Whatcom Clean Water Program Quarterly Report
October 1 – December 30, 2015

Included in this quarterly overview:

- Agencies create better access to maps and data
- Portage Bay shellfish growing area faces another failing monitoring station
- Summary of 2015 fecal coliform sampling at the U.S.-Canada border
- Agencies continue to work with Whatcom County residents to reduce fecal coliform bacteria pollution

Easier data access - To make fecal coliform monitoring information more readily available to the public, staff from multiple agencies worked together to develop maps locating sampling locations and reporting fecal coliform analysis results. To access the maps and data from one location, visit Whatcom County Public Works Water Quality Monitoring Results page (http://www.whatcomcounty.us/2170/Water-Quality-Monitoring-Results#wq summaries). See page 2 for more information.

Portage Bay water quality status - At year end 2015, marine water monitoring station 49 was added to a list of four other stations in the Portage Bay shellfish growing area that fail to meet at least one of the shellfish harvesting bacteria criteria required for Approved classification. See map below for lower Nooksack River drainage area and page 3 for Portage Bay marine sampling information.

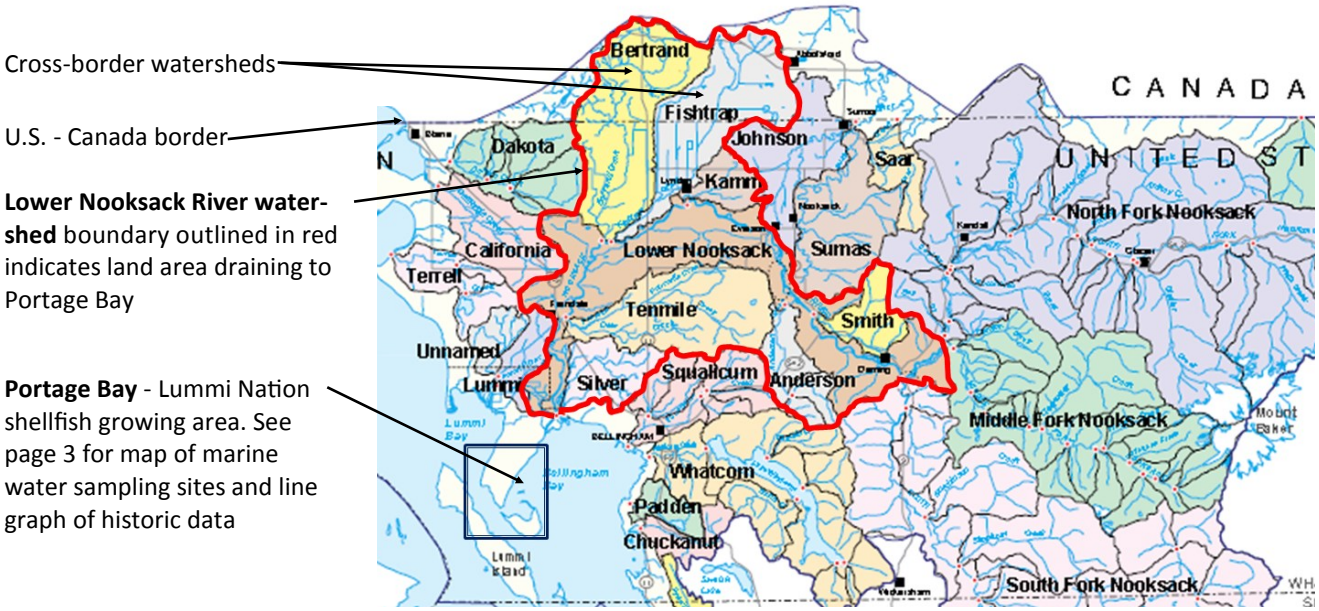


Figure 1 - Map outlining area that drains to the lower Nooksack River and eventually to the marine water of Portage Bay

Canadian border - During 2015, Whatcom Clean Water Program partners gathered data along the U.S.-Canada border to better document fecal coliform bacteria contributions flowing into Whatcom County from the north. Washington Department of Agriculture Dairy Nutrient Management Program staff compiled border data to share with Canadian counterparts (see pages 4-5).

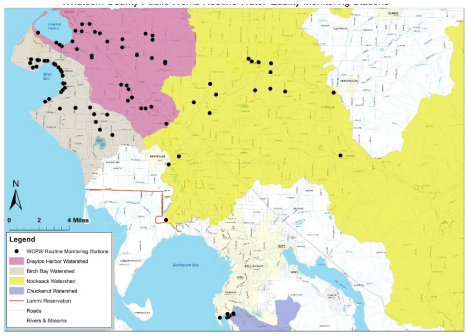
WHATCOM COUNTY FECAL COLIFORM BACTERIA SAMPLING & RESULTS

Bacteria status in Whatcom County - By the end of 2015, 80 percent of the 90 fixed-location sampling sites routinely monitored by Whatcom County Public Works (County PW) failed to meet standards for fecal coliform bacteria.

