



STATE OF WASHINGTON
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To: British Columbia Water Quality Partners

From: Michael Isensee, Dairy Nutrient Management Program, Washington State Department of Agriculture, misensee@agr.wa.gov

Re: Washington – British Columbia border water quality 2015: Bertrand Creek and Fishtrap Creek watersheds

Reducing fecal coliform loads from both Bertrand and Fishtrap Creeks is critical to obtaining water quality goals intended to protect beneficial uses in these waterways and for downstream users, especially shellfish harvest in Portage Bay.

In the Nooksack River Total Maximum Daily Load (TMDL) submittal report ([Ecology Publication No. 00-10-036](#), June 2000) and subsequent implementation report ([Ecology Publication No. 01-10-060](#) January 2002), researchers found these two streams contributed approximately five percent of the annual river flow but 43% of the bacteria load. At that time it was estimated that bacteria loads in these two watersheds would each need to be reduced by 40% in order to meet the overall watershed’s TMDL goal. Data from 2015 indicates that loading has increased, not decreased, making even larger reductions necessary. With half of each watershed in Canada, reductions are needed on both sides of the border to achieve water quality goals.

Calculations estimate nearly a 90% reduction is needed in bacteria loads in Bertrand Creek at the border, while an approximately 40% to 60% reduction in loads appears necessary in Fishtrap Creek (Table 1).

TABLE 1: Estimated Bacteria Reductions Needed at Border							
Bertrand Creek Border Stations	BECC0.2	BE9.1	JD-C	JD-B	BEJK2.0	JD-A	JD-F1.1
Estimated 90th percentile	2,050	2,746	145	345	815		1,234
Estimated reduction needed to meet 90% standard*	90.0%	92.7%	38.3%	42.0%	75.5%		83.8%
Fishtrap Creek Border Stations							
	DD-CA1	DD5 (W)	DD6 (E)	FT-8			
Estimated 90th percentile		491	352	335			
Estimated reduction needed to meet 90% standard*		59.2%	43.2%	40.3%			

* Based upon estimated 90th percentile using statistical roll back method (Ott, 1995)

Background

During 2015, bacterial water quality was regularly sampled at seven primary stations in Bertrand and Fishtrap watersheds where waters flow from headwaters areas in British Columbia, Canada to Whatcom County, Washington. All these stations drain to the Nooksack River and, ultimately, Portage Bay (Figure 1). Portage Bay is a crucial part of the Lummi Tribe's shellfish harvesting area and is used for subsistence, commercial and ceremonial purposes.

From 1996 to 2006 the Lummi Tribe's Portage Bay shellfish beds were closed due to fecal coliform bacteria exceeding National Shellfish Sanitation Program standards. Extensive source control efforts occurred in Whatcom County between 1998 and 2003 and marine water quality trends showed substantial improvements.

Starting in 2009, marine water quality began showing declining trends. Late in 2014, substantial portions of the shellfish beds were seasonally closed (April through June and October through December) due to fecal coliform bacteria again exceeding federal standards during these time periods.

<http://www.doh.wa.gov/Portals/1/Documents/4400/portage.pdf>

Sampling Locations

Five locations were sampled in the Bertrand watershed. These included the main creek (**BE9.1**) and a tributary to the west named Cave Creek (**BECC0.2**) (Figure 2) as they leave British Columbia. Also included was a highly modified stream known as Jackman Ditch and two associated drainages (Figure 3). In some cases, there are two sample locations associated with the same waterway, with samples collected on either the Washington or the British Columbia side of the border. These include Jackman ditch (**JD-B** north of Zero Avenue and **BEJK2.0** to the south) and the sub-drainage to the east (**JD-A** north of Zero Avenue and **JD-F1.1** to the south). In this latter case, there is a Canadian stormwater conveyance under Zero Avenue that enters the drainage between the two sample locations.

