6.5	62.60	17.50	1.97	16
-	1/4/2018	7.3	92.50	19.10	2.39	<1
-	3/29/2018	8.5	34.70	46.10	5.29	98
-	4/26/2018	13.1	6.72	28.30	2.93	50
-	5/24/2018	15.1	25.00	9.60	0.88	144
-	6/21/2018	15.2	20.10	9.10	0.74	68
GS3 S. Spruce St.	**Average/Geomean**	**10.2**	**24.5**	**26.8**	**4.9**	**33**
-	10/19/2017	-	-	-	-	-
-	11/9/2017	8.9	13.90	62.50	6.78	176
-	12/7/2017	4.4	5.21	16.20	15.50	2
-	1/4/2018	3.2	3.84	37.90	4.83	2
·	3/29/2018	8.7	7.99	21.70	2.49	54
-	4/26/2018	13.8	9.07	23.00	2.26	30
-	5/24/2018	15.5	89.70	12.90	1.27	368
-	6/21/2018	16.8	42.00	13.20	1.20	68
GS4 McCorquedale	**Average/Geomean**	**10.2**	**22.3**	**26.9**	**3.1**	**44**
-	10/19/2017	-	-	-	-	-
-	11/9/2017	6.6	39.80	23.20	2.85	208

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
GS4 McCorquedale	12/7/2017	2.9	4.77	23.80	3.09	4
-	1/4/2018	2.1	37.70	34.90	4.74	22
-	3/29/2018	8.9	5.27	48.00	5.58	32
-	4/26/2018	14.9	3.78	44.70	4.66	35
-	5/24/2018	17.3	36.30	7.40	0.62	104
-	6/21/2018	18.4	28.20	6.10	0.47	152
[redacted]						
Bay View						
BV1 Walker Rd	**Average/Geomean**	**6.5**	**8.1**	**109.7**	**11.7**	**25.6**
-	10/10/2017	-	-	-	-	-
-	10/22/2017	-	-	-	-	
-	11/7/2017	-	-	-	-	-
-	11/25/2017	9.2	8.3	103	10	20
-	12/5/2017	-	-	-	-	3
-	12/17/2017	6.1	2.5	107	11	13
-	1/2/2018	2.8	4	-	-	15
	1/14/2018	5.1	3	114	11.9	105
	1/30/2018	6.8	5.75	101.6	10.4	252
	2/11/2018	4.4	8.6	110.5	12.1	10
	2/27/2018	4.9	3.2	127	13.33	3
	3/11/2018	6.9	27	135	14.5	14
	3/27/2018	7.8	14	97	11.36	1600
	4/8/2018	10.9	5.1	92.4	10.38	19
	4/24/2018	-	-	-	-	-
	5/6/2018	-	-	-	-	-
BV2 C Street	**Average/Geomean**	**7.7**	**4.8**	**102.9**	**11.1**	**27**
-	10/10/2017	-	-	-	-	-
-	10/22/2017	10.5	2.4	106.1	11.8	
-	11/7/2017	-	2.8	-	-	109
-	11/25/2017	9	3.5	92	9	21
	12/5/2017	-	3.65	-	-	9
	12/17/2017	5.6	5.2	104.5	11	16
	1/2/2018	2.3	4.4	117	13.78	6
-	1/14/2018	5.1	-	108.6	11.6	51
-	1/30/2018	7.3	7.1	102.1	10.38	164
-	2/11/2018	4	5.5	110.5	12	6
-	3/11/2018	7	4.6	130	13	182.5
-	2/27/2018	5.3	3.1	126.2	14	0
-	3/27/2018	7.6	10	95.8	11.61	1600

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
BV2 C Street	4/8/2018	11.2	5.2	89.8	9.87	20
-	4/24/2018	9.4	3.6	82.2	9.2	1600
-	5/6/2018	15.3	6.2	73.3	7.5	-
BV3 Boat Launch	**Average/Geomean**	**8.0**	**6.3**	**99.1**	**10.1**	**30.0**
-	10/10/2017	11.1	6.26	77.5	7.3	1468
-	10/22/2017	9.9	3.6	109	10.3	-
-	11/7/2017	5.6	2.3	96.5	10.25	73
-	11/25/2017	9	1.2	97	9.4	16
-	12/5/2017	7.8	2.15	69.2	6.97	17
-	12/17/2017	6.5	4.5	103.3	10.7	4
	1/2/2018	4.2	23.7	119	12.9	86
	1/14/2018	7.1	8.1	99.5	9.8	32
	1/30/2018	7.3	8.7	98.7	10.18	167
	2/11/2018	6.2	6.4	107.9	11.2	20
-	3/11/2018	9.9	4.7	134	12.9	0
-	2/27/2018	6.5	3.5	104.8	10.58	9
-	3/27/2018	7.8	9.8	-	-	1234
-	4/8/2018	10.6	6.2	87.5	9.83	47
-	4/24/2018	10.4	3.6	84	9.2	950
	5/6/2018	-	-	-	-	-
BV4 Bay View State	**Average/Geomean**	**8.3**	**12.7**	**101.2**	**10.3**	**65**
Park	10/10/2017	11	9.23	92.8	8.64	828
-	10/22/2017	9.9	19.9	116	10.9	
-	11/7/2017	4.7	2.3	101	10.72	90
-	11/25/2017	9.1	-	100	9.6	9
-	12/5/2017	8.3	1.75	69	6.67	29
-	12/17/2017	6.7	2.6	96.7	9.8	10
-	1/2/2018	5.4	3	110.6	11.92	25
-	1/14/2018	7.5	3.1	97.3	9.8	9
-	1/30/2018	7.4	7	104.7	11.78	134
-	2/11/2018	6.4	5.2	99.5	10.3	31
-	2/27/2018	6.5	5	109.3	11.27	1461
-	3/11/2018	9.5	6	141	13.5	993
-	3/27/2018	8.3	9.3	97.4	9.6	107
-	4/8/2018	12	102	85.5	9.5	204
-	4/24/2018	11.7	0.99	97	10.3	4
	5/6/2018	-	-	-	-	-
Site	**Date**	**Water Temp (° C)**	**Turbidity (NTU)**	**D.O. (% sat.)**	**D.O. (mg/l)**	**FC (CFU/100ml)**

