

Nooksack River Transboundary Technical Collaboration Group 2018-2019 Annual Report

Final

July 2019



Executive Summary

The Nooksack River watershed spans part of the border between British Columbia (BC) and the State of Washington (WA). In August 2018, the international, multi-agency Nooksack River Transboundary Technical Collaboration Group (TCG) was established to implement a three-year work plan to reduce fecal bacteria concentrations in the Nooksack River watershed. As a work plan deliverable, the TCG produced this annual report summarizing first year project activities.

During the past year, BC and WA sampled surface water throughout the Nooksack watershed, including sites located at the international border. Analysis of BC *E. coli* data shows that the 2018 wet season geometric means met the BC Primary Recreation guideline throughout the BC portion of the watershed. For four waterways spanning the international border, BC and WA data analysis noted higher fecal coliform concentrations in Cave and Bertrand Creeks as compared to Pepin and Fishtrap Creeks. Higher fecal coliform and *E. coli* concentrations typically take place during the wet season when soils are saturated or following significant rainfall events.

While the Bertrand Creek's annual fecal coliform geometric mean increased due to high bacteria counts captured in winter 2018-2019, data trends in WA's lower Fishtrap and Bertrand Creeks and in the Nooksack River mainstem show a decline in longer term fecal coliform concentrations since 2015.

The Nooksack River is the largest freshwater source to Portage Bay and to the Lummi Nation's Portage Bay shellfish growing area. From 2014-2016, portions of the Portage Bay growing area experienced a series of harvest restrictions due to poor water quality conditions. By 2016, Washington State Department of Health had downgraded over 800 acres from Approved to Conditionally Approved. The Conditionally Approved portion was closed to shellfish harvest April-June and October-December each year. In 2019, due to water quality improvement, the spring harvest season was re-opened in the Conditionally Approved portion of the growing area. While harvest in the Conditionally Approved area is now allowed January through September, the area remains closed to harvest from October-December each year due to fall season elevated concentrations of fecal coliform bacteria in the marine water.

To reduce fecal bacteria pollution in the Nooksack watershed, BC and WA used multiple sampling methods to help identify potential pollution sources. Agencies acted on complaints, offering technical assistance and conducting regulatory compliance activities as appropriate. Both jurisdictions engaged agricultural and rural residential communities through non-regulatory outreach. A TCG outreach subcommittee facilitated compliance promotion and shared event schedules and education materials.

A TCG subcommittee developed a recommendation for a short- and long-term *E. coli* concentration border benchmark. Monitoring in comparison to the short- and long-term benchmarks will be reported next year.

Based on successful first year project completion, the TCG recommends minor adaptations to the work plan for the coming year. Adjustments will help align tasks with funding developments and policy direction to improve efficiencies and communication.

Overall 2018-2019 water quality monitoring results are positive. Compliance, stewardship, and communications activities successfully reached key audiences and helped to address fecal bacteria pollution concerns. The TCG will continue to implement work plan tasks in 2019-2020.

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Introduction

The BC/WA Nooksack River Transboundary Water Quality Task Group (WQTG) was established in December 2016 to develop a common understanding of current water quality issues, data, and conditions related to fecal coliform bacteria in transboundary waters and tributaries to the Nooksack River and Portage Bay. Bertrand Creek and the Fishtrap Creek are two large sub-basins of the lower Nooksack River watershed that straddle the international boundary. The land areas of both Bertrand Creek and Fishtrap Creek watersheds are located about half in British Columbia (BC), Canada and half in Washington (WA), USA.

As an outcome of the WQTG, the Nooksack River Transboundary Technical Collaboration Group (TCG) was established in August of 2018 to implement a three-year work plan to:

- Reduce fecal coliform bacteria contamination at transboundary stream locations of the Nooksack Watershed.
- Maintain communication at the operational level among member groups.
- Facilitate communication at the management level among member groups.
- Design and implement BC/WA joint actions described in the TCG's three-year transboundary work plan (Work Plan).
- Exchange updates related to jurisdiction-specific actions in the work plan.

This "Nooksack River Transboundary Technical Collaboration Group 2018-2019 Annual Report" (the report) includes water quality monitoring results for the Nooksack Watershed and Portage Bay, a TCG work plan implementation update, and recommendations for the following year including work plan adaptations.

Water Quality Monitoring

This section of the report addresses the relevant bacterial water quality sampling and analysis for BC and WA for the period of April 2018 to March 2019. This reporting period encompasses a full year of data including the four seasonal quarters. Partner data collected prior to the August 2018 TCG formation (April to July 2018) is included.

The locations covered are:

- Canada-United States border sites
- Nooksack River key tributaries originating in BC
- Nooksack River mainstem
- Portage Bay

Background

Various organizations conduct water quality monitoring throughout the Nooksack River watershed. Washington (WA) partners have maintained a long-term ambient monitoring program in the lower Nooksack River watershed since 1998. In October 2014, Washington (WA) partners began to include seven Canada-United States (CA-US) border sites into its existing ambient water quality monitoring program (Figure 1). WA included one additional border location (FT9) in 2016 and another border site in December 2018 (DEPO) to its ambient monitoring program. As of March 2019, WA collects ambient samples at nine border sites.

In December 2015, Langley Environmental Partners Society (LEPS) began collecting once-monthly samples at twelve sites in the Canadian portions of the Fishtrap Creek watershed, including the Pepin Brook sub-basin. LEPS collected samples on dates coordinated with WA monthly ambient sampling. This LEPS sampling program concluded December 2018.

In June 2017, BC Ministry of Environment and Climate Change Strategy (ENV) began collecting water samples at fourteen sites on Cave Creek, Bertrand Creek, Fishtrap Creek and Pepin Brook. In January 2019, BC ENV added monitoring at several hotspot sites in the watershed that had been previously sampled by LEPS through December 2018. See Figure 1 for the WA, LEPS, and ENV monitoring stations locations.

BC and WA compared their water quality sampling methodologies and determined that the methods are generally consistent and can be used effectively to look at results in a coordinated manner. WA partners collect grab samples for fecal coliform analysis following standard methods and outlined in each individual agency's Quality Assurance Project Plans (or QAPPs; Ecology 2014, WSDA 2017, Whatcom 2017). BC collects discrete (or grab) water samples for fecal coliform and *Escherichia coli* (*E. coli*) in accordance with the *British Columbia Field Sampling Manual* (BC ENV 2013a) and the BC Ministry of Environment, Lands and Parks *Freshwater Biological Sampling Manual* (BC ENV 2013b).