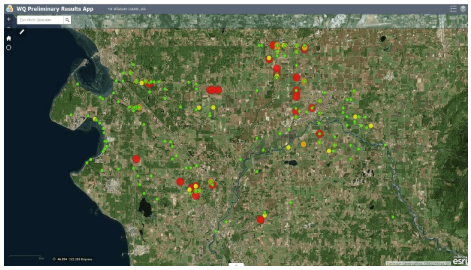
New ways to access county-wide data - Every month throughout Whatcom County, various groups, agencies, tribes and individuals collect hundreds of water samples to be analyzed for fecal coliform bacteria. As residents see or hear that samples are being gathered, many have wondered where all the data ends up. Agencies have been challenged to make data easily and quickly accessible to people who are interested and/or who live in the areas prioritized for pollution reduction.

During late 2015, staff from Washington Department of Agriculture Dairy Nutrient Management Program (DNMP), Washington Department of Ecology Water Quality Program (ECY), Whatcom Conservation District (WCD) and Whatcom County Public Works (County PW) worked to build and publish web-based maps to display location and results of fecal coliform sampling in Whatcom County.

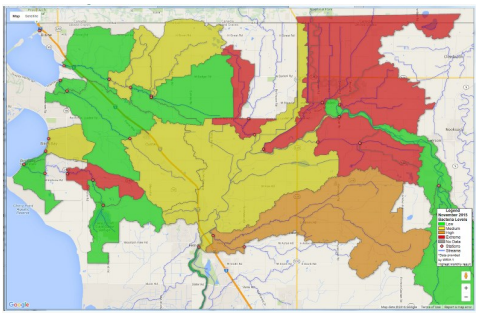
To access the maps and data from one location, County PW created a Water Quality Monitoring Results page (http://www.whatcomcounty.us/2170/Water-Quality-Monitoring-Results#wq summaries). Through the website, sampling locations and results from County PW, state agencies, Lummi Natural Resources and Nooksack Natural Resources are accessible on several interactive maps that allow a user to zoom in to areas of interest and to click on sampling points to see results. Examples of maps available to view are displayed below:



Map locating County PW routine monthly monitoring locations



Interactive map with location and results of routine fecal coliform sampling



Map indicating watershed health based on monthly fecal coliform sampling result

Pre-scheduled sampling at fixed location sites is known as **ambient** or **routine** sampling. Agencies use results to characterize general conditions and to prioritize drainages for pollution reduction efforts.

In addition to ambient sampling, DNMP and ECY staff collect **source identification samples** to help the narrow the location of potential sources of fecal coliform bacteria pollution. Source identification sampling occurs at various locations, usually during or shortly after rain events.

Fecal coliform is an indicator of bacterial contamination from warm-blooded animal, including people. History has demonstrated a relationship between the presence of fecal coliform bacteria and the presence of illness-causing viruses and bacteria, called pathogens. Washington state's freshwater bacteria standards protect recreational use; the criteria in the standards define maximum levels of fecal coliform according to several categories of recreational contact. Fecal coliform concentrations above the criteria indicate an increased public health risk.

Klebsiella - During 2015 due to increased outreach, many Whatcom County residents have become aware of fecal coliform bacteria and want to know more about potential sources. Some question the validity of using fecal coliform bacteria to indicate a potential health risk to people because bacteria such as *Klebsiella* are categorized as fecal coliform bacteria.

While a source of *Klebsiella* could be decaying organic matter such as wood waste, about 30 to 40 percent of people and animals have *Klebsiella* in their intestinal tract. The *Klebsiella a*re excreted with feces. Detecting *Klebsiella* does not rule out a fecal source, especially in areas where preventable human sewage, livestock manure, and pet waste sources may be present. See Appendix 1 for a Washington Department of Health summary of how *Klebsiella* relates to commercial shellfish classifications.