Trumpeter Basin						
TB1 Stonebridge	**Average/Geomean**	**8.9**	**5.2**	**97.6**	**11.5**	**37.5**
Adult Community	10/12/2017	9.3	2.09	96.10	10.97	13
-	10/25/2017	11.0	2.08	93.70	10.36	40
-	11/19/2017	9.3	2.57	93.50	10.82	73
-	12/7/2017	6.1	2.52	104.60	13.06	13
-	12/20/2017	6.6	8.58	102.10	12.50	73
-	1/4/2018	5.0	3.02	101.30	13.05	1
-	1/17/2018	7.7	5.65	98.40	11.73	7
-	2/1/2018	7.5	10.12	100.80	12.21	13
-	2/14/2018	4.7	11.84	101.30	13.03	360
-	3/1/2018	6.1	4.01	104.60	12.90	40
-	3/14/2018	7.6	2.65	77.30	11.61	33
-	3/29/2018	8.6	14.05	106.30	12.38	127
-	4/11/2018	9.8	7.03	98.30	11.15	47
-	4/26/2018	10.8	3.00	102.10	11.08	53
-	5/9/2018	13.9	4.33	93.30	9.60	287
-	6/6/2018	12.0	2.21	95.50	10.25	27
-	6/21/2018	15.7	2.58	89.90	8.73	153
TB2 Frazier Home	**Average/Geomean**	**9.1**	**14.2**	**91.1**	**10.6**	**71.3**
on College Way	10/12/2017	9.4	1.93	77.50	8.93	773
-	10/25/2017	13.3	5.54	91.50	9.57	7
-	11/19/2017	9.7	46.53	91.70	10.38	1493
-	12/7/2017	6.6	5.55	102.80	12.37	0
-	12/20/2017	5.2	13.44	96.10	12.27	307
-	1/4/2018	4.5	6.96	98.80	12.89	13
-	1/17/2018	7.1	17.85	92.10	11.14	393
-	2/1/2018	6.9	24.88	94.10	11.37	27
-	2/14/2018	4.1	47.66	96.80	12.64	247
-	3/1/2018	5.6	11.88	101.40	12.63	7
-	3/14/2018	8.1	6.46	93.50	11.05	87
-	3/29/2018	8.5	23.75	98.60	11.51	546
-	4/11/2018	9.6	9.49	92.30	10.51	47
-	4/26/2018	12.2	7.68	89.00	9.64	67
-	5/9/2018	14.4	8.88	77.30	7.90	887
-	6/6/2018	11.7	2.10	85.70	9.29	100
-	6/21/2018	17.8	1.32	69.10	6.75	1600
TB3 Summerson	**Average/Geomean**	**8.2**	**4.8**	**85.0**	**10.1**	**42.1**
Nursery Bridge	10/12/2017	8.9	1.89	84.60	9.79	53

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
TB3 Summerson	10/25/2017	9.8	4.30	72.20	8.16	80
Nursery Bridge	11/19/2017	7.6	1.20	66.20	7.99	33
-	12/7/2017	4.0	1.91	92.20	11.98	27
-	12/20/2017	5.5	7.98	90.80	11.43	120
-	1/4/2018	3.1	2.38	89.50	12.10	13
-	1/17/2018	7.0	4.62	86.60	10.48	7
-	2/1/2018	6.9	8.12	92.40	11.23	27
-	2/14/2018	4.2	19.78	94.90	12.43	100
-	3/1/2018	5.5	4.53	96.90	12.12	20
-	3/14/2018	7.3	3.35	87.00	10.16	20
-	3/29/2018	7.5	5.75	96.90	11.59	47
-	4/11/2018	9.2	3.81	87.50	10.07	33
-	4/26/2018	10.9	2.21	81.70	9.61	60
-	5/9/2018	13.8	4.41	76.10	7.88	193
-	6/6/2018	11.7	2.88	75.10	8.14	60
-	6/21/2018	15.9	3.17	73.70	7.27	87
TB4 Kiowa Street	**Average/Geomean**	**8.1**	**6.0**	**97.2**	**11.7**	**24.9**
-	10/12/2017	8.9	1.71	92.40	10.86	87
-	10/25/2017	10.0	2.65	95.30	10.77	20
-	11/19/2017	7.5	0.83	90.13	10.89	80
-	12/7/2017	4.3	2.34	106.00	13.74	0
-	12/20/2017	5.5	9.33	99.30	12.52	140
-	1/4/2018	3.5	2.27	99.30	13.24	13
-	1/17/2018	7.0	5.81	96.30	11.70	127
-	2/1/2018	6.9	14.94	98.50	12.01	107
-	2/14/2018	4.5	30.05	102.00	13.19	67
-	3/1/2018	5.1	3.96	102.20	12.90	7
-	3/14/2018	7.1	1.85	99.50	12.02	60
-	3/29/2018	7.5	4.37	101.00	12.14	40
-	4/11/2018	9.2	2.97	96.00	11.04	40
-	4/26/2018	10.8	1.63	97.90	11.32	7
-	5/9/2018	13.4	3.39	95.60	10.70	53
-	6/6/2018	11.3	11.51	98.70	10.81	293
-	6/21/2018	15.1	1.95	82.70	9.10	33
TB5 Bakerview	**Average/Geomean**	**7.6**	**3.1**	**91.1**	**10.2**	**28.53**
Park	10/12/2017	8.9	1.71	92.40	10.86	87
Footbridge	10/25/2017	10.0	2.65	95.30	10.77	20
-	11/19/2017	7.5	0.83	90.13	10.89	80
-	12/7/2017	4.3	2.34	106.00	13.74	0