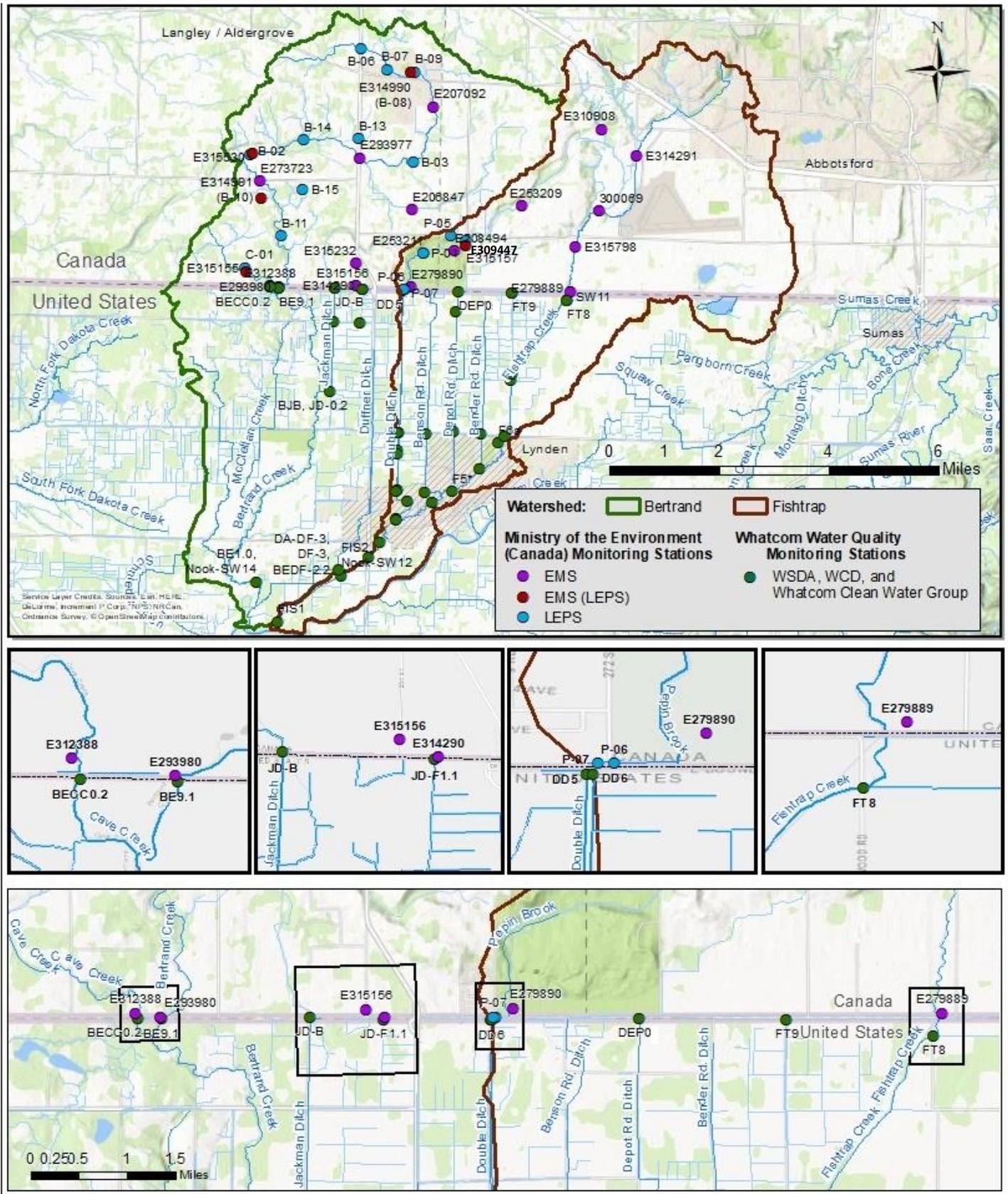


Figure 1: Map of Stream Water Quality Monitoring Ambient Locations in the Bertrand and Fishtrap Watersheds

Data from these sites can be found on WA's [Surface Water Monitoring for Fecal Coliform Bacteria map](#) or BC's [Surface Water Monitoring Sites Interactive Map](#).

Ambient Water Quality Monitoring April 2018 to March 2019

Ambient sampling is routine sampling, pre-scheduled to occur typically weekly or monthly and is not dependent on weather conditions.

BC has fourteen ambient sampling locations including four border sampling locations on Cave Creek, Bertrand Creek, Pepin Brook and Fishtrap Creek. BC ENV samples ambient locations on a monthly basis and complements the monthly data with seasonal 5 consecutive weekly samples collected in 30 days (5 in 30) as required for comparison to BC water quality guidelines. BC also conducts source tracking sampling, which is discussed in the work plan implementation section.

BC's water quality data is available through the Surface Water Monitoring Sites web application. The web application provides the monitoring site name and description as well as direct links to the Environmental Monitoring Sites (EMS) web reporting where data can be downloaded. BC's data can be accessed from this website: <https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/tools-databases/surface-water-monitoring-sites>

WA monitoring partners collect ambient samples at multiple locations within the Nooksack River watershed, including sites at the CA-US border (Figure 1). WA partners complement ambient sampling with storm event and source identification (source ID) sampling throughout the lower Nooksack River watershed, including Fishtrap and Bertrand creek sub-basins (discussed under storm event and source ID sampling section). WA ambient sampling relevant to transboundary collaboration includes:

- **Lower Nooksack watershed:** WA regularly samples 19 fixed location sites in the lower Nooksack River watershed twice monthly (<http://www.co.whatcom.wa.us/2608/Routine-Monitoring-Results>), including once on the day prior to monthly sampling for fecal coliform in the downstream marine water shellfish growing area of Portage Bay. (<https://fortress.wa.gov/doh/oswpviewer/index.html>)
- **Border sites:** From 2014 to 2016, WA sampled seven border locations monthly. In 2016 WA added border site FT9 and added DEPO in 2018 as part of a larger, same-day ambient sampling run coordinated each month at fixed location sites throughout the lower Nooksack watershed

For this first reporting year, BC and WA did not combine data analysis due to data and sampling location challenges. While BC analyzes samples for *E. coli*, WA does not. Some border sampling sites monitored by BC and by WA differed in location, and may not be directly comparable.

BC *E. coli* 5 in 30 Sampling

BC *E. coli* data (Figure 2) show that the wet season geometric means meet the BC Primary Recreation guideline (200 CFU/100 mL) throughout the BC portion of the watersheds. This sampling was completed at locations that had historically higher *E. coli*, including one border site on Pepin Brook (E27890). BC added 5 in 30 day sampling at the four stream border sites and will report these results in the next annual report.

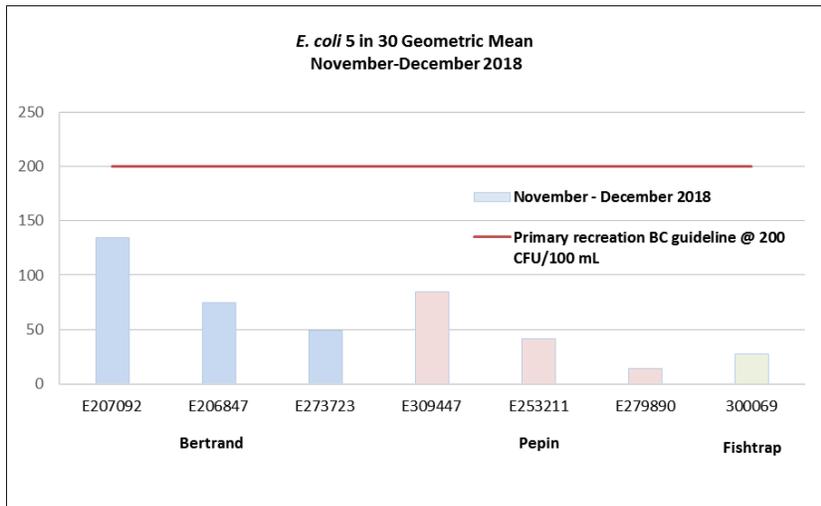


Figure 2. Wet season geometric means for *E. coli* at BC sampling locations for each tributary. The left to right order for each watershed reflects the order of the sites from upstream to downstream.

Border Sites Fecal Coliform by Year

BC and WA fecal coliform data from April 2018-March 2019 shows that annual geometric means for fecal coliforms (Figure 3a) are at or below the WA Primary Contact Recreation Criterion (100 CFU/100 mL) for Cave Creek, Bertrand Creek, Pepin Brook, and Fishtrap Creek. Annual geometric means show general improvement from the longer datasets (denoted as bars) at all sites except for site JD-F1.1:

- Site JD-F1.1 is located on a small tributary of Jackman Ditch and is the only site at which the geometric mean and estimated 90th has worsened in the past year compared to the past three years.
- Site JD-F1.1 is small in volume but continues to have bacteria counts far higher than those measured at other border sites.

Six of the nine border sites meet the WA criterion for fecal coliform estimated 90th percentile (200 CFU/100 mL) based on the last year of data (Figure 3b). This is an improvement compared to the three-year dataset, but means additional work is still needed to address seasonal and condition-specific high bacteria counts at these sites.

In general, higher concentrations are found upstream in these drainages. By the time the waterways reach the border sites, fecal bacteria concentrations are typically quite low. Overall, both BC and WA data show that the higher fecal coliform and *E. coli* concentrations typically take place during the wet season when soils are saturated or following significant rainfall events.

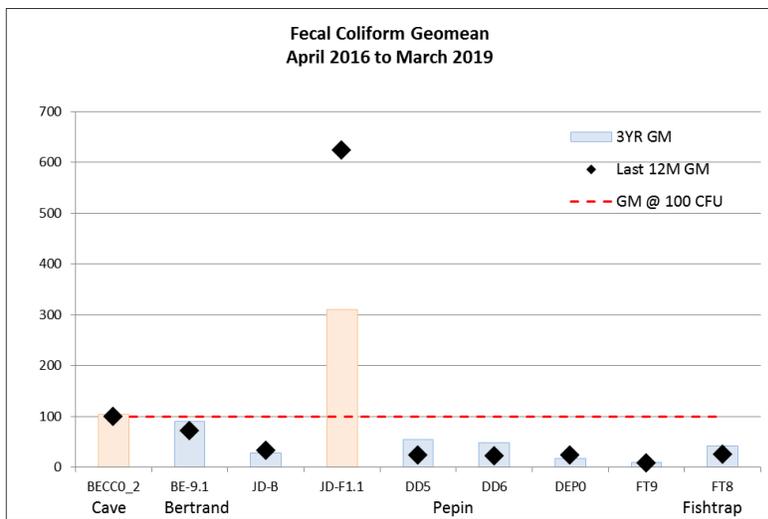
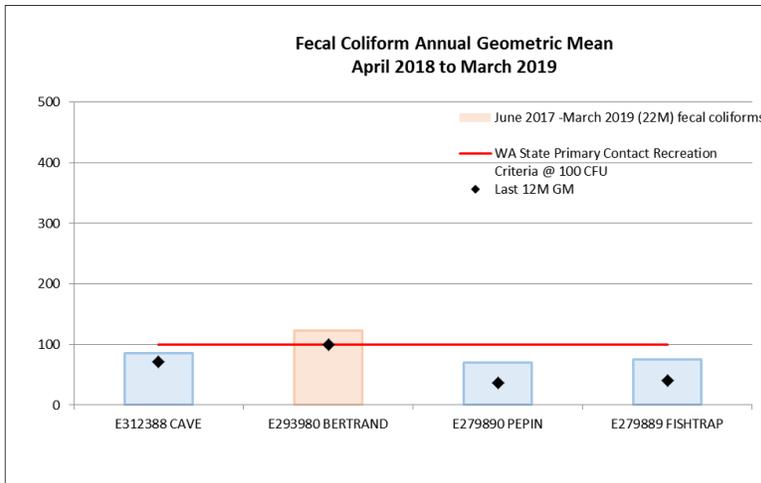