PORTAGE BAY

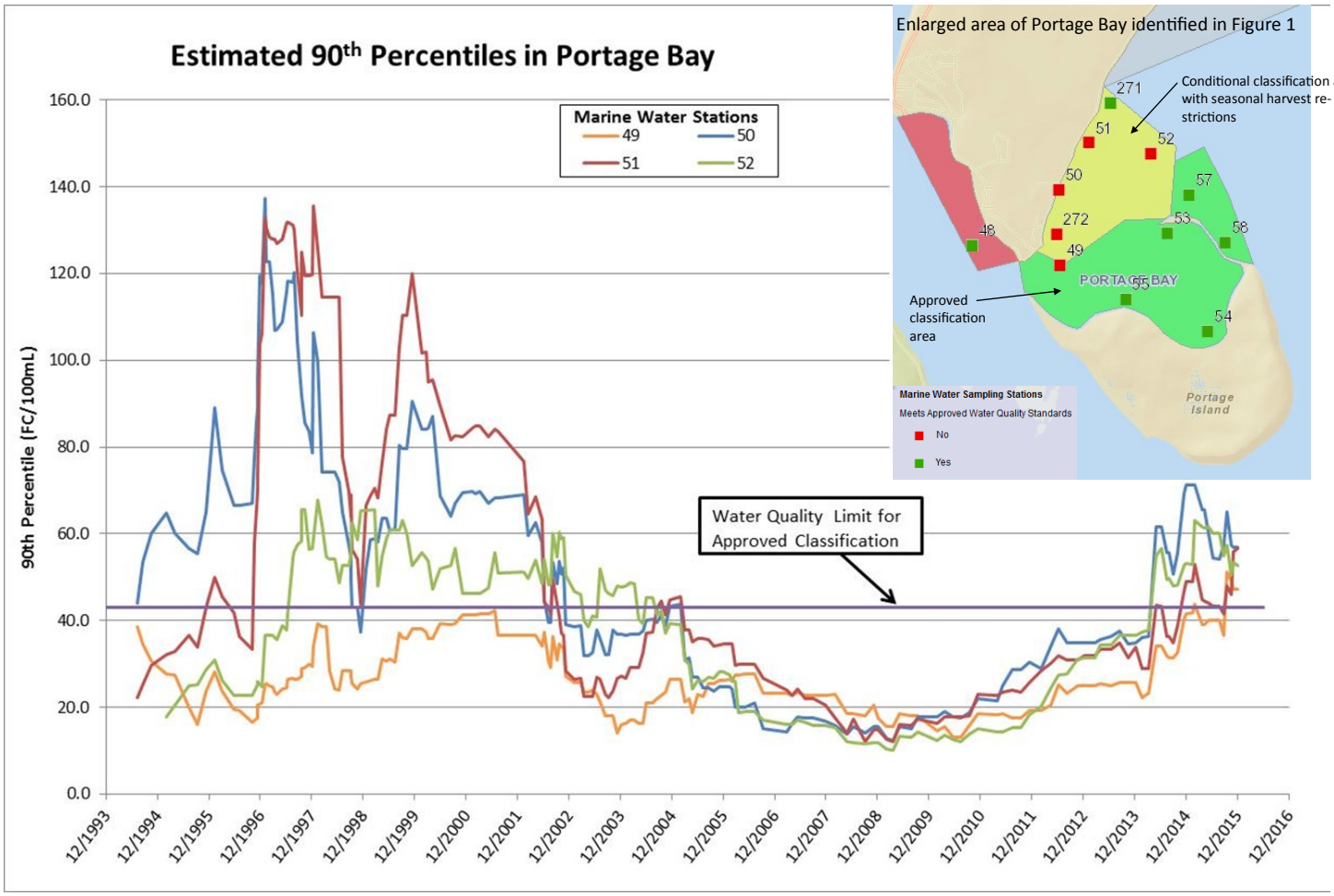


Figure 2 - Line graph illustrating history of fecal coliform data for four marine water monitoring stations in the Portage Bay shellfish growing area (1993-2015) . The estimated 90th percentile limit is 43 FC/100mL for Approved classification.

At year end 2015, Portage Bay shellfish growing area station 49 was failing the estimated 90th percentile criterion. Station 49 is currently in the Approved area. In addition to station 49, four other stations (50, 51,52, 272) fail to meet National Shellfish Sanitation Program (NSSP) standards. These four stations are included in the almost 500 acres of Lummi Nation's shellfish growing area downgraded from Approved to Conditional in spring 2015. The Conditional classification prohibits harvest during April-June and October–December.

The Washington Department of Health (DOH) will review data and classification for the entire Portage Bay growing area during an annual review period in early 2016. DOH administers the NSSP for the Lummi shellfish growing area in consultation with Lummi Nation.

LOWER NOOKSACK/PORTAGE BAY WATERSHED Water Quality

Whatcom County Pollution Identification and Correction (PIC) program

Within the lower Nooksack River watershed that flows to Portage Bay, Whatcom County Public Works (County PW) routine sampling includes twice monthly sampling at 19 fixed-location sites in the Nooksack River watershed. For one of the routine sampling dates each month, County PW, ECY and tribal staff coordinate to sample on the same day in an expanded area.