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
TB5 Bakerview	12/20/2017	5.5	9.33	99.30	12.52	140
Park	1/4/2018	3.5	2.27	99.30	13.24	13
Footbridge	1/17/2018	7.0	5.81	96.30	11.70	127
-	2/1/2018	6.9	14.94	98.50	12.01	107
-	2/14/2018	4.5	30.05	102.00	13.19	67
-	3/1/2018	5.1	3.96	102.20	12.90	7
-	3/14/2018	7.1	1.85	99.50	12.02	60
-	3/29/2018	7.5	4.37	101.00	12.14	40
-	4/11/2018	9.2	2.97	96.00	11.04	40
-	4/26/2018	10.8	1.63	97.90	11.32	7
-	5/9/2018	13.4	3.39	95.60	10.70	53
-	6/6/2018	11.3	11.51	98.70	10.81	293
-	6/21/2018	15.1	1.95	82.70	9.10	33
-						
Ace of Hearts						
AH1 Heart Lake	**Average/Geomean**	**7.5**	**1.4**	**79.5**	**9.6**	**7**
Trail	10/11/2017	-	-	-	-	-
-	10/26/2017	-	-	-	-	-
-	11/9/2017	-	-	-	-	-
-	11/21/2017	-	-	-	-	-
-	12/7/2017	5.5	1.50	54.30	6.97	2
-	12/21/2017	4.0	1.81	69.10	9.07	-
-	1/4/2018	3.7	2.96	67.30	9.07	2
-	1/18/2018	5.6	-	81.70	10.30	2
-	2/1/2018	5.8	2.09	95.20	12.08	7
-	2/15/2018	5.3	-	74.50	9.51	200
-	3/1/2018	3.8	1.79	80.70	10.38	2
-	2/15/2018	6.4	1.24	74.10	9.09	200
-	3/29/2018	8.6	1.47	99.20	11.63	<1
-	4/12/2018	9.9	0.43	84.50	9.52	<1
-	4/26/2018	13.9	0.94	77.10	8.02	2
-	5/9/2018	17.6	0.07	96.00	9.17	<2.5
-	5/24/2018	-	-	-	-	-
-	6/7/2018	-	-	-	-	-
-	6/21/2018	-	-	-	-	-
AH2 H & 41st St	**Average/Geomean**	**8.5**	**3.3**	**84.7**	**10.0**	**14**
-	10/11/2017	10.1	0.78	75.70	7.26	2
-	10/26/2017	10.5	2.41	71.10	7.91	3

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
AH2 H & 41st St	11/9/2017	7.5	3.09	75.00	9.03	5
-	11/21/2017	7.4	7.46	72.60	8.90	300
-	12/7/2017	4.4	2.89	83.50	10.84	2
-	12/21/2017	3.7	5.99	98.10	12.93	
-	1/4/2018	3.5	3.84	92.40	12.39	2
-	1/18/2018	6.1	3.72	97.50	12.05	<1
-	2/1/2018	5.8	7.54	101.40	12.56	3
-	2/15/2018	4.9	2.88	86.80	11.09	12
-	3/1/2018	4.4	3.16	87.40	11.30	77
-	3/15/2018	5.7	2.72	90.20	11.26	25
-	3/29/2018	8.2	5.40	93.00	10.98	58
-	4/12/2018	9.3	3.44	88.60	10.21	5
-	4/26/2018	11.3	2.10	79.90	8.72	48
-	5/9/2018	15.6	1.82	94.30	9.40	83
-	5/24/2018	13.8	1.20	72.20	7.43	15
-	6/7/2018	13.8	0.47	78.00	8.03	30
	6/21/2018	15.7	0.86	72.30	7.12	40
AH3 Rotary Dog Park	**Average/Geomean**	**8.7**	**4.5**	**91.3**	**10.6**	**25**
	10/11/2017	10.2	2.37	90.30	8.65	133
-	10/26/2017	10.6	2.14	88.90	9.86	90
-	11/9/2017	9.1	8.78	85.70	9.90	12
-	11/21/2017	8.1	13.50	83.10	9.80	50
-	12/7/2017	6.3	2.36	90.50	11.15	2
-	12/21/2017	4.4	5.81	101.00	13.10	-
-	1/4/2018	4.4	3.83	94.00	12.14	8
-	1/18/2018	6.5	6.57	96.60	11.89	5
-	2/1/2018	6.2	6.88	98.10	12.08	<1
-	2/15/2018	5.7	7.57	87.30	10.95	22
-	3/1/2018	4.9	3.37	87.60	11.25	35
-	3/15/2018	6.9	3.35	95.50	11.51	67
-	3/29/2018	8.4	7.16	95.70	11.21	200
-	4/26/2018	11.2	1.93	85.10	9.31	20
-	5/9/2018	15.2	2.11	96.70	9.69	1600
-	5/24/2018	12.3	1.94	91.20	9.83	155
-	6/7/2018	12.8	1.02	85.00	9.60	<1
-	6/21/2018	13.1	2.31	91.30	9.62	73
AH4 Happy Valley Creek	**Average/Geomean**	**8.3**	**6.5**	**95.8**	**11.2**	**68**
	10/11/2017	9.9	4.87	93.90	9.04	18
-	10/26/2017	11.2	3.40	92.30	10.11	10