In the Fishtrap Creek watershed, Fishtrap Creek was sampled near but not at the border (**FT-8**). This station is approximately 750 feet, or 225 meters, downstream from the border where the creek crosses Northwood Road. Pepin Brook (known as Double Ditch in Washington State) was occasionally sampled

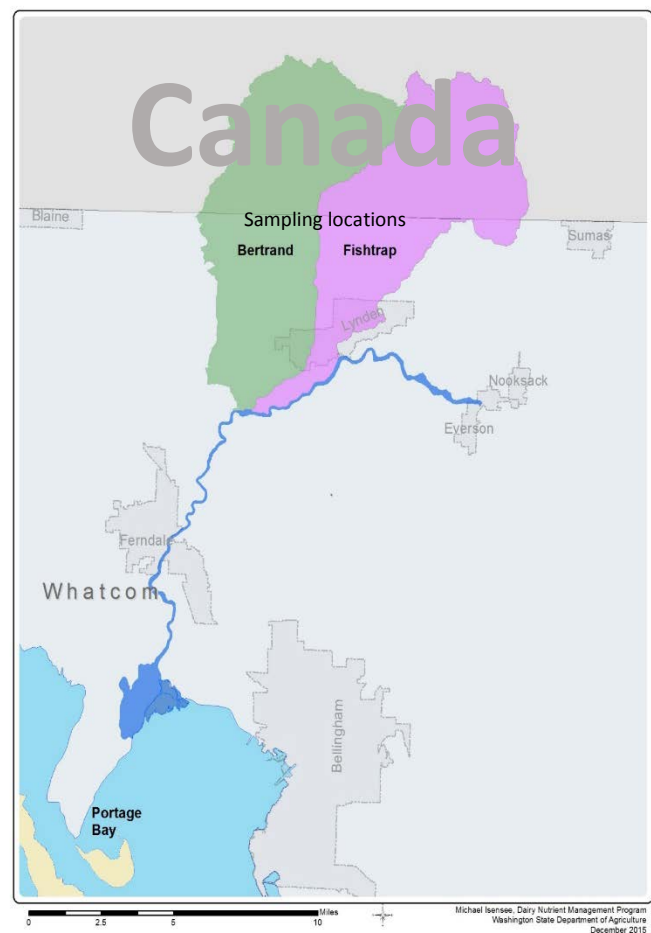


Figure 1: Cross-boundary watersheds relative to Portage Bay.



Figure 2: Bertrand and Cave Creek Border Sampling Stations

in British Columbia north of Zero Avenue (**DD-CA1**) but usually was sampled from the east and west ditches along Double Ditch Road where Pepin Brook exits drains flowing under Zero Avenue and East Boundary Road. Water flow is complex in this location (Figure 4), with stormwater flows entering Pepin Brook from the west along Zero Avenue (green line), from the north along 272nd Street (orange line), flowing along both the north and south sides of Zero Avenue before entering the west or east sides of Double Ditch (yellow line) and with flows along the north side of Zero Avenue east of Pepin Brook (red line). Variation in sample results in the two sides of Double Ditch appears to relate to the complexity of flow immediately upstream.

Sampling Discussion

Over two hundred fecal coliform bacteria samples were collected along the border in 2015; 74 in Bertrand Creek and 139 in Fishtrap Creek. Just under two thirds of samples in Bertrand Creek were collected as part of an ambient sampling event (17 of 27 sample days). Ambient sampling occurs on an ongoing basis on pre-scheduled dates regardless of weather.

The vast majority of samples in Fishtrap Creek were collected as part of ambient sampling programs (87% of the 52 different sample days). However, both watersheds were sampled approximately the same number of times as part of source identification sampling efforts (10 in Bertrand; 11 in Fishtrap). Source identification sampling is set to coincide with wet weather conditions.

Bertrand Creek

Results from sampling Bertrand Creek in 2015 are presented in Table 2. Samples were collected at two or more stations along the border on eight different days with more than a quarter inch (0.64mm) of precipitation. While samples were not necessarily elevated under these conditions, each time a fecal coliform count exceeded 1,000, a minimum of 0.48" (12.2mm) of precipitation was recorded that day (January 5, March 25, June 2, November 13, November 17).