- 52% (10 of 19) of County PW routinely monitored sites fail to meet either criteria of the freshwater bacteria standard for primary contact recreation
  - Of the 10 failing sites, County PW has noted improved water quality (bacteria decreases) in 4 of the sites during the past year, with only S3 (Scott Ditch at Thiel Road) getting worse
  - See bar graphs comparing bacteria levels to standards at http://www.whatcomcounty.us/DocumentCenter/View/14556
- Fishtrap Creek drainage became a focus area for Whatcom County's Pollution Identification and Correction (PIC) program during 2015
  - County PW conducts routine monitoring at 21 sites in the focus area on a weekly basis
  - See a Fishtrap focus area water quality status summary at http://www.whatcomcounty.us/DocumentCenter/View/14190
  - 57% (12 of 21) of County PW routinely monitored focus area sites fail to meet either criteria of the bacteria standards

Cross-boundary watershed water quality

Because about half of the land area of both the Bertrand Creek and the Fishtrap Creek watersheds are in Canada, agencies and Whatcom County residents are interested in the quality of the water that is flowing across the international border through these drainages. During 2015, County PW, Dairy Nutrient Management Program (DNMP) and ECY staff gathered over two hundred fecal coliform bacteria samples along the border.

DNMP staff compiled a year-end summary of fecal coliform bacteria monitoring at the U.S.-Canada border:

- Border sites in Bertrand watershed include the mainstem Bertrand Creek, a tributary called Cave Creek, Jackman Ditch and two associated drainages
  - 74 bacteria samples were collected during 2015, both ambient and source identification sampling
    - ⇒ Over 66% of samples collected in the main creek at the border exceeded the state limit of 200FC/100mL (maximum acceptable concentration for a single sample)
    - ⇒ 40% of samples collected in Jackman Ditch drainages at the border exceeded 200FC/100mL
- Border sites in the Fishtrap watershed include Pepin Brook (known as Double Ditch in Whatcom County) sampled in British Columbia north of Zero Avenue,

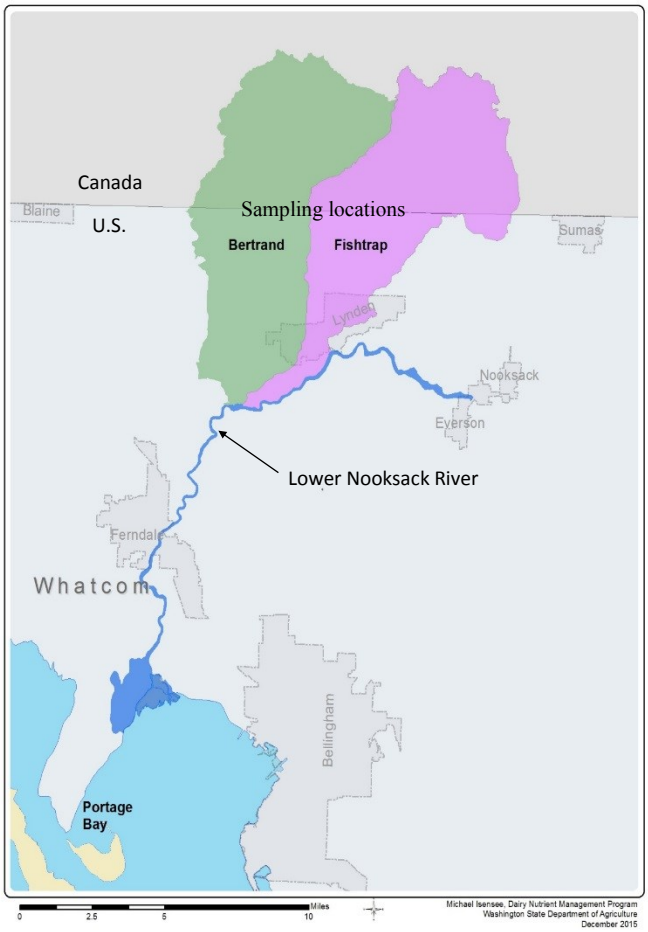


Figure 3 - Bertrand and Fishtrap cross-boundary watersheds relative to Portage Bay

sites in the ditches on the east and west side of Double Ditch Road as water flows under Zero Avenue from Pepin Brook and roadside ditches, and the mainstem of Fishtrap Creek as it crosses Northwood Road

- 139 bacteria samples were collected during 2015, both ambient and source identification sampling
  - ⇒ Almost 25% of samples collected in the main creek at Northwood Road exceeded 200FC/100mL
  - ⇒ 30% of samples in Double Ditch at the border exceeded 200FC/100mL
  - ⇒ Sampling through much of 2015 resulted in low concentrations of fecal coliform bacteria in Double Ditch at the border; however, during wet conditions (Feb-Mar and Nov-Dec), sample results exceeded 1000FC/100mL six times. These results suggest a substantial pollution source exists only under saturated conditions.