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
AH4 Happy Valley Creek	11/9/2017	8.9	6.12	88.50	10.26	77
	11/21/2017	8.3	19.00	92.90	10.94	-
-	12/7/2017	4.6	4.27	99.60	12.82	42
-	12/21/2017	3.3	5.99	100.70	13.44	-
-	1/4/2018	3.4	4.79	98.40	13.20	18
-	1/18/2018	7.2	8.73	102.00	12.42	70
-	2/1/2018	6.3	8.46	104.10	12.92	55
-	2/15/2018	4.5	5.38	93.20	12.00	45
-	3/1/2018	5.0	6.68	89.80	11.46	20
-	3/15/2018	6.3	3.49	100.30	12.23	12
-	3/29/2018	8.3	8.64	98.20	11.54	240
-	4/12/2018	8.9	6.41	92.60	10.70	65
-	4/26/2018	11.9	2.45	89.80	9.74	12
-	5/9/2018	12.0	3.84	101.00	10.89	1600
-	5/24/2018	12.2	5.82	94.00	10.03	505
-	6/7/2018	12.0	9.84	95.50	10.07	600
-	6/21/2018	13.0	5.03	93.00	9.75	340
-						
Kulshan Creek						
KC1 S 14th St.	**Average/Geomean**	**8.5**	**3.9**	**93.2**	**11.0**	**56.0**
-	10/2/2017	11.2	2.95	86.80	9.52	926
-	10/30/2017	8.1	1.64	83.30	9.82	13
-	11/14/2017	9.4	3.76	85.20	9.75	187
-	12/11/2017	4.1	1.71	92.80	12.21	13
-	12/26/2017	4.4	1.68	106.00	13.85	7
-	1/9/2018	7.3	5.78	82.20	9.87	440
-	1/22/2018	7.2	4.78	93.20	11.34	180
-	2/7/2018	8.5	4.46	96.10	11.27	20
-	2/20/2018	3.8	2.28	102.60	13.55	7
-	3/6/2018	5.6	1.83	97.00	12.23	7
KC1 S 14th St.-	3/19/2018	6.8	1.45	95.30	11.64	7
-	4/16/2018	9.1	10.34	95.70	11.27	260
-	4/30/2018	11.1	4.39	93.80	10.25	167
-	5/14/2018	12.9	2.70	86.30	9.11	100
-	5/31/2018	11.2	5.79	89.70	9.89	33
-	6/11/2018	16.0	7.34	105.60	10.40	593
KC2 Parker Way	**Average/Geomean**	**9.3**	**7.4**	**62.3**	**7.3**	**130.2**
-	10/2/2017	13.0	6.92	19.30	2.05	387

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
KC2 Parker Way	10/30/2017	9.8	6.69	34.70	3.97	80
-	11/14/2017	10.1	5.81	68.90	8.21	213
-	12/11/2017	5.1	7.88	62.00	7.80	67
-	12/26/2017	5.8	5.97	69.50	8.75	33
-	1/9/2018	7.4	9.42	79.50	9.60	140
-	1/22/2018	7.4	10.30	86.40	10.36	127
-	2/7/2018	8.7	8.42	88.10	10.03	20
-	2/20/2018	4.8	7.12	87.40	11.23	26
-	3/6/2018	6.7	3.37	69.20	8.43	73
-	3/19/2018	7.4	3.60	68.00	8.16	73
	4/16/2018	9.4	25.83	89.70	10.24	2200
-	4/30/2018	12.0	5.24	74.50	8.04	427
-	5/14/2018	14.3	6.20	33.10	3.36	573
-	5/31/2018	12.9	3.99	29.30	3.03	147
-	6/11/2018	13.2	2.22	37.40	3.94	120
KC3 Roosevelt Ave	**Average/Geomean**	**9.3**	**7.2**	**30.6**	**3.6**	**48.5**
-	10/2/2017	13.7	5.03	16.80	1.74	573
-	10/30/2017	10.2	1.97	14.00	1.57	13
-	11/14/2017	9.5	3.45	47.20	5.41	47
-	12/11/2017	4.6	12.70	24.10	3.22	7
-	12/26/2017	4.8	3.84	37.70	4.87	7
-	1/9/2018	7.4	5.79	57.40	6.85	73
-	1/22/2018	7.9	5.05	13.40	1.55	47
-	2/7/2018	9.0	4.14	48.30	5.63	13
-	2/20/2018	4.8	2.86	39.10	5.00	13
-	3/6/2018	5.8	14.41	36.40	4.23	7
-	3/19/2018	7.2	7.17	24.60	2.97	147
-	4/16/2018	9.7	4.96	61.00	6.94	420
-	4/30/2018	12.2	4.88	51.70	5.54	500
-	5/14/2018	15.3	15.00	2.50	0.25	153
-	5/31/2018	13.4	18.00	9.70	1.13	47
-	6/11/2018	13.8	5.53	5.20	0.54	60
KC4 Riverside Dr.	**Average/Geomean**	**8.8**	**6.4**	**71.8**	**8.4**	**50.1**
-	10/2/2017	12.1	1.46	67.00	7.24	60
-	10/30/2017	8.6	2.23	52.20	6.12	127
-	11/14/2017	9.2	4.78	69.10	7.91	200
-	12/11/2017	3.3	1.75	76.40	10.16	0
-	12/26/2017	4.1	5.71	76.10	9.91	33
-	1/9/2018	7.3	10.80	72.70	8.82	947
-	1/22/2018	7.3	5.43	77.80	9.49	67