Figure 3: Jackman Ditch and tributary ditches

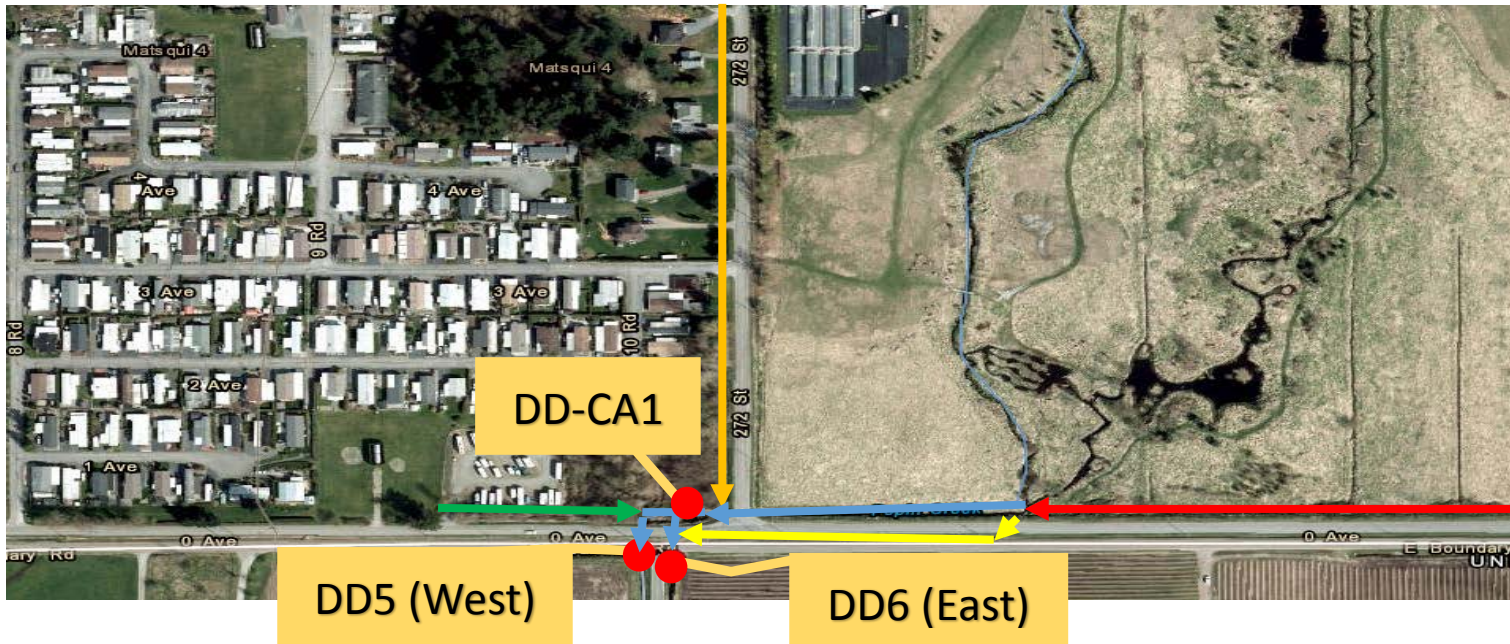


Figure 4: Pepin Brook at border, splitting into Double Ditch

Elevated fecal coliform levels were frequently identified during dry periods including repeatedly through the summer months in Bertrand Creek proper (**BE9.1**), a time when the smaller tributaries were dry or stagnant. Over two thirds of the samples collected in the main channel of Bertrand Creek at the border exceeded 200fc/100mL.

In the three Jackman ditch drainages, elevated counts were frequently identified in all three drainages on the same day, suggesting a weather and time of year relationship. Forty percent of the samples collected in Jackman ditch at the border exceeded 200fc/100mL.