Figure 3a. Annual geometric means of fecal coliform at four border sites sampled by BC ENV (top) and nine border sites samples by WA partners (bottom) April 2018 through March 2019

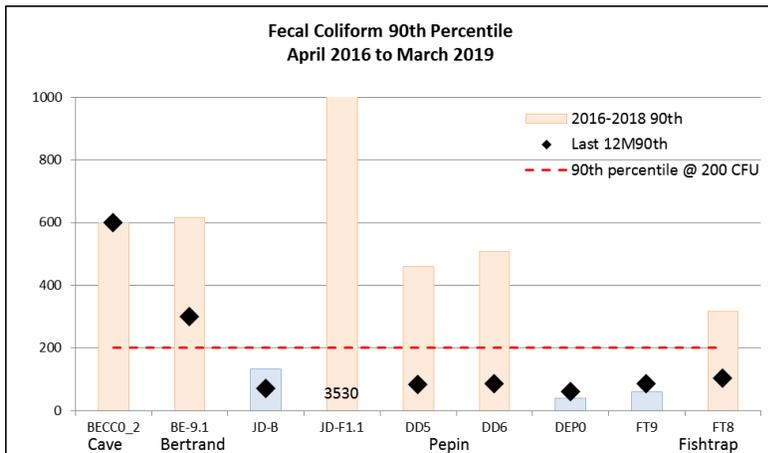


Figure 3b. Annual estimated 90th percentiles of fecal coliform at nine border sites sampled by WA partners April 2018 through March 2019

Border Site Seasonal Geometric Means

Seasonal geometric means for fecal coliform were calculated for BC and WA border sites on Cave Creek, Bertrand Creek, Pepin Brook, and Fishtrap Creek (Figure 4a). BC and WA datasets show similar patterns, but some differences.

The small dataset used for seasonal comparisons (3 to 12 samples taken at each site per season) make this analysis sensitive to specific sample dates and to individual high counts. Seasonal data is useful for comparing year to year, for identifying critical conditions and times of the year to focus bacteria reduction efforts, and for ensuring year-round sampling analysis does not mask periods of non-compliance. General conclusions for 2018-2019 seasonal fecal coliform data (Figure 4a) include:

- Cave Creek and Bertrand Creek each exceeded the WA Primary Contact Criterion for fecal coliforms in two or more seasons.
- Pepin Brook did not exceed the WA criterion for fecal coliforms in any season.
- Fishtrap Creek exceeded the WA criterion in the summer on the BC side of the border, but did not exceed for any seasons in WA.

For comparison purposes only, figure 4b displays seasonal *E. coli* geometric means in relation to the BC Primary Recreation guideline (200 CFU/100 mL), which is based on a geometric mean of 5 samples in 30 days. BC data show that Cave Creek *E. coli* was elevated in winter 2019; all other seasons at Cave Creek and all seasons at the other waterways were not elevated.

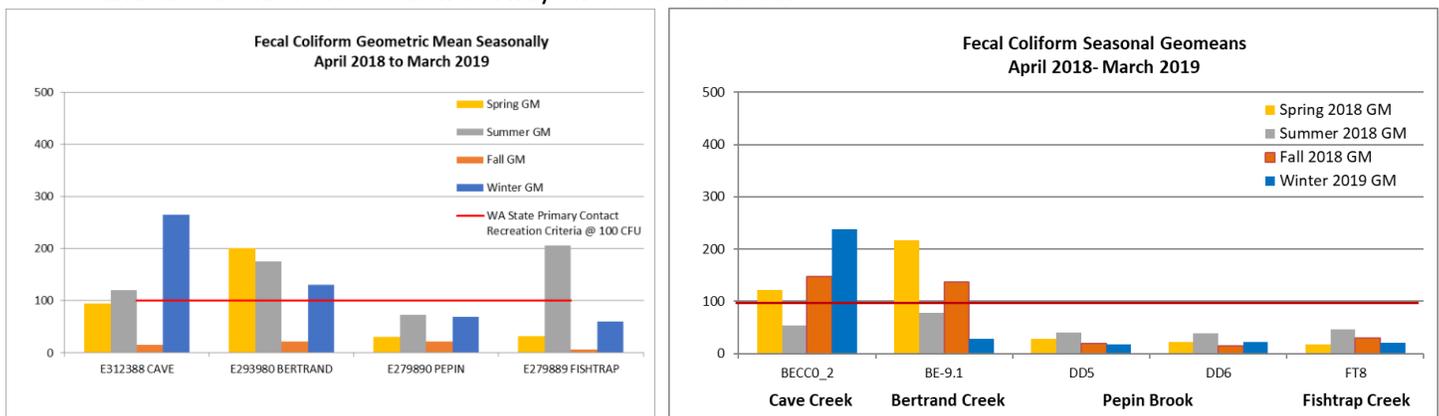


Figure 4a. Seasonal geometric means of fecal coliform at four border sites sampled by BC ENV (left) and at five border sites sampled by WA partners (right) April 2018 through March 2019

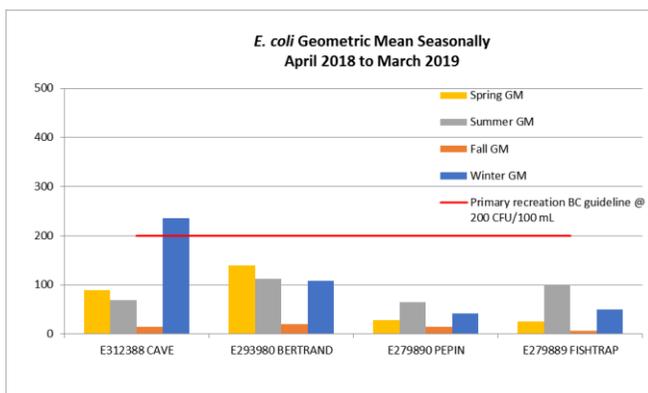


Figure 4b. Seasonal geometric means of *E. coli* at four border sites sampled by BC ENV April 2018 through March 2019

Nooksack River Tributaries and Mainstem

Fishtrap and Bertrand Creeks are the largest tributaries entering the Lower Nooksack River. The relative proportion of water that originates in BC in these two creeks varies seasonally and year to year. The *Lower Nooksack River Basin Bacteria Total Maximum Daily Load Evaluation* published in 2001 estimated that Fishtrap and Bertrand Creeks combined account for 44% of the annual fecal coliform bacteria load to the Lower Nooksack Basin. Hence, Fishtrap and Bertrand Creeks have been the focus of significant bacteria reduction efforts in the Nooksack watershed.

The furthest downstream monitoring stations in Fishtrap Creek (F1) and Bertrand Creek (B1) prior to entering the mainstem Nooksack River serve as “keystone” stations for the watersheds (Figure 5). Fecal coliform concentrations in these waterways have been declining since 2015. However, elevated counts in the Bertrand watershed over the past year (especially winter 2018-2019) have led to an increase in the annual geometric mean at B1.