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
KC4 Riverside Dr.	2/7/2018	8.6	5.73	75.50	8.77	73
-	2/20/2018	3.9	4.33	80.20	10.53	20
-	3/6/2018	6.1	3.88	82.50	10.29	7
-	3/19/2018	7.2	3.31	75.70	9.18	20
-	4/16/2018	9.2	8.20	79.00	9.09	553
-	4/30/2018	11.6	4.91	76.40	8.30	827
-	5/14/2018	16.6	3.45	63.00	6.13	453
-	5/31/2018	12.7	33.62	60.20	5.89	133
-	6/11/2018	12.9	3.06	64.40	6.86	87
KC5 Lions Park	**Average/Geomean**	**9.3**	**8.4**	**74.8**	**8.7**	**36.9**
-	10/2/2017	14.5	6.33	52.20	5.30	533
-	10/30/2017	11.1	1.89	63.40	6.97	40
-	11/14/2017	9.3	5.73	71.40	8.24	327
-	12/11/2017	5.3	2.50	79.90	10.70	7
-	12/26/2017	4.8	3.93	79.20	10.20	20
-	1/9/2018	7.3	11.60	73.80	8.91	1013
-	1/22/2018	7.3	-	81.10	9.83	60
-	2/7/2018	-	-	-	-	-
-	2/20/2018	5.6	7.41	90.10	11.30	7
-	3/6/2018	6.7	6.44	78.30	9.55	13
-	3/19/2018	7.6	4.59	79.80	9.53	20
	4/16/2018	9.2	45.37	85.70	9.87	1540
-	4/30/2018	11.6	6.81	73.80	8.00	767
-	5/14/2018	12.7	5.74	84.70	9.10	13
-	5/31/2018	12.8	5.39	67.40	7.25	0
-	6/11/2018	14.1	3.32	61.30	6.32	193
[redacted]						
Joe Leary Slough						
JL1 Dahlstedt Road	**Average/Geomean**	**9.0**	**54.9**	**45.7**	**5.2**	**126**
-	10/8/2017	-	-	-	-	-
-	10/23/2018	-	-	-	-	-
-	11/5/2017	3.5	61.00	54.50	7.24	918
-	11/20/2017	6.8	164.00	59.70	7.24	1051
-	12/3/2017	7.7	42.50	41.20	4.90	-
-	12/21/2017	5.4	33.50	36.90	4.61	114
-	12/31/2017	6.0	35.30	35.60	4.40	160
-	1/18/2018	8.5	44.60	50.40	5.23	171
-	1/28/2018	8.1	22.20	45.10	5.29	58
-	2/16/2018	6.0	134.00	57.50	7.03	253

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
JL1 Dahlstedt Road	2/25/2018	6.5	35.10	43.90	5.33	109
-	3/14/2018	8.6	140.30	49.20	5.77	1600
-	3/25/2018	9.5	30.70	53.20	5.17	230
-	4/11/2018	10.7	21.20	32.70	3.32	82
-	4/22/2018	13.3	34.20	39.60	4.12	36
-	5/9/2018	13.4	19.20	48.20	5.00	14
	5/20/2018	12.0	25.40	42.60	4.97	20
	6/6/2018	15.1	51.40	48.10	4.81	23
	6/17/2018	12.4	38.90	37.70	3.96	118
JL2 Hwy 99.Gear Rd	**Average/Geomean**	**9.4**	**35.9**	**53.3**	**6.1**	**200**
-	10/8/2017	12.8	4.94	43.50	4.58	209
-	10/23/2018	10.4	13.65	60.00	6.80	1102
-	11/5/2017	5.9	30.90	52.80	6.52	-
-	11/20/2017	8.0	45.20	60.10	7.11	-
-	12/3/2017	7.8	44.20	47.10	5.56	-
-	12/21/2017	5.4	28.40	44.50	5.90	1600
-	12/31/2017	6.1	28.80	49.00	5.98	428
-	1/18/2018	8.5	37.90	45.50	5.29	488
-	1/28/2018	7.8	38.40	53.10	6.18	74
-	2/16/2018	6.0	90.10	62.00	7.72	1600
-	2/25/2018	5.1	48.30	61.50	7.84	173
-	3/14/2018	8.8	43.10	50.70	5.88	1912
-	3/25/2018	8.4	28.20	58.20	6.82	327
-	4/11/2018	10.3	35.00	48.20	5.42	132
-	4/22/2018	12.0	32.30	61.50	6.58	92
-	5/9/2018	13.4	33.60	63.10	6.76	33
-	5/20/2018	13.2	43.20	49.00	5.10	59
-	6/6/2018	13.3	28.70	54.30	5.62	50
-	6/17/2018	15.1	26.60	48.20	4.78	74
JL3 Wilson.Avon	**Average/Geomean**	**10.2**	**61.0**	**68.6**	**7.7**	**108**
Allen	10/8/2017	12.1	13.60	81.50	8.69	17
-	10/23/2018	9.8	14.00	53.90	6.08	8
-	11/5/2017	7.2	21.20	58.50	6.96	14
-	11/20/2017	9.2	132.80	63.00	7.20	316
-	12/3/2017	8.7	61.30	57.10	6.60	-
-	12/21/2017	6.0	75.40	60.40	7.37	148
-	12/31/2017	5.8	154.20	62.10	7.73	607
-	1/18/2018	8.3	34.50	58.00	6.77	194
-	1/28/2018	8.1	68.60	66.90	7.85	-
-	2/16/2018	5.9	130.50	82.00	10.22	191