Washington Department of Agriculture Dairy Nutrient Management Program (DNMP)

During October-December 2015, DNMP staff conducted source identification sampling on seventeen different days and participated in one overflight with ECY and County Planning & Development Services (PDS) staff. Highlights of DNMP sampling and follow up activity are provided in Figure 4.

Figure 4 - DNMP fecal coliform sampling and follow up summary Oct-Dec 2015

Event	Date	Watersheds	Outcomes/summary of results
Sampling	10/31	California, Dakota, Fishtrap, Wiser-Cougar, Tenmile	DNMP sampled on Saturday during a significant fall storm. Results showed high fecal coliform bacteria counts in both Drayton Harbor and Portage Bay watersheds. One dairy received a warning letter.
Flyover	11/5	All watersheds	Identified follow-up sites in Terrell (Birch Bay), Dakota (Drayton Harbor), and Kamm Creek (Portage) watersheds. Photos were used for one warning letter, an ongoing investigation, and a pending enforcement action.
Sampling	11/13	Bertrand, Fishtrap, Scott	Sampling results showed high bacteria throughout Jackman Ditch (Bertrand), including at all three stations at the Canadian border. Elevated counts were not clearly associated with specific land practices. Sampling included follow up on an ERTS* referral from ECY for a dairy field in Bertrand Creek drainage; results were inconclusive. Sampling results in Fishtrap showed elevated bacteria, including very high results in Double Ditch at the Canada border and downstream from two non-dairy facilities; DNMP submitted an ERTS for one of the properties. All stations sampled in Scott Ditch showed elevated bacteria levels.
Sampling	11/17	California, Tenmile	Identified multiple probable discharges, both dairy and non-dairy. Sampling resulted in six ERTS reports. ERTS reports included four dairies; one received a warning letter and the other three face pending enforcement action. Referred non-dairy sites to Ecology.
Flooding Surveillance	11/18	Scott	DNMP identified elevated bacteria counts associated with late fall manure/ nutrient applications and a flooded facility.
Sampling	12/8	Bertrand, Fishtrap, Kamm, Scott, Sumas	Sampling results in Jackman (Bertrand) drainage were low at most stations. Two somewhat elevated counts could not be associated with specific practices. Bacteria analysis results were high from Double Ditch (Fishtrap) border locations. Resampling at one non-dairy facility with livestock present again showed elevated bacteria levels; DNMP submitted an ERTS referral. Kamm had an elevated result downstream from a manure/nutrient application noted a month earlier during aerial surveillance. DNMP is investigating. Sumas: DNMP staff sampled roadside ditch downstream from non-dairy animals; high bacteria results; DNMP submitted an ERTS referral. Sumas: In response to a citizen-submitted ERTS, sampled at a roadside ditch near a fall dairy manure solids application; Results showed elevated bacteria counts and an enforcement action is pending.

*Environmental Report Tracking System (ERTS) referrals; the ERTS is managed by WA Department of Ecology (ECY) and is a way to report and track among agencies the response and follow up to environmental incidents. Incident reports may be submitted anyone - agency staff or private citizen

LOWER NOOKSACK/PORTAGE BAY WATERSHED Property Outreach, Assessments and Results

Whatcom County Public Works (County PW) and Whatcom Conservation District (WCD)

In Whatcom County's PIC program focus area of Fishtrap Creek, County PW worked closely with board members of the North Lynden watershed improvement district (WID) to develop a process for contacting residents with potential fecal coliform bacteria sources in areas of high pollution levels. The contact with residents is to request that landowners voluntarily seek non-regulatory assistance to identify and correct potential pollution concerns.

For pollution concerns related to livestock manure, WCD is available to provide non-regulatory technical assistance. Whatcom County Health Department provides technical assistance related to septic system operation and maintenance.

As pollution hotspots are identified through sampling or validated complaints are received through the Environmental Report Tracking System (ERTS), County PW notifies North Lynden WID leadership. A WID representative then contacts residents within WID borders to discuss the problem and request a response within a specific timeline.