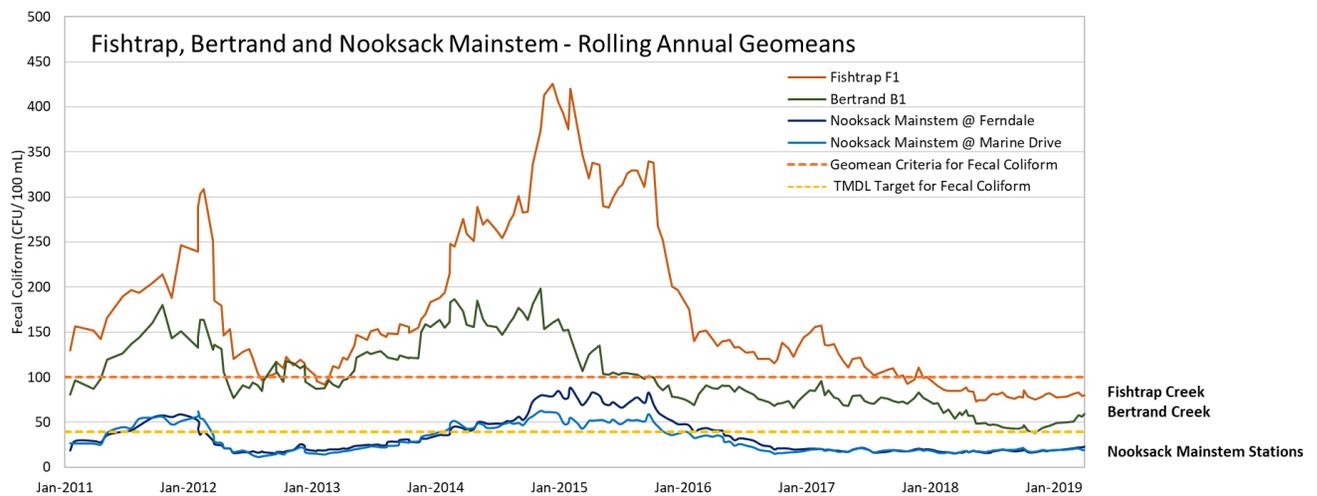
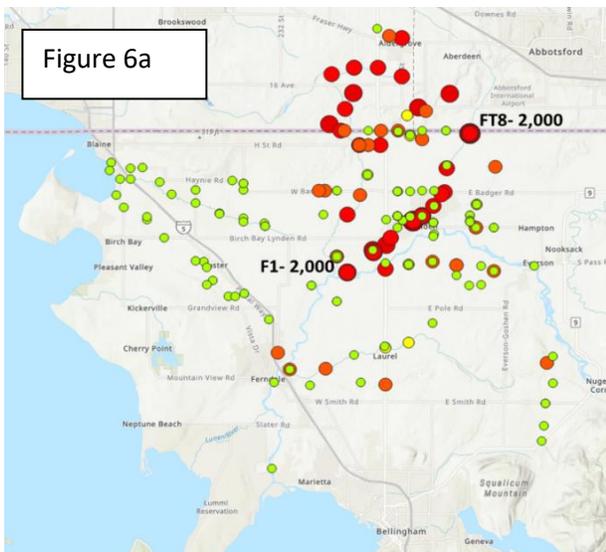


Figure 5. Rolling annual geometric means for the lowest downstream Fishtrap Creek (F1) and Bertrand Creek (B1) stations and two Lower Nooksack River mainstem stations. Sites are sampled twice monthly (n=24, with some minor exceptions).

Periodically during the wet season, coordinated ambient sampling in the Nooksack watershed captured instances where high fecal bacteria concentrations measured at CA-US border sites appear to travel through tributaries to the mainstem Nooksack River. The samples at the same locations would frequently be much lower the week before or after these occurrences. High concentrations were reported and responded to by BC ENV compliance staff as appropriate. Figures 6a and 6b offer two wet season examples of bacteria load transport through the system from the 2018-19 winter:

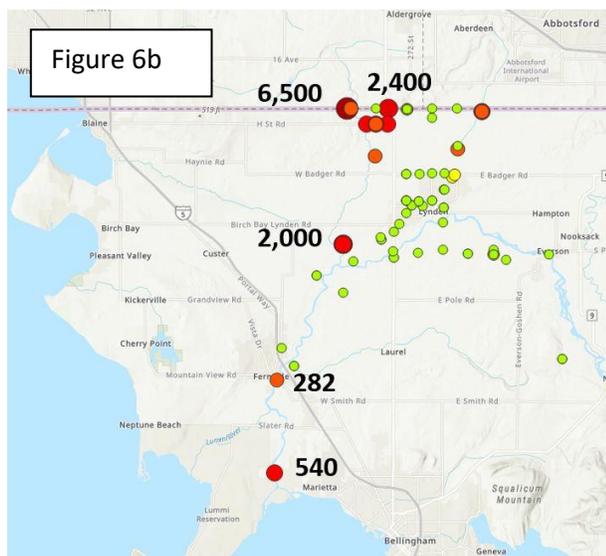
Screen shots from online data map showing preliminary results of fecal coliform bacteria analysis (colony forming units per 100 mL)

- Red circles represent fecal bacteria concentrations above 500 fecal coliform per 100mL
- Green circles represent fecal bacteria concentrations below 100 fecal coliform per 100mL



Screenshot from online data map - December 11, 2018

- 2,000 CFU/ 100 mL was measured at Fishtrap Creek at Northwood Road just south of the CA-US border (FT8).
- 2,000 CFU/100 mL was measured at F1. F1 is a downstream Fishtrap Creek monitoring site located before Fishtrap Creek enters the Nooksack River
- From FT8 south, high fecal bacteria counts were measured downstream in the Fishtrap Creek mainstem.
- In this example, data from field and roadside waterways draining WA areas systems show fecal bacteria concentrations generally below 100 (i.e. green circles)



Screenshot from online data map - January 7, 2019

- 6,500 CFU/ 100 mL was measured at Cave Creek at O Ave. (BECCO.2).
- 2,400 CFU/ 100 mL was measured at Bertrand Creek at O Ave. (BE-9.1).
- 2,000 CFU/ 100 mL was measured at B1. B1 is a downstream Bertrand Creek monitoring site located before Bertrand Creek enters the Nooksack River
- 282 CFU/ 100 mL was measured at M2. M2 is located on the Nooksack River mainstem at Ferndale, WA.
- 540 CFU/ 100 mL was measured at M1. M1 located on the Nooksack River at Marine Drive before the river enters the Lummi reservation boundaries and the marine system.
- Data from field and roadside waterways draining WA areas systems show fecal bacteria concentrations generally below 100 (i.e. green circles)

Storm Event and Source Identification Sampling

WA uses storm event and source identification sampling to help characterize 'critical conditions' for the border sites. Critical conditions likely relate to seasonal and precipitation patterns as those components affect soil moisture levels, runoff conditions, stream flows, and bacteria loading. Critical conditions may differ among waterways due to size of the channel, soil types, land uses, potential bacteria pollution sources within the area drained by the waterway, and proximity to the source in time and distance.

In the past year, 55 source identification samples were taken at the 9 border sites. These samples are evaluated independently from the ambient dataset and are not used in the calculation of the geometric mean or estimated 90th percentile for any site.

BC adds discrete sampling at specific locations when additional information is needed to assist with confirming or identifying a potential source of elevated bacterial levels.

BC and WA carried out bacterial and microbial source tracking sampling projects during 2018-2019. Partners will report project results in the next annual report.

Portage Bay Shellfish Growing Area Monitoring

The Nooksack River is the largest source of freshwater to the Portage Bay shellfish growing area. Heavy or sustained rainfall (typically observed during the fall and winter) and substantial snowmelt (typically observed during the spring) increase the discharge of the Nooksack River to marine water. The interaction of the Nooksack River with Portage Bay is complex. The direction and extent of the river plume is influenced by river discharge volume as well as by wind and tidal conditions. High fecal coliform densities can be measured in Portage Bay when contaminated Nooksack River water enters the bay. Portions of the Portage Bay shellfish growing area are classified by the Washington State Department of Health as either Conditionally Approved or Approved as shown in Figure 7.

Washington State Department of Health (DOH) and Lummi Nation Natural Resources Department cooperate to collect once-monthly regulatory samples at Portage Bay sampling locations. DOH manages marine water sampling results accessible through an interactive [Commercial Shellfish Map Viewer](#) or summarized in [shellfish growing area annual reports](#). DOH evaluates a 30-sample geometric mean and an estimated 90th percentile to determine compliance with marine water quality criteria for shellfish harvest (Figure 8).