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
JL3 Wilson.Avon	2/25/2018	6.8	62.10	67.80	8.31	66
Allen	3/14/2018	8.8	38.50	66.20	7.76	1333
-	3/25/2018	9.5	23.10	75.40	8.58	159
-	4/11/2018	10.7	27.60	66.60	7.51	483
-	4/22/2018	14.1	33.30	72.00	7.39	35
-	5/9/2018	15.7	51.70	76.80	7.58	54
-	5/20/2018	13.0	73.10	76.70	8.07	30
-	6/6/2018	19.1	80.00	84.70	7.77	127
	6/17/2018	15.0	64.30	74.00	7.36	419
JL4 Tide Gate	**Average/Geomean**	**10.1**	**32.9**	**52.3**	**6.2**	**132**
-	10/8/2017	12.0	15.00	57.10	5.98	495
-	10/23/2018	10.3	16.20	51.30	5.75	172
-	11/5/2017	6.0	20.50	41.70	5.12	1600
-	11/20/2017	7.7	16.80	69.30	8.19	36
-	12/3/2017	7.8	32.50	53.40	6.25	-
-	12/21/2017	4.9	46.10	52.90	6.70	187
-	12/31/2017	5.7	73.10	52.00	6.46	432
-	1/18/2018	8.5	36.50	6.79	7.89	81
-	1/28/2018	7.8	37.40	57.80	6.82	123
-	2/16/2018	7.6	32.70	58.00	6.52	94
-	2/25/2018	6.4	34.10	69.50	8.51	75
-	3/14/2018	9.4	32.40	45.20	5.22	182
-	3/25/2018	8.9	30.20	68.20	7.87	304
-	4/11/2018	10.8	43.80	61.10	6.68	108
-	4/22/2018	12.5	35.40	47.00	4.97	46
-	5/9/2018	15.8	31.60	50.60	4.95	20
-	5/20/2018	15.2	33.40	44.60	4.43	40
-	6/6/2018	16.5	28.50	58.70	5.70	117
-	6/17/2018	18.2	28.80	48.80	4.58	203
[redacted]						
Upper Nookachamps						
UN1 Lake McMurray	**Average/Geomean**	**8.6**	**5.9**	**92.8**	**10.5**	**220**
Estates	10/17/2017	8.6	2.53	81.9	9.45	1255
-	10/28/2017	9.8	1.95	86.6	9.77	40
-	11/8/2017	7.6	2.06	76.9	9.16	35
-	11/25/2017	9.9	5.9	90.4	10.22	165
-	12/6/2017	5.2	4.17	109.5	13.06	55
-	12/23/2017	3.4	6.12	100.3	13.37	170

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
-	1/3/2018	3.6	4.66	101.8	13.27	30
-	1/20/2018	6.5	11.8	100.5	12.34	195
-	1/31/2018	7	9.47	98.4	11.9	120
-	2/17/2018	5.8	17.3	99	12.3	980
-	2/28/2018	6	5.25	91.6	11.46	45
-	3/17/2018	6.6	3.94	112.30	13.76	80
-	3/28/2018	7.8	9.56	87.90	10.49	625
-	4/14/2018	9.3	13.02	87.40	10.30	900
-	4/25/2018	11.6	2.31	83.90	9.29	250
-	5/12/2018	12.3	2.78	90.70	6.32	290
-	5/23/2018	12.2	2.12	96.80	6.54	735
-	6/9/2018	14.4	4.38	88.40	9.02	1600
-	6/19/2018	16.0	1.85	78.20	7.68	975
UN2 Big lake	**Average/Geomean**	**10.1**	**2.8**	**85.4**	**9.5**	**12.2**
Outflow	10/5/2017	10.7	1.30	44.50	4.92	25
-	10/17/2017	12.5	5.20	72.70	7.62	709
-	11/2/2017	7.5	2.00	5.20	0.62	349
-	11/14/2017	8.6	3.70	79.40	9.23	135
-	12/1/2001	7.9	3.30	97.80	11.62	16
-	12/12/2017	5.7	2.10	79.80	9.45	5
-	12/28/2017	4.2	2.80	87.70	12.78	8
-	1/9/2018	4.8	2.40	92.70	11.94	10
-	1/24/2018	6.2	2.40	100.60	12.50	35
-	2/6/2018	7.0	4.60	100.90	12.39	21
-	2/22/2018	4.7	7.10	113.80	14.60	3
-	3/6/2018	5.1	2.00	90.60	11.51	11
-	3/22/2018	9.1	2.90	108.50	12.50	9
-	4/3/2018	8.7	2.50	94.50	10.99	0
-	4/19/2018	9.8	2.60	99.30	11.23	11
-	5/1/2018	13.7	1.60	95.60	9.93	14
-	5/17/2018	19.2	1.30	100.00	6.10	18
-	5/29/2018	18.4	2.20	91.30	5.66	9
-	6/14/2018	17.8	1.30	83.00	7.80	4
	6/25/2018	19.9	2.60	69.20	5.90	13
UN3 Otter Pond Rd	**Average/Geomean**	**9.2**	**2.8**	**95.3**	**10.6**	**20.8**
-	10/5/2017	9.8	1.40	92.90	10.51	111
-	10/17/2017	11.3	1.86	94.70	10.40	1529
-	11/2/2017	9.4	2.00	92.50	10.65	36
-	11/14/2017	8.4	5.40	81.60	9.56	70
-	12/1/2001	7.9	4.00	96.60	10.84	48

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
UN3 Otter Pond Rd	12/12/2017	4.4	2.40	88.30	10.81	17
-	12/28/2017	4.4	2.70	97.80	13.25	17
-	1/9/2018	5.1	4.60	99.90	12.80	21
-	1/24/2018	6.3	3.60	101.70	12.51	73
-	2/6/2018	7.6	5.90	105.50	12.63	35
-	2/22/2018	4.0	3.40	88.80	11.46	3
-	3/6/2018	4.6	2.20	89.10	11.42	0
-	3/22/2018	8.5		96.80	11.24	650
-	4/3/2018	8.0	2.00	90.30	10.07	0
-	4/19/2018	10.5	3.00	103.00	11.44	6
-	5/1/2018	12.8	1.80	101.00	10.65	114
-	5/17/2018	16.8	1.60	98.10	6.25	29
-	5/29/2018	14.2	2.10	96.70	6.46	67
-	6/14/2018	14.7	1.40	95.30	9.65	29
-	6/25/2018	15.4	2.30	94.70	9.32	218
UN4 Knapp Road Bridge	**Average/Geomean**	**9.7**	**4.9**	**73.5**	**8.1**	**93.7**
	10/5/2017	10.0	1.90	10.80	1.20	13
-	10/17/2017	10.1	4.70	37.60	4.23	97
-	11/2/2017	8.8	3.40	32.00	3.70	53
-	11/14/2017	8.1	12.30	55.40	6.53	1032
-	12/1/2001	7.4	3.00	94.40	10.60	31
-	12/12/2017	5.3	4.50	78.20	9.33	42
-	12/28/2017	4.2	4.20	85.70	11.18	151
-	1/9/2018	5.3	4.70	82.30	10.30	388
-	1/24/2018	6.5	3.50	89.10	10.98	49
-	2/6/2018	7.1	5.60	90.70	10.91	118
-	2/22/2018	3.6	8.70	81.00	10.60	58
-	3/6/2018	4.8	9.20	86.40	10.87	28
-	3/22/2018	8.8	5.60	91.20	10.60	23
-	4/3/2018	8.1	2.90	82.20	9.64	180
-	4/19/2018	10.3	3.20	93.40	10.47	30
-	5/1/2018	13.2	3.30	86.20	9.05	58
-	5/17/2018	18.3	2.70	85.90	5.32	169
-	5/29/2018	17.6	4.80	69.70	4.27	344
-	6/14/2018	16.5	4.90	84.60	8.20	471
-	6/25/2018	19.4	5.20	53.10	4.82	298