- During November and December 2015, three properties in the Fishtrap Creek watershed were identified as likely contributing fecal coliform bacteria pollution through surface runoff from muddy, manure-contaminated site conditions
  - County PW notified North Lynden WID leadership of two ERTS referrals; one of the properties chose to work with WCD to correct pollution sources
  - County Planning & Development Services is following up with one landowner
  - Agricultural BMP progress in Fishtrap focus area includes one completed manure storage facility, with ten other BMPs planned

Whatcom County Public Works and Whatcom Conservation District partnered to advertise availability of no-cost farm management assistance

Whatcom County Health Department - On-site Sewage Systems (OSS)

Whatcom County's PIC program includes identifying and correcting fecal coliform pollution sources from failing on-site sewage systems (OSS). Whatcom County Health Department's (WCHD) OSS operation and maintenance (O&M) program requires regular evaluations of OSS.

During October–December 2015, WCHD continued to prioritize the Lynden North area (includes Bertrand, Fishtrap and Kamm watersheds) for compliance with O&M requirements. WCHD notifies OSS owners about responsibilities and deadlines for OSS evaluations through a series of letters.

- WCHD sent 982 initial O&M notifications in August 2015. O&M evaluation deadline for Lynden North Watershed was December 31, 2015. See Figure 5 for Oct-Dec 2015 activity summary.
- 541 OSS have been evaluated since August 2015
- 441 OSS have not been evaluated and are currently out-of-compliance (55% compliance rate)
- At the end of January 2016, WCHD will send notices of violation to out of compliance OSS owners
- 80 people attended three homeowner training workshops. WCHD hosted the workshops to educate OSS owners and to certify the attendees as eligible to complete their own OSS evaluations
- To eligible attendees of the workshops, County PW worked with WCHD to distribute 56 rebates of $100-$200 each, depending on OSS O&M action (evaluation, pumping, installation of O&M equipment)

Whatcom County Health Department's Environmental Health website offers information about proper septic system operation & maintenance

In addition to normal responses to failures/sewage releases, WCHD staff performed audits of homeowner OSS evaluation work in the North Lynden focus area. During an audit, staff verifies the validity of a homeowner report of system status (HROSS) and provides on the ground education and technical assistance.

- Of 34 audits completed, WCHD staff identified 7 HROSS errors and two systems that had not been evaluated.
- WCHD ensured OSS owners corrected the errors and completed the evaluations. One property owner hired a professional to complete a ROSS. The other individual properly completed the HROSS with WCHD O&M staff present.

WCHD sent letters to the Tenmile Clean Water Project group and to the leadership of the South Lynden and the Laurel watershed improvement districts to inform them that OSS owners in the Tenmile watershed and Scott Ditch watershed will be receiving O&M requirement letters in 2016. WCHD sent these informational letters to coordinate with the community groups and offer an opportunity to answer questions prior to WCHD mailing individual letters to OSS owners.

Figure 5 - OSS Operation & Maintenance program activity summary for Lynden North focus area Oct-Dec 2015)

O&M Activity	Lynden North focus area
O&M notification letters sent[1]	757
ROSS[2] submitted	232
ROSS indicating failure	0
ROSS with maintenance needed	26
HROSS[3] audits	34
OSS replacement applications	2

[1] 2nd notification to OSS owners who did not have their OSS evaluated as of 10/26/15
[2] ROSS = Report of System Status (submitted by licensed O&M specialist
[3] HROSS = Homeowner Report of System Status (submitted by homeowner after self-inspection

WA Department of Ecology (ECY)

During fourth quarter 2015, ECY Water Quality Program staff conducted inspections, investigation sampling, and landowner meetings. ECY inspectors:

- Interacted with 21 properties throughout Whatcom County during the quarter, including 6 property inspections (5 inspections in Nooksack watershed—see figure 6 for summary)
- Inspectors attempted to contact 28 other properties, but received no response
- Two properties refused access to ECY inspectors
- Conducted property-specific fecal coliform sampling investigations; 19 sampling events on 15 properties
- Submitted two ERTS referrals for dairy–related properties and one ERTS related to portable toilets overturned near field ditches
- Confirmed 15 agricultural BMPs completed on 11 properties; BMP implementation is confirmed by follow up visit, roadside observation, or photographic evidence
- Issued 4 warning letters: 2 Nooksack/Portage Bay watershed properties; 2 Sumas watershed properties