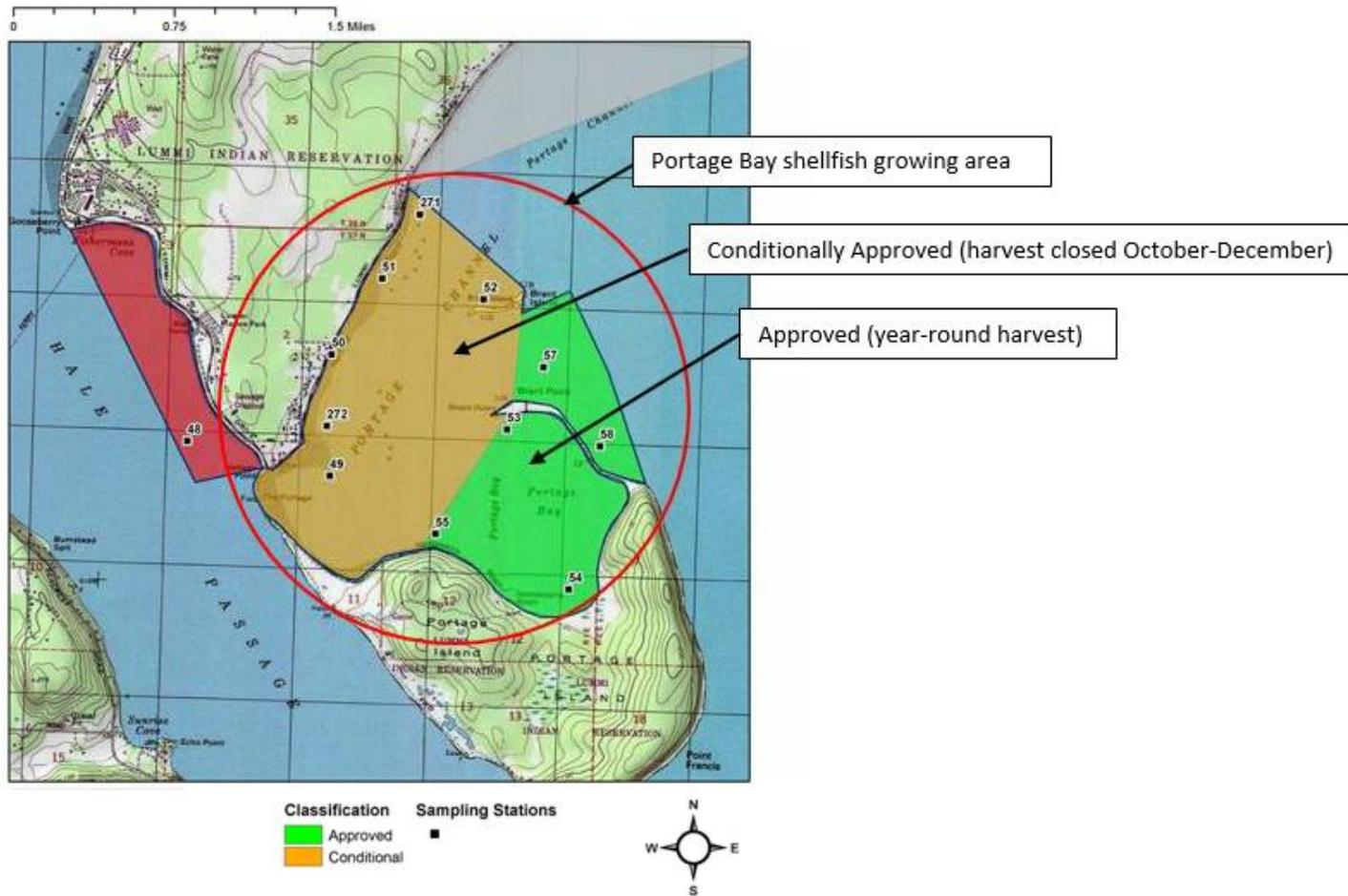


Figure 7: Map of Portage Bay shellfish growing area classifications as of March 2019

Spring Season Shellfish Harvest Recovery

In early 2019 after four years of closure, Washington State Department of Health (DOH) removed shellfish harvest restrictions for the April 1-June 30 spring season in the Conditionally Approved portion of the Portage Bay shellfish growing area (see Figure 7). A DOH January 2019 [Addendum to the 2009 Sanitary Survey Report of Portage Bay \(2019 Addendum\)](#) summarizes analysis of regulatory and special sample data confirming improved spring season water quality.

The 2019 Addendum concludes:

- Based on improved marine water quality from April through June at stations in the Conditionally Approved area and multi-agency cleanup work in the Nooksack River watershed, all of the Conditionally Approved portion of the Portage Bay Growing Area is open to commercial shellfish harvest from April 1 through June 30 each year.
- The Conditionally Approved area remains closed to harvest from October 1 through December 31 each year due to continued poor water quality during these months.

Fall Season Water Quality Challenges

DOH's 2019 Addendum notes that all stations in the Conditionally Approved area meet National Shellfish Sanitation Program water quality standards when including the last 30 monthly samples. However, when data is sorted and analyzed seasonally, the geometric means fail to meet the standards when calculated with data collected during the three-month fall closed period.

The fall closed period geometric means were elevated when compared to the last 30 monthly samples and when compared to the open period only data. Because data from the fall closed period (October–December) shows elevated fecal coliform bacteria levels in the Conditionally Approved area during these months, the Conditionally Approved portion of the growing area remains closed to harvest during the October–December.

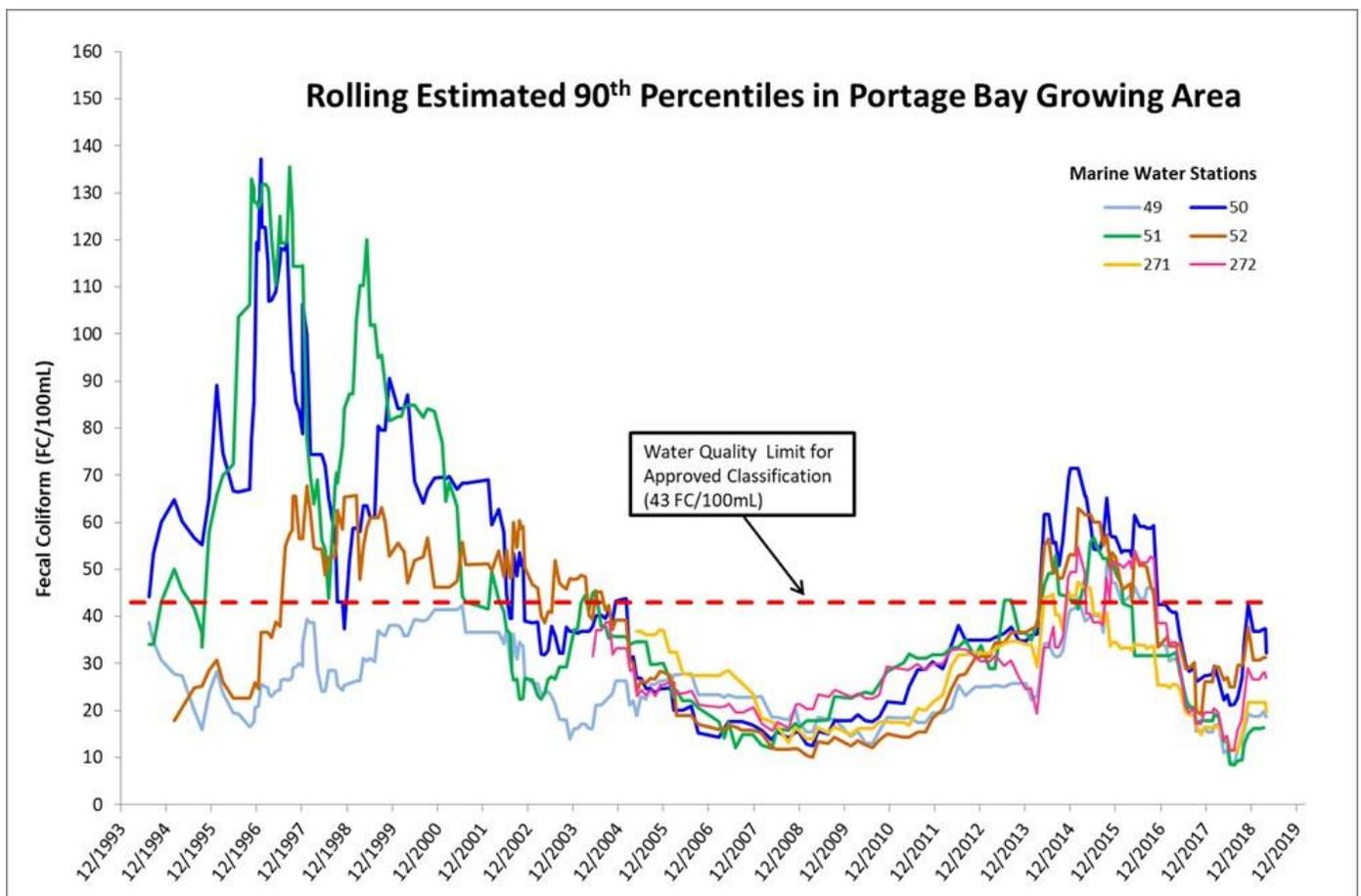


Figure 8. Estimated 90th percentiles for marine stations in the Conditionally Approved area of Portage Bay; 1993- March 2019.

Border Benchmark Recommendations and Initial Results

The TCG's Terms of Reference identifies deliverables for BC and WA to accomplish as joint actions. A key deliverable included setting a goal for fecal concentrations at water quality monitoring stations located at the CA-US border within the Nooksack watershed project area.