Fishtrap Creek

Results from sampling Fishtrap Creek in 2015 including Pepin Brook are presented in Table 3. Samples were collected at one or more stations along the border on 18 different days with more than a quarter inch (0.64mm) of precipitation; 30 sampling events occurred on days with less than one tenth inch of precipitation. Most of these had no recorded precipitation.

Fishtrap Creek proper has been the only sample location to meet the state's geomean standard for fecal coliform (<100 fecal coliform per 100/mL in a minimum of 10 samples) although even it is failing the second state standard of no more than 10% of all samples exceeding 200fc/100mL. As precipitation has saturated soils and overland runoff has become more frequent, water quality in Fishtrap Creek has generally been poor, with 7 of the 9 samples from November to mid-December exceeding 200fc/100mL. Nearly 25% of all 2015 samples in Fishtrap Creek at the border exceeded 200fc/100mL.

Pepin Brook – Double Ditch

Sampling through much of the year shows low levels of fecal coliform bacteria in the waterway. Very elevated levels during wet conditions in February-March and again in November-December suggests a substantial source exists only under saturated runoff conditions. Sample results exceeded 1,000 fecal coliforms per 100mL six times during these time periods, primarily on wet days. Thirty percent the samples in Double Ditch at the border exceeded 200fc/100mL.

TABLE 2: BERTRAND CREEK FECAL COLIFORM SAMPLING, 2015

Date	BECC0.2	BE9.1	JD-C	JD-B	BEJK2.0	JD-A	JD-F1.1	Clearbrook 24 hour precip (inches, from 6 PM)	Sampling Type
Site	Cave Creek N Side Zero Ave.	Bertrand Creek N Side Zero Ave.	Farm Ditch N Side Zero Ave.	Jackman Ditch N Side Zero Ave.	Jackman Ditch S Side Zero Ave.	Farm Ditch N Side Zero Ave.	Farm Ditch S Side Zero Ave.		
Latitude	49.0024	49.0024	49.0024	49.0024	49.0022	49.0023	49.0022		
Longitude	-122.527	-122.5233	-122.507	-122.5011	-122.5011	-122.49	-122.4901		
1/5/2015	6,800	6,500						1.94	Ambient
1/14/2015	20	72	9	130		15	38	0	Ambient
1/27/2015			20	36				0.03	Source ID
2/2/2015	33	92	11	24			46	0.22	Ambient
2/10/2015			100	130			160	0.47	Source ID
3/9/2015	35	270						0	Ambient
3/12/2015			34	140			180	0.07	Source ID
3/16/2015			800	760			700	0.39	Source ID
3/25/2015			300	737			4,600	1	Source ID
3/30/2015	200	728	120	190			140	0.19	Ambient
4/8/2015	27	78						0	Ambient
4/27/2015			37	350			2	0.06	Source ID
5/11/2015	570	300			530		121	0	Ambient
6/2/2015	1,491	700						0.48	Ambient
6/8/2015	38	800			490			0	Ambient
7/6/2015		782						0	Ambient
8/3/2015		480						0	Ambient
8/24/2015		450						0	Ambient
9/21/2015		450			48			0.01	Ambient
9/25/2015					52			0.25	Source ID
10/15/2015				460		430	846	0	Source ID
10/19/2015	48	64			42			0.28	Ambient
11/2/2015							250	0.12	Ambient
11/13/2015			1,028	837			2,800	1.08	Source ID
11/17/2015	2,200	8,000			480		4,000	1.16	Ambient
11/30/2015	94	28			44		145	0	Ambient
12/8/2015			64	78			90	0.61	Source ID
Boldfaced dates were countywide ambient sampling dates									
WSDA Source ID Sampling					Ecology Ambient Sampling				
N (total 74)	12	16	11	12	7	2	15		
Geomean	159.5	369.5	75.8	190.5	128.4	80.3	223.2		
% exceeding 200	33	69	27	42	43	50	40		