Figure 6 - ECY inspection activity in Portage Bay watershed for Oct-Dec 2015

Date	Activity	Sub-watershed	Facility type	Pollution sources identified and BMPs prescribed
10/21	Initial inspection based on conditions documented in aerial photos	Kamm	Beef cattle	Manure accumulations around barn area that slopes to surface water Heavy use area at channel crossing and on slope above stream. BMPs need to address manure accumulations and connectivity to surface water; exclusion fencing or management BMPs to control access to riparian area and surface water Manure from pad collected and appropriately spread on fields; animals removed from site. Owner agreed to work with WCD to address long-term BMP needs before returning animals to the site
11/20	Initial inspection	Kamm	Beef cattle	Heavy use areas on slope draining to stream; manure application to saturated areas Owner working with WCD to develop a farm plan; ECY to follow up
11/25	Initial inspection based on ERTS referral from DNMP	Tenmile	Blueberry field	Dairy manure solids applied to blueberry rows in mid-November High fecal coliform counts documented in field runoff Short-term fix included berm to prevent polluted discharge to roadside ditch; working with WCD for longer-term solution
12/2	Initial inspection; ERTS referral from DNMP	Anderson	Beef cattle	Cows with direct access to surface water in flooded field; pollution source is deposition of manure into and near surface water Management changes needed to exclude animals from saturated area that drains to surface water Animals removed from site
12/30	Follow up inspection; ECY initially contacted property in 2014 due to high fecal coliform counts downstream	Kamm	Horse boarding and beef cows	Sampling results downstream of site show high fecal coliform counts Previous owner obtained farm plan and corrected some manure-related pollution sources; new operator changed management New operator has excluded cows from wet portion of pasture Follow up needed to locate all catch basins on the property and conduct further sampling to identify and correct pollution sources; recommend farm plan

WA Department of Agriculture Dairy Nutrient Management Program (DNMP)

During fourth quarter 2015, DNMP staff conducted:

- *Routine* inspections - include a complete physical inspection of the dairy facility and its manure management. DNMP staff conduct routine inspections at dairy facilities approximately every 22 months
- *Follow-up* inspections - focused on issues identified at the previous visit; follow-up inspections track improvements made at the request of program inspectors
- *Special inspections* - can include lagoon assessments, clean water diversion checks, nutrient application assessments, records reviews or other
- I*nvestigation*s - occur when issues are identified
- *Responses to Environmental Report Tracking System (ERTS) - D*NMP staff responded to 17 ERTS referrals for properties associated with dairy facilities or with fields included in a dairy nutrient management plan.

See Figure 7 for inspection summary and Figure 4 for additional DNMP activity summary.

Figure 7 - DNMP inspection activity in Portage Bay watershed for Oct-Dec 2015

Watershed	Routine inspection	Follow-up inspection	Investigation	Special inspection	WCD referral	Agency referral	Non-dairy outreach	Enforcement
Lower Nooksack/Portage	11	2	3	1	1	3	1	2 WL*

*WL = Warning letter

DRAYTON HARBOR WATERSHED Water Quality

Whatcom County Pollution Identification and Correction (PIC) program

Throughout 2015, Whatcom County's PIC Program continued pollution reduction efforts in focus areas of Drayton Harbor watershed.

- 40% (12 of 30) of routinely monitored sites fail to meet either criteria of the bacteria standards
  - Of the 12 failing sites, County PW has noted improved water quality (bacteria decreases) in 11 of the sites during the past year (see http://www.whatcomcounty.us/DocumentCenter/View/14557 for bar graphs comparing bacteria levels to standards). Only one North Fork Dakota site saw increased fecal coliform bacteria concentrations during the past year.
- In Drayton Harbor PIC focus areas, 83% (19 of 23) of sampling sites fail to meet bacteria standards. Of the 19 failing sites, 63% are showing improvement.

DRAYTON HARBOR WATERSHED Property Outreach, Assessments and Results

Whatcom County Public Works and Whatcom Conservation District

County PW prioritizes PIC program focus areas based on fecal coliform sampling data. After surveying land use and property conditions in areas of high bacteria pollution levels, County PW requests voluntary action from residents with potential fecal coliform bacteria pollution sources. Residents are contacted about technical assistance available from WCD for issues related to livestock manure and from Whatcom County Health Department related to septic systems.

During October through December 2015, County PW contacted 39 focus area properties with non-dairy livestock. County PW's PIC program includes a partnership with Whatcom Conservation District (WCD) as the education and non-regulatory technical assistance connection to the agricultural community.

- Of the 39 properties contacted by PW, WCD connected with 17
  - Eight of the 17 properties began working with WCD to improve management of manure, animals and/or infrastructure to protect water quality. Status of additional improvements include:
    - ⇒ 7 farm plans completed, with 15 best management practices (BMPs) installed or implemented
    - ⇒ County PW distributed a total of $3745 in cost-share funds to assist with BMP implementation
  - County PW referred 9 properties to County Planning & Development Services (PDS) for regulatory follow up. The referred properties were identified as potential bacteria pollution sources and encouraged to participate in voluntary technical assistance program, but the residents chose not to respond.
- In total, County PW has referred 13 Drayton Harbor focus area properties to PDS. Regulatory enforcement results include:
  - 10 Notices of Violations (NOVs)
  - 1 penalty
    - ⇒ 9 properties are in the process of correcting pollution sources, with 2 unresolved NOVs

WA Department of Ecology (ECY)

During fourth quarter 2015, ECY Water Quality Program staff conducted one inspection in the Drayton Harbor watershed. See Figure 8 for summary.

Figure 8 - ECY inspection activity in Drayton Harbor watershed for Oct-Dec 2015

Date	Activity	Sub-watershed	Facility type	Pollution sources identified and BMPs prescribed
10/27	Initial inspection	California Creek	Beef cattle	Cattle on saturated field; manure and mud accumulations draining to surface water Owner modified drainage infrastructure and removed cows from field temporarily; working with WCD to complete a farm plan Owner to submit plan to ECY

WA Department of Agriculture Dairy Nutrient Management Program (DNMP)

During fourth quarter 2015, DNMP staff conducted four routine inspections as well as other activity in the Drayton Harbor watershed. See Figure 9 for inspection summary and Figure 4 for additional summary of DNMP activity in the watershed.

Figure 9 - DNMP inspection activity in Drayton Harbor watershed for Oct-Dec 2015

Watershed	Routine inspection	Follow-up inspection	Investigation	Special inspection	WCD referral	Agency referral	Non-dairy outreach	Enforcement
Drayton Harbor	4	0	2	0	0	2	0	1 WL*

*WL = Warning letter

Klebsiella

How this bacteria relates to commercial shellfish classifications

In the Environment

Klebsiella are one of many bacteria categorized as fecal coliform bacteria. They can be found in animals, people, water, soil, and plants. About 30 to 40 percent of all people and animals have *Klebsiella* in their intestinal tract, which come out in feces. There can be up to 100,000,000 *Klebsiella* per gram of feces (American Water Works Association, 1999).

Potential Public Health Impact

Klebsiella can make people sick, and even cause death, when ingested in large numbers or by people who have a health condition that makes them vulnerable (i.e. immunocompromised). Many studies have shown that, in general, strains of this bacterium from plants, soil, or water are as likely to cause illness as those from animals or people (Struve, 2004). Estimates are that ingesting 100 ml (about 3 oz.) of drinking water containing 35 *Klebsiella* per ml could be a risk to susceptible people (American Water Works Association, 1999). Foodborne illness outbreaks linked to *Klebsiella* have also been reported (from contaminated iced tea (Tauxe, 1996) and turkey (Rennie, 1990)).

Relationship to Commercial Shellfish Classifications

National Shellfish Sanitation Program (NSSP) rules require the use of fecal coliform bacteria when evaluating marine water quality for the classification of commercial shellfish harvesting areas. Fecal coliform bacteria are used as an indicator of the potential presence of harmful bacteria or viruses.

We received guidance from the U.S. Food and Drug Administration (FDA) on the evaluation of wastewater containing *Klebsiella* bacteria (i.e. from pulp mills). The key points of FDA's guidance (FDA, 2003) on application of the NSSP rules related to this issue include:

- The NSSP does not allow a State Shellfish Control Authority to distinguish among types of fecal coliforms when making regulatory decisions. We must treat *Klebsiella* the same as other fecal coliform bacteria – there are no criteria for exceptions in NSSP rules.
- We measure indicators, not actual pathogens. Using fecal coliform bacteria as an indicator organism provides notice of many potentially harmful bacteria and viruses in the water. Fecal coliform is considered to be reliable indicator: it produces quick results, is relatively inexpensive, has reproducible results, and can be uniformly applied on an interstate and international basis.

References

1. American Water Works Association. 1999. Waterborne Pathogens. Manual of Water Supply Practices – M48. American Water Works Association, Denver, CO.
2. Food and Drug Administration. 2003. FDA Responses to Grays Harbor Issues Presented by the Weyerhaeuser Company. (Technical memorandum). Food and Drug Administration, College Park, MD.
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4. Struve, C. and K.A. Krogfelt. 2004. Pathogenic potential of environmental *Klebsiella pneumonia*e isolates. Environmental Microbiology (2004) 6(6), 584-590.
5. Tauxe, R.V. and M.L. Cohen. 1996. Bacterial contamination of iced tea. (Technical memorandum). Centers for Disease Control and Prevention, Atlanta, GA.