To meet the border goal deliverable, BC and WA TCG partners formed a subcommittee in October 2018 to begin reviewing data and developing alternatives. In June 2019 the subcommittee recommended the TCG consider adopting the following border benchmarks for 2-year and 5-year time periods using *E. coli* as the bacterial indicator:

- ***E. coli* of 200 CFU/100 mL** – Short-term border benchmark to be achieved at border stations over two-years
 - Benchmark is based on the geometric mean calculation of five weekly samples collected over 30 days (known as 5-in-30) and should apply to both wet and dry seasons
- ***E. coli* of 100 CFU/100 mL** – Longer-term border benchmark to be achieved at border stations within five years
 - Benchmark is based on the geometric mean calculation of 5-in-30 samples and should apply to both wet and dry seasons.
- The benchmark will be used at four border locations (i.e. the main waterways of Bertrand, Cave, Pepin and Fishtrap), with additional locations to be considered

BC and WA border benchmark subcommittee members support the border benchmarks as proposed. Members emphasize that the short- and long-term benchmarks reflect the intention of continued pollution reduction.

As the TCG steering members consider the proposed benchmark, subcommittee members will continue to evaluate the similarities and differences between BC and WA monitoring frequencies and compliance assessments. Continued communication will help determine how subcommittee members will measure progress toward the short- and long-term benchmarks. Continuing conversations include:

- understanding how each side uses different datasets (e.g. ambient, storm event, source identification) in producing charts and communicating statistics
- refining border sampling locations and who will monitor them
- determining how BC and WA can adapt their monitoring programs to further complement each other, including cost-effectiveness and usefulness of data

Sampling for comparison to the border benchmark, based on the BC Water Quality Guidelines (i.e., geometric mean calculations based on five samples collected within 30 days, "5-in-30 sampling") was not conducted for the reporting period at all border sites. 5 in 30 day sampling at the four stream border sites has been added to BC's sampling program and will be reported out in the next annual report.

For comparison purposes only, Figure 9 displays dry and wet season geometric means for six monthly samples in relation to the BC Guideline for Primary Recreation for *E. coli*. BC's guideline is based on a geometric mean of 5 samples in 30 days. *E. coli* results have been generally low at the border for the reporting period.

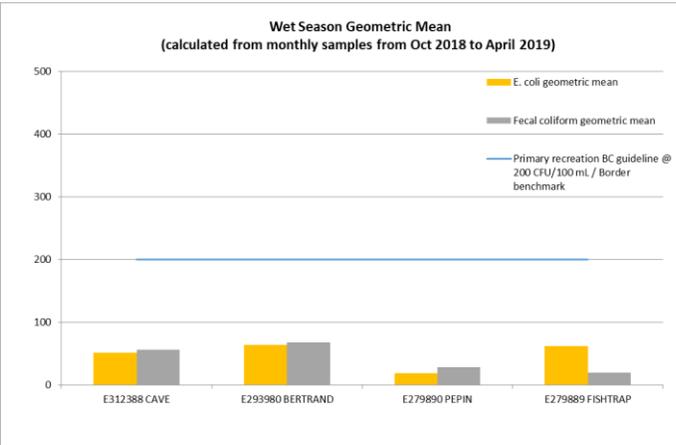
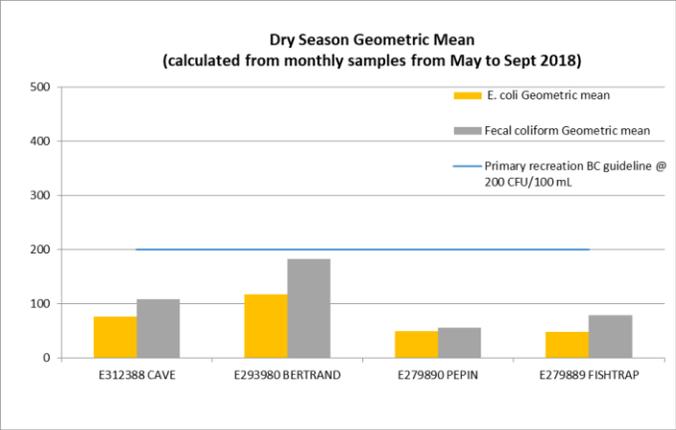


Figure 9. BC seasonal geometric means of fecal coliform and *E. coli* at four border sites sampled monthly by BC ENV from May through September 2018

Work Plan Implementation

The summary of activities is based on tasks in TCG Work Plan as recommended by the BC-WA Nooksack River Transboundary Water Quality Task Group. The TCG Work Plan identifies who was to be the lead (either WA or BC) or whether the task was to be a BC, WA joint initiative. This reporting covers the period of August 2018 to June 2019 as the TCG was established in August 2018.

BC
Joint = BC and WA
WA

Specific WA TCG Technical Member agency acronyms referred to in the activity summary include:

- Whatcom Clean Water Program (WCWP) - collective

State

- WA State Department of Agriculture (WSDA)
- WA State Department of Ecology (ECY)
- WA State Department of Health (DOH)

Local

- Whatcom Conservation District (WCD)
- Whatcom County Health Department (WCHD)
- Whatcom County Planning and Development Services (PDS)
- Whatcom County Public Works (WCPW)

Specific BC TCG Technical Member agency acronyms referred to in the activity summary include:

- Ministry of Environment and Climate Change Strategy (ENV)
- Ministry of Agriculture (AGRI)
- BC Agricultural Research and Development Corporation - Environmental Farm Plan (ARDCorp)

COMMUNICATION		
<i>TASK: Periodic meetings or conference calls as necessary between BC management and Washington/local managers of the Pollution Identification and Correction program</i>		
Who	Activities	Next Steps
Joint	<ul style="list-style-type: none"> ▪ Official TCG meetings: January and June 2019 <ul style="list-style-type: none"> ○ ENV and DOH co-chairs plan agendas, conduct meetings, track action items and follow up 	<ul style="list-style-type: none"> ▪ Continue twice yearly meetings
ENV	<ul style="list-style-type: none"> ▪ Every 1 to 2 months BC team coordinate work plan meetings 	<ul style="list-style-type: none"> ▪ Continue meeting
WCWP	<ul style="list-style-type: none"> ▪ Twice monthly field staff meetings; once monthly pollution identification and correction (PIC) program manager meeting 	<ul style="list-style-type: none"> ▪ Continue field staff meeting schedule

TASK: Increase non-regulatory engagement with the agricultural/rural residential community by participating in relevant events and forums. Take advantage of transboundary opportunities for outreach and promotional engagement at events in the Nooksack Watershed and Whatcom County		
Joint	<ul style="list-style-type: none"> ▪ No joint BC/WA TCG participation in transboundary outreach event with ag/rural residential community ▪ Formed outreach subcommittee to facilitate non-regulatory compliance promotion information exchange; shared online access to event schedules and farm planning and septic system education promotional materials ▪ Joint participation in April 2019 North Puget Sound Pollution Identification and Correction (PIC) program meeting focused on source tracking tools; ENV staff participated by phone; meeting took place in WA 	<ul style="list-style-type: none"> ▪ Continue to strengthen communication about opportunities for agency partners to participate in events during 2019-2020 where agricultural and rural residential residents will be in attendance ▪ Continue resource information exchange
AGRI	<ul style="list-style-type: none"> ▪ Contributes to and oversees Environmental Farm Plan (EFP) program and supports EFP workshops. Continue to support EFP events and forums 	<ul style="list-style-type: none"> ▪ Continue to support EFP events and forums
ENV	<ul style="list-style-type: none"> ▪ Participated in outreach events and forums. ▪ Met with agricultural associations to explain the new agricultural waste rules ▪ Participated in EFP workshop 	<ul style="list-style-type: none"> ▪ Continue to participate in events and forums with target audiences
WCWP	<ul style="list-style-type: none"> ▪ Hosted and participated in agricultural land use-related forums including workshops, farm tours, and speaker series ▪ Hosted and participated in community events including annual fun run; Small Farm Expo; SeaFeast to promote clean water goals and fecal pollution reduction activities ▪ Participated in routine meetings with farmer representatives (North Lynden Watershed Improvement District (WID) and Bertrand WID) to share data and collaborate on landowner contacts ▪ Conducted social marketing campaign to encourage septic system evaluations ▪ Conducted homeowner training classes to support code-required septic system operation & maintenance actions ▪ Distributed septic system rebates for qualified evaluations and maintenance; shared information about regional loan program to assist with septic system repair and replacement 	<ul style="list-style-type: none"> ▪ Continue to promote clean water goals and availability of farm planning services ▪ Continue to promote septic system educational opportunities and encourage proper operation & maintenance actions
TASK: Expand Regional Operations Branch (ROB) Nooksack team. Invite non-ENV agencies to planning and work meetings		
ENV	<ul style="list-style-type: none"> ▪ Extended invitations to various local, federal and First Nation governments, provincial agencies and stakeholders, providing updates after every TCG meeting and when reports are posted 	<ul style="list-style-type: none"> ▪ Continue to share implementation progress

TASK: Continue managing and improving a shared database for multi-agency water quality data, including online results mapping		
WCWP	<ul style="list-style-type: none"> ▪ Improved and maintained multi-agency database and online data mapping capabilities through refining data submittal processes, ArcGIS layers, and collector apps ▪ Refined communication with laboratories to provide prompt online access to preliminary data for agencies to post to online map 	<ul style="list-style-type: none"> ▪ Continue supporting Data Coordinator position ▪ Continue multi-agency data team meetings to identify challenges and implement solutions
COMPLIANCE AND STEWARDSHIP		
TASK: Continue source identification and correction work (compliance inspections and compliance actions)		
Who	Activities	Next Steps
Joint	<ul style="list-style-type: none"> ▪ WCWP, led by WSDA, communicated to ENV high fecal bacteria results and/or visual observations of potential water quality concerns at border location sampling sites; ENV communicated plans and follow up results and inspected sites to determine sources of contamination. ▪ Communication resulted in source identification and/or plans for future monitoring 	<ul style="list-style-type: none"> ▪ Continue communicating amongst WA and ENV TCG members to share water quality observations and follow up actions, evaluate and adjust sampling program, identify and address hotspots, track progress, and refer water quality concerns to additional agencies as needed
ENV	<ul style="list-style-type: none"> ▪ ENV completed follow up with previously inspected sites to determine compliance and escalated compliance responses when appropriate. ▪ ENV conducted new inspections at sites around fecal hotspot areas based on monitoring results to determine compliance and identify possible fecal bacteria sources. ▪ ENV conducted inspections to respond to complaints 	<ul style="list-style-type: none"> ▪ Continue to inspect in fecal hotspot areas and follow up on past non-compliance inspections
TASK: Set goal for reduced fecal coliform bacteria concentrations at border stations		
Joint	<ul style="list-style-type: none"> ▪ Established short-term and longer-term border benchmarks to reflect the targeted fecal bacteria concentration reductions at border monitoring locations <ul style="list-style-type: none"> ○ Formed short-term data review workgroup as part of longer-term data subcommittee ○ Compiled and analyzed relevant datasets ○ Proposed <i>E. coli</i> as the fecal bacteria indicator ○ Short-term, two-year benchmark established: <i>E. coli</i> 200 CFU/100mL geometric mean; applicable both wet and dry seasons 	<ul style="list-style-type: none"> ▪ Evaluate water quality data and track annual and seasonal progress relative to the border benchmark

	<ul style="list-style-type: none"> ○ Long term, 5-year benchmark established: <i>E. coli</i> 100 CFU/100mL geometric mean; applicable both wet and dry seasons 	
TASK: Promotional compliance project(s)		
ENV	<ul style="list-style-type: none"> ▪ Contacted 69 agricultural associations about this watershed project and results of a compliance audit ▪ Ten associations agreed to publish compliance promotional articles in their respective provincial agricultural newsletters/websites/magazines ▪ Developed 11 compliance promotional factsheets for January 2019 agricultural event and presented on the new agricultural rules that took effect in February 2019 at event workshops 	<ul style="list-style-type: none"> ▪ Developing promotional materials and guidance for distribution
AGRI	<ul style="list-style-type: none"> ▪ Developing On-Farm Composting Handbook to help small to medium operations and will post the handbook on the web this summer 	<ul style="list-style-type: none"> ▪ Post and promote On-Farm Composting Handbook
TASK: Environmental Farm Plan outreach and cost-sharing initiative in the Nooksack tributaries		
AGRI ARDCorp	<ul style="list-style-type: none"> ▪ Updated agencies and stakeholders in January 2019 on the Environmental Farm Plan (EFP) program in watershed ▪ Delivered EFP training and workshops in watershed 	<ul style="list-style-type: none"> ▪ Continue to deliver EFP outreach and cost-sharing initiative
TASK: Target implementation of AGRI's Manure Spreading Advisory/Application Risk Management tool in Nooksack tributaries; develop nutrient management planning calculator and communicate to users		
AGRI	<ul style="list-style-type: none"> ▪ Distributed manure spreading advisories in 2018 and now replacing advisories with the Application Risk Management tool (ARM), an adaptation of WA's tool ARM is developed specifically for an area of the province that includes the Nooksack watershed ▪ Developed, launched and posted nutrient management planning calculator on ENV and AGRI websites. Presenting calculator to agricultural associations 	<ul style="list-style-type: none"> ▪ Continue to promote nutrient management calculator and launch ARM
TASK: Riparian Health Framework project to explore monitoring protocols for riparian health		
AGRI	<ul style="list-style-type: none"> ▪ Adapted a tool to evaluate riparian health using an inventory process and launched first training session in October 2018 ▪ Preparing to deliver second training session to further adapt tool to BC 	<ul style="list-style-type: none"> ▪ Deliver second training session and pilot tool in the Bertrand Creek
TASK: Use a Living Lands/Discovery Farm approach to engage stakeholders		
AGRI	<ul style="list-style-type: none"> ▪ Agriculture and Agri-Food Canada is setting up a "Living Laboratories" initiative across Canada, and there was potential for applied research to be set up to address water quality issues in the Nooksack, but B.C. is not scheduled to have a Living Laboratory site until 2021 	<ul style="list-style-type: none"> ▪ See the recommendation to remove this item from the work plan

TASK: Continue farm planning and cost-share funding initiatives		
WCWP	<ul style="list-style-type: none"> ▪ WCWP partners referred agricultural properties with water quality concerns to WCD for technical assistance ▪ WCD promoted farm planning services and offered incentives through soil tests, tarps to cover manure piles, rebates for qualifying practices, and cost-share program ▪ Whatcom County Public Works coordinated landowner contacts and facilitated small farm rebate and cost-share program ▪ WCD worked with farmers to produce farm plans and put in place water quality protection practices; technical assistance included working with dairy producers and crop producers related to manure and facility management 	<ul style="list-style-type: none"> ▪ Continue supporting and pursuing funding to continue and expand farm planning services and ways to engage the agriculture community in clean water solutions
TASK: Continue educating and reaching out to landowners about clean water goals; offer technical assistance and financial incentives to reduce pollution risk and encourage cooperative compliance		
WCWP	<ul style="list-style-type: none"> • Field staff and outreach workgroup developed focused messages for spring 2019 season; partner agencies promoted collective messages related to timing of allowing animals on pasture, use of the Manure Spreading Advisory tool, and proper cleaning up of pet waste • Outreach venues and methods included printed materials, events, social media posts, pet waste kits, signage, radio ads, phone text alerts, and links to online resources such as water quality results map and story map [blue text are hyperlinks] 	<ul style="list-style-type: none"> ▪ Develop fall 2019 focused messages for partners to deliver based on each agency's program role and responsibility ▪ Continue multi-prong approaches to delivering coordinated messages
TASK: Collaborate to maintain and improve online water quality results and data communication		
WCWP	<ul style="list-style-type: none"> ▪ Continued multi-agency work to contribute monitoring data to online map ▪ Consistently made preliminary results available to the public via the online results map ▪ Provided relevant and timely content to the public via WSDA StoryMap ▪ Consistently created and posted monthly water quality summaries to the WCPW website 	<ul style="list-style-type: none"> ▪ Include DOH marine sampling results into online data mapping of preliminary results ▪ Include alerts for WSDA StoryMap in WCPW, WCD, and PDS newsletters
TASK: Maintain regulatory backstop programs, including relevant outreach/technical and financial assistance components; collaborate to maintain and improve online water quality results and data communication		
WCWP	<ul style="list-style-type: none"> ▪ Recommendation to revise this task description to remove the crossed out phrase because it repeats wording from the task above <p><u>Dairy</u></p> <ul style="list-style-type: none"> ▪ Washington State Department of Agriculture (WSDA) Dairy Nutrient Management Program 	<ul style="list-style-type: none"> ▪ Continue routine inspections of dairy