TABLE 3: FISHTRAP CREEK FECAL COLIFORM SAMPLING, 2015

Date	DD-CA1	DD5 (W)	DD6 (E)	FT-8	Clearbrook 24 hour precip (inches, from 6 PM)	Sampling Type
Site	Pepin Brook N Side Zero Ave	Double Ditch West	Double Ditch East	Fishtrap Cr @ Northwood Road		
Latitude	49.0024	49.0021	49.0021	49.0006		
Longitude	-122.4737	-122.474	-122.4738	-122.4007		
2/5/2015		10,600	7,500		1.38	Source ID
2/10/2015	210				0.47	Source ID
3/12/2015	45				0.07	Source ID
3/23/2015		230	240		0.42	Source ID
3/25/2015	3,300				1.00	Source ID
3/30/2015	110	90	84	38	0.19	Ambient
4/6/2015		48	40	20	-	Ambient
4/13/2015		60	80	32	0.42	Ambient
4/20/2015		38	46	25	-	Ambient
4/27/2015	4,500				0.06	Source ID
4/30/2015		86	78	17	-	Ambient
5/4/2015		62	42	20	-	Ambient
5/11/2015		82	64	50	-	Ambient
5/11/2015		52	64		-	Ambient
5/18/2015		50	42	42	-	Ambient
5/27/2015		64	340	64	-	Ambient
6/1/2015		54	72	104	0.01	Ambient
6/8/2015		230	100	50	-	Ambient
6/15/2015		68	42	74	-	Ambient
6/22/2015		96	76	19	-	Ambient
6/29/2015		54	200	84	-	Ambient
7/7/2015		420	250	106	-	Ambient
7/13/2015		360	320	163	0.69	Ambient
7/20/2015		360	270	550	-	Ambient
7/27/2015		133	200	76	-	Ambient
8/4/2015		116	74	200	-	Ambient
8/10/2015				132	0.01	Ambient
8/17/2015		88	76	260	-	Ambient
8/24/2015		54	50		-	Ambient
8/31/2015		682	137	70	0.51	Ambient

TABLE 3 (CONTINUED): FISHTRAP CREEK FECAL COLIFORM SAMPLING, 2015

Date	DD-CA1	DD5 (W)	DD6 (E)	FT-8	Clearbrook 24 hour precip (inches, from 6 PM)	Sampling Type
Site	Pepin Brook N Side Zero Ave	Double Ditch West	Double Ditch East	Fishtrap Cr @ Northwood Road		
9/8/2015		80	64	76	0.17	Ambient
9/14/2015		52	33	78	-	Ambient
9/22/2015		22	27	44	-	Ambient
9/28/2015		10	9	25	-	Ambient
10/5/2015		15	12	52	-	Ambient
10/12/2015		260	137	40	0.42	Ambient
10/19/2015		51	33		0.28	Ambient
10/20/2015		20	10	50	-	Ambient
10/26/2015		96	92	320	0.48	Ambient
10/28/2015		30	200		0.37	Source ID
10/30/2015				370	0.38	Source ID
10/31/2015		250	300		0.89	Source ID
11/2/2015		46	33	210	0.12	Ambient
11/3/2015		25	17	30	-	Ambient
11/9/2015		60	80	64	-	Ambient
11/13/2015		3,000	3,600		1.08	Source ID
11/16/2015		220	64	500	0.18	Ambient
11/23/2015		38	64	1	0.26	Ambient
11/30/2015		90	90		-	Ambient
12/2/2015		3,400	3,800	460	0.29	Ambient
12/7/2015		2,000	370	420	0.34	Ambient
12/8/2015		400	400	2,100	0.61	Source ID
12/14/2015		2,000	928	110	0.07	Ambient
boldfaced dates were countywide ambient sampling dates						
Whatcom County Ambient Sampling		WSDA Source ID Sampling				
N (total = 139)	5	47	47	40		
Geomean All Samples	434.2	119.7	106.0	76.7		
% exceeding 200	60	32	25.5	23		