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
Lower Nookachamps						
LN1 College Way	**Average/Geomean**	**8.6**	**5.9**	**92.8**	**10.5**	**220**
-	10/17/2017	8.6	2.53	81.9	9.45	1255
-	10/28/2017	9.8	1.95	86.6	9.77	40
-	11/8/2017	7.6	2.06	76.9	9.16	35
-	11/25/2017	9.9	5.9	90.4	10.22	165
-	12/6/2017	5.2	4.17	109.5	13.06	55
-	12/23/2017	3.4	6.12	100.3	13.37	170
-	1/3/2018	3.6	4.66	101.8	13.27	30
-	1/20/2018	6.5	11.8	100.5	12.34	195
-	1/31/2018	7	9.47	98.4	11.9	120
-	2/17/2018	5.8	17.3	99	12.3	980
-	2/28/2018	6	5.25	91.6	11.46	45
-	3/17/2018	6.6	3.94	112.30	13.76	80
-	3/28/2018	7.8	9.56	87.90	10.49	625
-	4/14/2018	9.3	13.02	87.40	10.30	900
-	4/25/2018	11.6	2.31	83.90	9.29	250
-	5/12/2018	12.3	2.78	90.70	6.32	290
-	5/23/2018	12.2	2.12	96.80	6.54	735
-	6/9/2018	14.4	4.38	88.40	9.02	1600
-	6/19/2018	16.0	1.85	78.20	7.68	975
LN2 Hwy 9 Bridge	**Average/Geomean**	**7.6**	**5.2**	**80.4**	**9.8**	**46.7**
-	10/17/2017	9	0.87	90.8	10.54	135
-	10/28/2017	8.8	2.42	66.6	7.71	65
-	11/8/2017	5.2	2.22	66	8.36	12
-	11/25/2017	8.5	24.8	73.1	8.56	313
-	12/6/2017	3.7	2.91	73.6	9.01	35
-	12/23/2017	2.4	3.33	7.14	9.75	7
-	1/3/2018	3.1	2.19	78.2	10.65	18
-	1/20/2018	5.8	6.9	89.2	11.15	71
-	1/31/2018	6.1	6.57	84.1	10.75	41
-	2/17/2018	5.1	11.4	90.1	12.64	140
-	2/28/2018	5	2.23	83.6	10.46	20
-	3/17/2018	6.2	2.19	94.50	11.68	31
-	3/28/2018	5.2	11.31	88.90	11.42	83
-	4/14/2018	6.0	9.80	95.90	11.91	124
-	4/25/2018	10.7	1.97	95.10	10.52	5
-	5/12/2018	10.2	1.24	82.30	5.90	38
-	5/23/2018	14.7	2.83	85.06	5.64	31
-	6/9/2018	11.9	1.09	105.00	11.31	238
	6/19/2018	16.7	1.68	78.90	7.71	116

Site	Date	Water Temp (° C)	Turbidity (NTU)	D.O. (% sat.)	D.O. (mg/l)	FC (CFU/100ml)
LN3 Swan Road	**Average/Geomean**	**8.4**	**4.7**	**77.2**	**8.9**	**60.5**
-	10/17/2017	9.6	3.99	71.9	8.18	76
-	10/28/2017	9	3.9	65.7	7.58	29
-	11/8/2017	5.4	3.73	65.9	8.43	40
-	11/25/2017	-	-	-	-	-
-	12/6/2017	4.3	5.63	73.1	8.99	11
-	12/23/2017	2.6	4.02	74.7	10.13	50
-	1/3/2018	3	3.47	82.8	11.04	34
-	1/20/2018	5.9	5.08	80.4	10.01	77
-	1/31/2018	6.2	8.61	85.7	10.54	137
-	2/17/2018	5.5	7.9	97.3	12.52	127
-	2/28/2018	4.9	4.92	79.4	10.13	23
-	3/17/2018	6.5	4.23	89.30	10.97	25
-	3/28/2018	5.7	11.51	83.30	10.35	130
-	4/14/2018	7.2	4.55	85.00	10.23	93
-	4/25/2018	11.4	2.88	84.60	9.45	61
-	5/12/2018	14.1	1.82	53.10	3.55	51
-	5/23/2018	15.0	2.86	72.30	4.00	64
-	6/9/2018	14.0	2.83	74.20	7.65	356
	6/19/2018	20.0	3.24	70.30	6.37	121
LN4 Francis Road	**Average/Geomean**	**8.3**	**6.0**	**75.7**	**8.6**	**60.8**
	10/17/2017	9.1	10.85	50.7	5.83	55
-	10/28/2017	9.8	3.95	59.3	6.72	35
-	11/8/2017	5.7	6.63	59.1	7.41	48
-	11/25/2017	-	-	-	-	-
-	12/6/2017	4.6	6.03	71.1	8.54	25
-	12/23/2017	2.7	5.8	75.2	10.2	36
-	1/3/2018	2.9	3.76	79	10.78	44
-	1/20/2018	6	3.9	83.6	10.4	111
-	1/31/2018	6.2	9.08	85.1	10.61	43
-	2/17/2018	5.7	7.1	96.7	12.48	133
-	2/28/2018	5.1	5.32	77.7	9.74	37
-	3/17/2018	6.9	7.47	84.80	10.30	239
-	3/28/2018	5.7	14.69	80.80	10.19	268
-	4/14/2018	7.8	4.04	84.80	10.03	32
-	4/25/2018	11.8	3.21	83.10	9.02	61
-	5/12/2018	15.0	1.64	68.50	4.50	20
-	5/23/2018		2.71	72.10	4.57	23
-	6/9/2018	15.2	6.50	58.60	5.87	224
	6/19/2018	21.3	5.18	92.30	8.12	118