	<p>staff conducted routine compliance inspections at dairy facilities; reviewed records for compliance and offered technical assistance and/or referrals to WCD to improve or correct identified problems</p> <ul style="list-style-type: none"> ▪ WSDA staff conducted investigations; pursued compliance actions related to water quality or record keeping violations ▪ WSDA staff responded to dairy-related water quality complaints; verified if valid; followed up with dairy producer <p><u>Non-dairy agriculture</u></p> <ul style="list-style-type: none"> ▪ Washington State Department of Ecology (ECY) Water Quality Program staff responded to complaints or field staff observations related to real or potential fecal bacteria pollution resulting in water quality violation; if verified valid water quality concern, followed up with property resident/landowner offering technical assistance and referral to WCD and using agency enforcement protocols ▪ Whatcom County Planning and Development Services (PDS) responded to complaints or field staff observations related to real or potential critical areas ordinance violations; if verified critical areas ordinance violation, followed up with property resident/landowner offering technical assistance and referral to WCD using agency enforcement protocols ▪ PDS carried out annual review of farm plan implementation to evaluate landowner compliance with Critical Areas Ordinance 	<p>facilities and dairy record-keeping documents and follow up on complaints and/or high bacteria counts related to dairy operations</p> <ul style="list-style-type: none"> ▪ Continue regulatory backstop programs for non-dairy agriculture land use sources of fecal bacteria pollution ▪ Continue regulatory agency work with non-regulatory agencies offering technical assistance and rebate and cost-share opportunities to encourage implementation and maintenance of water quality protection practices
<p>TASK: Continue assessing effectiveness of management practices</p>		
<p>WCWP</p>	<ul style="list-style-type: none"> ▪ Recommendation to revise this task description to recognize that WCWP does not formally assess effectiveness of management practices as part of its current bacteria Pollution Identification and Correction (PIC) program ▪ Recommendation to revise this task description to better reflect intent for WA partners to identify and pursue effectiveness monitoring in a way that provides useful information in PIC program prioritized geographic areas 	<ul style="list-style-type: none"> ▪ Perform a “needs” assessment for effectiveness monitoring ▪ Based on assessment results, incorporate effectiveness monitoring into future implementation projects as resources allow
<p>TASK: Continued administration of OSS compliance efforts; operations & maintenance program (regular system evaluations) including repair/replacement of failing systems; oversight of OSS design and installation; financial incentives</p>		
<p>WCWP</p>	<ul style="list-style-type: none"> ▪ Whatcom County Health Department (WCHD) responded to complaints, water quality data, 	<ul style="list-style-type: none"> ▪ Continue OSS compliance efforts, including

	<p>and field observations related to possible human waste sources of fecal bacteria pollution</p> <ul style="list-style-type: none"> ▪ If human waste source identified, WCHD followed up using agency enforcement protocols ▪ WCHD administered Whatcom County's On-Site Sewage system (OSS) operation & maintenance (O&M) program including permitting, conducting homeowner OSS education classes, evaluating reports of system status, notifying landowners of OSS evaluation requirements, ensuring failing systems are repaired or replaced, and sharing information about rebates and regional loan program ▪ Whatcom County Public Works worked with WCHD to share information about rebates for OSS O&M actions and to distribute rebates 	landowner contacts and follow-ups.
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MONITORING

TASK: Continue source identification sampling to identify fecal coliform sources

Who	Activities	Next Steps
Joint	<ul style="list-style-type: none"> ▪ WA collected 55 total storm event samples at 9 border sites during the annual data reporting period (April 2018-March 2019) ▪ BC conducted additional targeted sampling based on unusual site conditions and/or information received about particular sites in the watershed ▪ BST/MST projects by BC and WA in these watersheds collected just over 100 source ID samples for environmental DNA analysis ▪ BC/WA communicate following high results at the border which can result in additional sampling 	<ul style="list-style-type: none"> ▪ Continue to consider source ID sampling data with field condition information to better characterize critical conditions and potential pollution sources ▪ BC will continue to coordinate and communicate internally with Compliance and Authorization departments ▪ WA to continue storm event sampling

TASK: Continue long- and short-term ambient sampling in freshwater and in shellfish growing areas

Joint	<ul style="list-style-type: none"> ▪ BC and WA performed monthly ambient sampling throughout the annual data reporting period (April 2018-March 2019) ▪ Coordinated WA freshwater sampling in the Nooksack River watershed with monthly DOH and Lummi Natural Resources marine sampling in Portage Bay ▪ BC sampled monthly at 14 stations on Bertrand and Fishtrap Creeks and Pepin Brook, including 4 sites on the CA-US border ▪ BC and WA coordinated on same-day sampling on 15 events during the annual data reporting period ▪ BC completed two attainment sampling events (5-in-30) for establishing and tracking progress towards a border benchmark and evaluating 	<ul style="list-style-type: none"> ▪ Continue coordination of sampling dates for monthly ambient sampling (dates currently scheduled through December 2019) ▪ Data subcommittee will continue to evaluate trends in ambient data (twice annually) ▪ BC will continue its twice annual border benchmark attainment sampling on streams (5-in-30)
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	<p>seasonal trends in data, one sampling event is within the annual data reporting period</p> <ul style="list-style-type: none"> ▪ BC and WA formed data subcommittee to coordinate monitoring, data sharing and collective analysis. ▪ BC and WA shared sampling plans and standard operating procedures ▪ Formed and maintained data subcommittee to coordinate monitoring, data sharing and collective analysis 	
TASK: Microbial/bacterial source tracking project (BST/MST)		
ENV	<ul style="list-style-type: none"> ▪ BC collected 70 BST water samples and analyzed 36 for 16S and 13 for Shotgun, and collected 7 scat samples of different species ▪ BC has initiated communicating preliminary results to key partners through a presentation 	<ul style="list-style-type: none"> ▪ Evaluation of results for gap analysis and potential additional sampling ▪ Communicate final results to key partners for education and compliance promotion and audits
TASK: Research and evaluate usefulness of source tracking methodologies (e.g. microbial source tracking, metagenomics, ZAPS)		
WCWP	<ul style="list-style-type: none"> ▪ WCD/Exact Scientific Services conducted a microbial source tracking (MST) project scheduled for completion at end of July 2019. WCD is producing a project report. Water quality samples analyzed for the project included samples from three CA-US border water quality monitoring locations. ▪ WCD, DOH, Lummi Natural Resources, and the US Environmental Protection Agency maintained a research project begun in 2017 evaluating use of ZAPS Liquid water quality monitoring equipment in the Nooksack watershed. WCD will produce a project report by end of 2019. ▪ Tested usefulness of a fluorometer for measuring optical brighteners during a three month period 	<ul style="list-style-type: none"> ▪ Continue exploring source ID tools and making use of tools determined to be helpful and cost effective ▪ Communicate final results to key partners and the public.

Conclusions

TCG members completed first year tasks outlined in the TCG work plan and met deliverables stated in the Terms of Reference. Highlights include:

- Establishing a three-year goal for fecal concentrations at project area CA-WA border locations.
- Forming data management, border benchmark, and non-regulatory outreach subcommittees.
- Meeting formally in January and July 2019.
- Coordinating water quality monitoring plans and evaluation of monitoring results.
- Acting on water quality complaints, including offering technical assistance and conducting regulatory compliance activities as appropriate.
- Hosting and/or participating in relevant non-regulatory engagement events and forums and distributing promotional materials through various media.
- Completing an evaluation of first year project work and an annual summary report
- Developing recommendations for adaptations to incorporate into following year work to improve effectiveness and efficiency

Overall 2018-2019 surface water quality monitoring results are positive. However, due to natural annual variability and limited data, it is too early to make conclusions about long term trends of *E. coli* at the border. The TCG will continue to implement work plan tasks in 2019-2020.

Recommendations

The TCG recommends the following adaptations to the work plan based on the first year of implementation:

Communication:

1. Identify an approved shared platform for BC and WA collaboration to produce joint documents such as annual reports.
2. Compile a list of online resources and related projects, including websites or document links and any open data to showcase the project's resource development and collaboration (e.g. flow or nutrient data; local and related research efforts; other transboundary collaboration efforts).

Compliance:

1. Change the Work Plan category title from "Compliance" to "Compliance and Stewardship" to acknowledge non-regulatory outreach, technical assistance, compliance promotion components.
2. BC task: Remove "Use a Living Lands/Discovery Farm approach to engage stakeholders," as BC is scheduled to access this federal initiative in 2021 and this project ends in 2021.
3. WA task: Remove this duplicative task captured in another item "collaborate to maintain and improve online water quality results and data communication" from longer task description of "Maintain regulatory backstop programs, including relevant outreach/technical and financial assistance components; ~~collaborate to maintain and improve online water quality results and data communication.~~"
4. WA task: Change task description from "Continue assessing effectiveness of management practices" to "Evaluate needs for measuring effectiveness of management practices; incorporate identified effectiveness monitoring priorities into future practice implementation projects." This

task was originally misstated; WA's effectiveness monitoring is currently very limited but local partners are working to better integrate this type of monitoring into WA programs.

Monitoring:

1. Coordinate and prioritize sampling events by both jurisdictions to occur on the same day north and south of the border at least once-monthly.
2. Split a limited number of water samples for analysis at both BC and WA laboratories to determine inter-laboratory variability.
3. Conduct multi-agency same site duplicate or replicate samples to ensure comparable data.
4. Evaluate border sampling coordination between jurisdictions, including:
 - a. Prioritizing sampling sites
 - b. Statistically comparing datasets from geographically close BC and WA sites to determine if the site data can be used interchangeably
 - c. Determining if any geographically close sites can be removed
 - d. Identifying additional sites that should be monitored
 - e. Include the required 5 in 30 day sampling at key seasons.
5. Gather additional hydrological information to better understand loading from Canadian portions of Bertrand and Fishtrap watersheds to downstream WA portions of Bertrand and Fishtrap Creeks and to the Mainstem Nooksack River.

Overarching addition:

The TCG annually reviews and updates the project's Terms of Reference, Work Plan and monitoring programs based on current circumstances.

References

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