Appendix B – Storm Team Data

	10/22/2017	11/26/2017	12/2/2017	12/18/2017	12/30/2017	1/13/2018	3/27/2018	4/15/2018	**Geomean**
JLS-SSD	185	290	-	405	195	75	1600	1345	**353**
JLS11.25NO	1600	20	40	360	270	100	1600	1470	**271**
JLS11.25EA	820	0	-	60	150	200	1600	810	**57**
JLS-Gear	1600	1000	660	1600	1600	1020	1600	1240	**1237**
HS -PR	0	280	80	1600	560	100	1360	120	**65**
LIS-FM	1600		1600	1580	40	1160	1600	1600	**901**
NN11.5	300	190	70	470	160	90	1600	1600	**302**
NN9	200	280	80	410	120	110	1600	1300	**290**
BV3	1600	390	90	210	1470	310	260	160	**350**
BV4	1520	1360	740	1600	1600	620	320	500	**889**
BV5	1040	360	720	1110	690	80	530	540	**512**
BV7	820	480	140	100	20	380	680	40	**181**

Site ID	Padilla Bay Storm Sites	Site ID	
JLS-SSD	South Spur Ditch (JLS) at Josh Wilson Rd	NN11.5	Little Indian Slough at Farm-to-Market Road
JLS11.25NO	Joe Leary Slough N side of Dahlstedt Rd at v-ditch	NN9	Marihugh and Bayview-Edison Road
JLS11.25EA	Joe Leary Sl S of Dahlstedt Rd , E of culvert	BV3	No Name Slough at end of Egbers-Kalso Road
JLS-Gear	Joe Leary Slough at Gear Rd (car lots)	BV4	Bay View - B Street Culvert
HS -PR	Higgins Slough at Peterson Road	BV5	Bay View - Boat Launch Culvert
LIS-FM	Little Indian Slough at Farm-Market Road	BV7	Blue beach cottage

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 sterifil 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
d. oxygen	YSI probe	instream	none	immediately
total depth	Installed depth gauge	instream	none	immediately
temperature	YSI probe thermometer	instream instream	none none	immediately 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:_____

Lower Samish Watershed
Skagit Stream Team
Water Quality Monitoring

Field Work By_____

Lab Work By:_____

Dupe Site_____

FC Results_____

Site LS1. Old Hwy. 99 Samish Bridge
Water Appearance
- ❑ Scum/Film
- ❑ Foam
- ❑ Muddy Brown
- ❑ Milky
- ❑ Clear
- ❑ Oily Sheen
- ❑ Frozen
- ❑ Other_____

Field: Biological/Unusual Observations:

Time of Sample	Total Depth ft	Water Temp ºC
D.O. saturation %	D.O. mg/L	

Lab metadata

Turbidity NTU's
Fecal Coliform FC / mL = FC / **100** mL
Fecal Coliform FC / mL = FC / **100** mL

Site LS2. Samish River @ Jolly Road
Water Appearance
- ❑ Scum/Film
- ❑ Foam
- ❑ Muddy Brown
- ❑ Milky
- ❑ Clear
- ❑ Oily Sheen
- ❑ Frozen
- ❑ Other_____

Field: Biological/Unusual Observations:

Time of Sample	Total Depth ft	Water Temp ºC
D.O. saturation %	D.O. mg/L	

Lab metadata

Turbidity NTU's
Fecal Coliform FC / mL = FC / **100** mL
Fecal Coliform FC / mL = FC / **100** mL

Site LS3. Samish River @ Chuckanut Drive Bridge
Water Appearance
- ❑ Scum/Film
- ❑ Foam
- ❑ Muddy Brown
- ❑ Milky
- ❑ Clear
- ❑ Oily Sheen
- ❑ Frozen
- ❑ Other_____

Field: Biological/Unusual Observations:

Time of Sample	Total Depth ft	Water Temp ºC
D.O. saturation %	D.O. mg/L	

Lab metadata

Turbidity NTU's
Fecal Coliform FC / mL = FC / **100** mL
Fecal Coliform FC / mL = FC / **100** mL

Site LS4. Samish River @ Mouth (Boat Dock)
Water Appearance
- ❑ Scum/Film
- ❑ Foam
- ❑ Muddy Brown
- ❑ Milky
- ❑ Clear
- ❑ Oily Sheen
- ❑ Frozen
- ❑ Other_____

Field: Biological/Unusual Observations:

Time of Sample	Total Depth ft	Water Temp ºC
D.O. saturation %	D.O. mg/L	

Lab metadata

Turbidity NTU's
Fecal Coliform FC / mL = FC / **100** mL
Fecal Coliform FC / mL = FC / **100** mL

Additional notes or observations: