



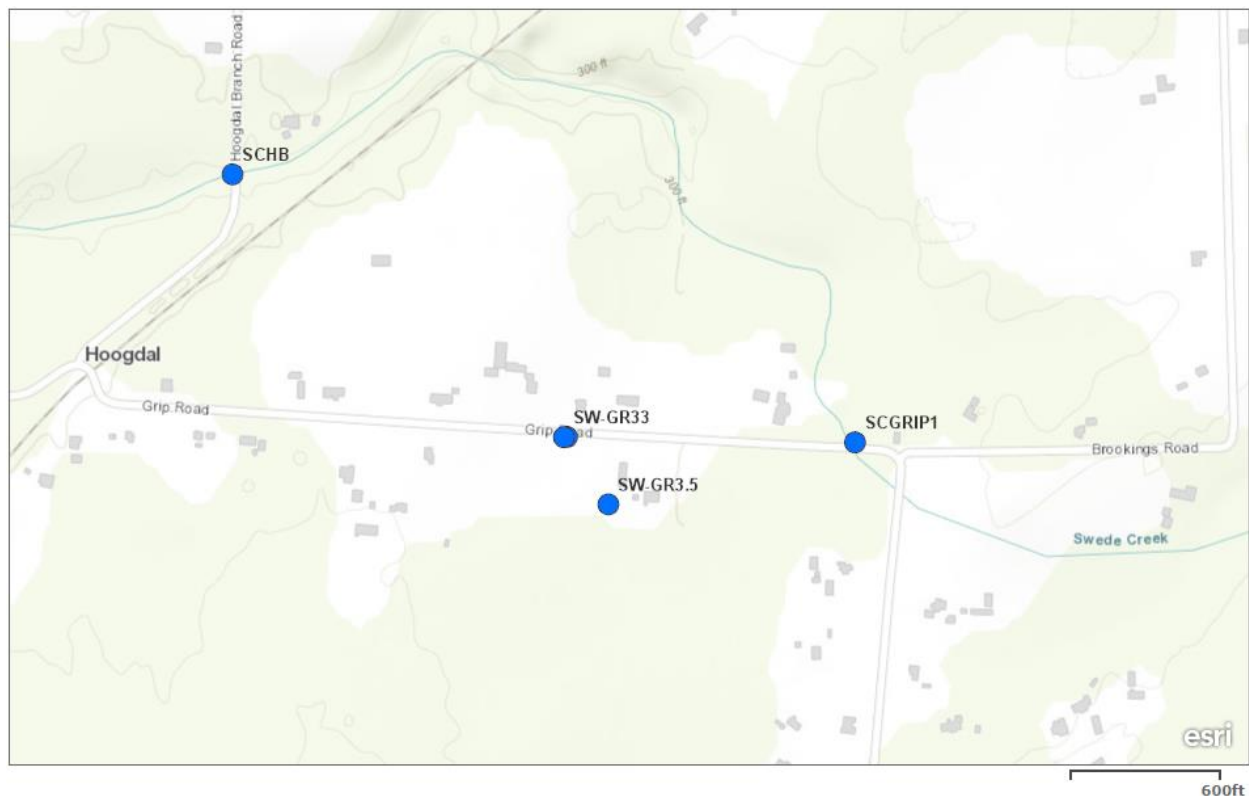
2019-2020 MST RESULTS

In the 2020 water year, 17 sites were sampled for MST (microbial source tracking, often called “DNA analysis) and fecal coliform analysis. Sites were chosen from watersheds with known fecal coliform problems. Several sites represent very small areas with unexplained high fecal coliform counts. In some cases, we know that sources exist upstream but we have been unable to identify the pollution path. Other sites were chosen to bracket sections of tributaries in our focus areas. All sites were sampled during storms. Due to the pandemic, we did not succeed in sampling as many storms as we had hoped. Thomas Creek sites were sampled seven additional times during the dry season because Thomas Creek has high bacteria levels during the summer.

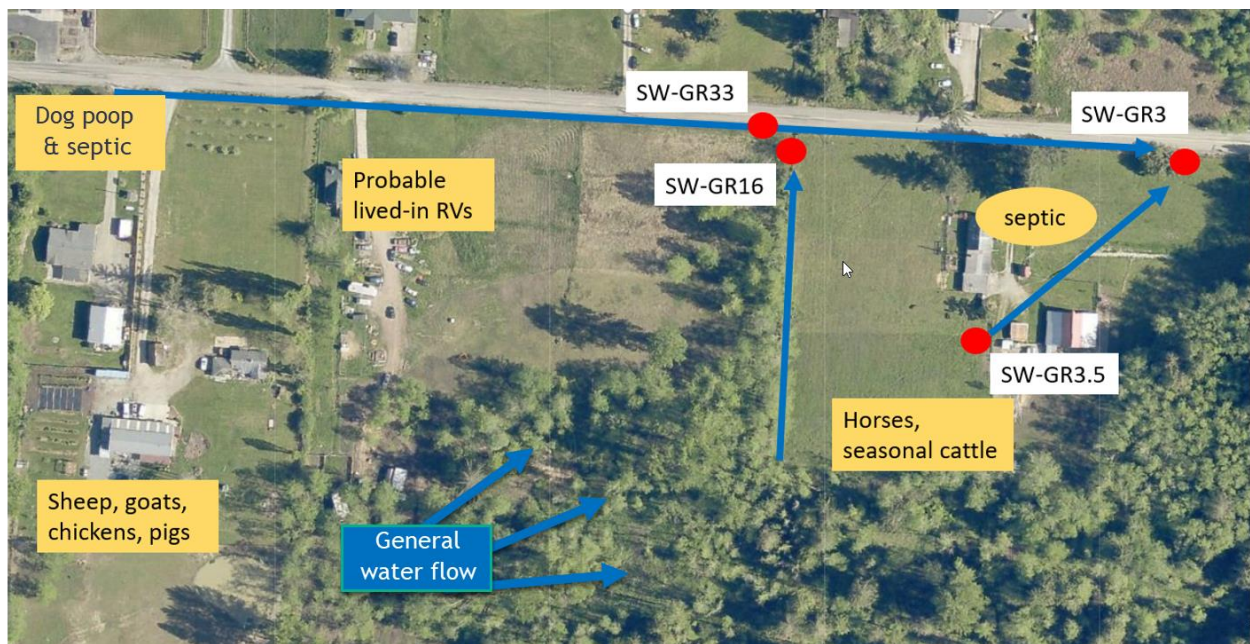
Below is a summary of the results of the study. All results are provided with + or – used to represent whether a DNA marker for that source was present. We have begun sampling additional sites in other watersheds for the 2021 year.

SWEDE CREEK

Swede Creek has always been a challenge because of the lack of places to bracket the creek from the public right of way. The map below shows the locations of the sample sites. SW-GR16 is located just next to SW-GR33, and is not shown on the first map. SCMP8 is about 1.5 miles downstream of SCHB, near the mouth of Swede Creek.



The map below shows sites, flow, and the properties discussed in detail below:



In the mainstem of Swede Creek, the area above SCGrip1 appears to have the greatest evidence for cattle and human markers. Dogs are a consistent source throughout the watershed. In the focused area on Grip Rd, dogs, humans, and ruminants are significant sources.

SCGRIP1 – UPPER MAINSTEM SWEDE CREEK

This site was selected because it is as far upstream as we can safely sample from the public right of way. There is a small herd of beef cattle upstream, along with a variety of residences.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	540	+	BLOQ	+	+	-	+
11/19/19	240	+	-	+	+	BLOQ	+
1/23/20	540	+	+	-	+	-	+
1/23/20 dup	1600	+	+	-	-	BLOQ	+
3/3/20	79	+	BLOQ	-	BLOQ	-	+

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL.

We should continue to work with the beef cattle operation with verified discharges, as it appears that the work we have done is not enough. We should also look for any cattle in the watershed. There appears to be a consistent human contribution as well. We should reinvestigate septic systems in the area, look for potential RV contributions, and set water level & conductivity loggers to look for evidence of illicit discharges of sewage. The area should be included in dog poop outreach.

SCHB – MIDDLE MAINSTEM SWEDE CREEK

This site is located on the mainstem of Swede Creek, about a half mile downstream of SCGrip1. It is the middle of the three sites on the creek itself that we can access from the public right of way.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	350	-	-	-	BLOQ	-	-
11/19/19	1600	-	-	+	-	BLOQ	-
1/23/20	350	+	BLOQ	+	Rejected	Rejected	+
3/3/20	79	BLOQ	BLOQ	-	-	-	+

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL. Rejected = this sample failed the lab's quality control rules.

Cattle markers at this site are likely due to influences from upstream of SCGrip1. It appears that there is no additional human influence in the half-mile stretch between SCGrip1 and SCHB. The area should be included in dog poop outreach.

SCMP8 – MAINSTEM SWEDE CREEK NEAR THE MOUTH

This site is located just before Swede Creek joins the Samish River. It is approximately a mile and a half downstream of SCHB; there are no places to access the creek from the public right of way between the sites. The creek flows through the Skagit Land Trust Tope Ryan restoration site just before reaching this site. Neighborhood dogs are known to frequent the Tope Ryan site, and it is visited occasionally by recreationalists, possibly with dogs.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	920	-	-	-	-	-	-
11/19/19	920	-	-	+	BLOQ	-	+
1/23/20	240	-	-	+	+	-	+
3/3/20	130	-	-	-	-	-	+
3/3/20 dup	70	-	BLOQ	-	-	-	+

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL.

Very little of the upstream cattle markers seem to have made it to the mouth of the creek. Ruminant markers could be remainder from upstream cattle markers. Ruminant markers could also be a sign of deer influence in the natural area next to the sampling site. There appears to be a mild human influence, possibly from sources already noted above SCGrip1. We should consider adding signage about pet waste at the Tope Ryan site, and including the area in dog poop outreach. We should set water level and conductivity loggers at this site to check for potential illicit discharges.

SW-GR3.5 – SMALL FARM DITCH, UPSTREAM OF SW-GR3 AND A SEPTIC SYSTEM

The waterway on this property begins as a ditch on the southeast side of the property, and ends as a swale at the northwest corner of the property. The property hosts 2-3 cows seasonally, a couple of horses, and a dog. The

property owner has worked with the Skagit Conservation District and made improvements to the farm. All PIC partners agree that the farm is very well managed, but faces the challenge of poorly drained soils and a seasonally high water table. This site is upstream of the property's septic system. Deer are reported in the forested area on the southern edges of the property. A neighboring property to the east, separated by the ditch that feeds SW-GR16, may have illegal RV waste disposal.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	920	-	-	-	BLOQ	-	-
11/19/19	170	-	-	-	-	-	-
1/23/20	22	-	-	-	BLOQ	-	-
3/3/20	23	-	-	-	-	-	BLOQ

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL.

Aside from the 10/21 sampling, these fecal coliform results are much lower than we've found during previous sampling. It is possible that the neighboring property's possible (but thus far unproven) human sewage issues may be affecting the bacteria on this property when groundwater levels are high. The small amount of ruminant may be from local deer. All cows were removed from the property in the fall.

SW-GR3 – SWALE RUNNING THROUGH SMALL FARM AND ENTERING GRIP RD DITCH

See property description in SW-GR3.5. An older septic system sits between SW-GR3.5 and this site. The septic system is older, but has been dye tested and cleared. The swale was too shallow to get a clean DNA sample on 3/3/20.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	1600	-	-	-	+	+	-
11/19/19	70	-	-	BLOQ	-	-	+
1/23/20	350	-	-	+	+	-	BLOQ
3/3/20	23	No sample	No sample	No sample	No sample	No sample	No sample

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL.

Results show influence from the nearby drainfield, which ends close to the swale. The dye test was performed in March during a dry spring, when water tables were dropping. Because these samples were taken during storms, it is possible that the drainage swale nearby is too close to the end of the drainfield, and is capturing sewage during high water. The septic program should re-evaluate the system.

SW-GR16 – DITCH RUNNING BETWEEN SMALL FARM AND SUSPECT RV SEWAGE SITE

This site is in a ditch that runs between the small farm noted above and the property next door. The property next door has an open code compliance case. Skagit County's Code Enforcement Officer believes it likely that people are living several broken down RVs on the property, and sewage may not be managed well. The next property in line from the small farm and code compliance property is a small farm with goats, pigs, sheep, and chickens. We have visited that farm and provided recommendations that have were not implemented until fall 2020. That farm also flows to this site.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	920	-	BLOQ	-	BLOQ	-	+
11/19/19	540	-	-	+	-	-	+
1/23/20	920	-	+	+	BLOQ	-	+
3/3/20	920	-	+	+	BLOQ	-	+

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL.

There appears to be evidence for a possible greywater or mild sewage influence at this site. Dogs are a definite possibility as well. The cattle markers are surprising. The cows were removed from the small farm site to the east by August or September 2019, and the manure is well managed. The property to the west may also have cows that are not visible from the road. It is possible that deer or other wildlife are also influencing the site, especially if garbage from RV occupants is not well managed. The property with goats and sheep may be a ruminant source.

SW-GR33 – GRIP RD DITCH UPSTREAM OF CONFLUENCE WITH SW-GR16

The roadside ditch was sampled at SW-GR33, just before the ditch at SW-GR16 joins the roadside ditch. The code compliance site and small farm next door do not contribute a large amount of water to this roadside ditch. The site with the highest likelihood of impacting this ditch is another property near the beginning of the ditch. At that site, the residents had been piling dog poop behind a small berm near the road. We have asked them to cease that practice.

Results:

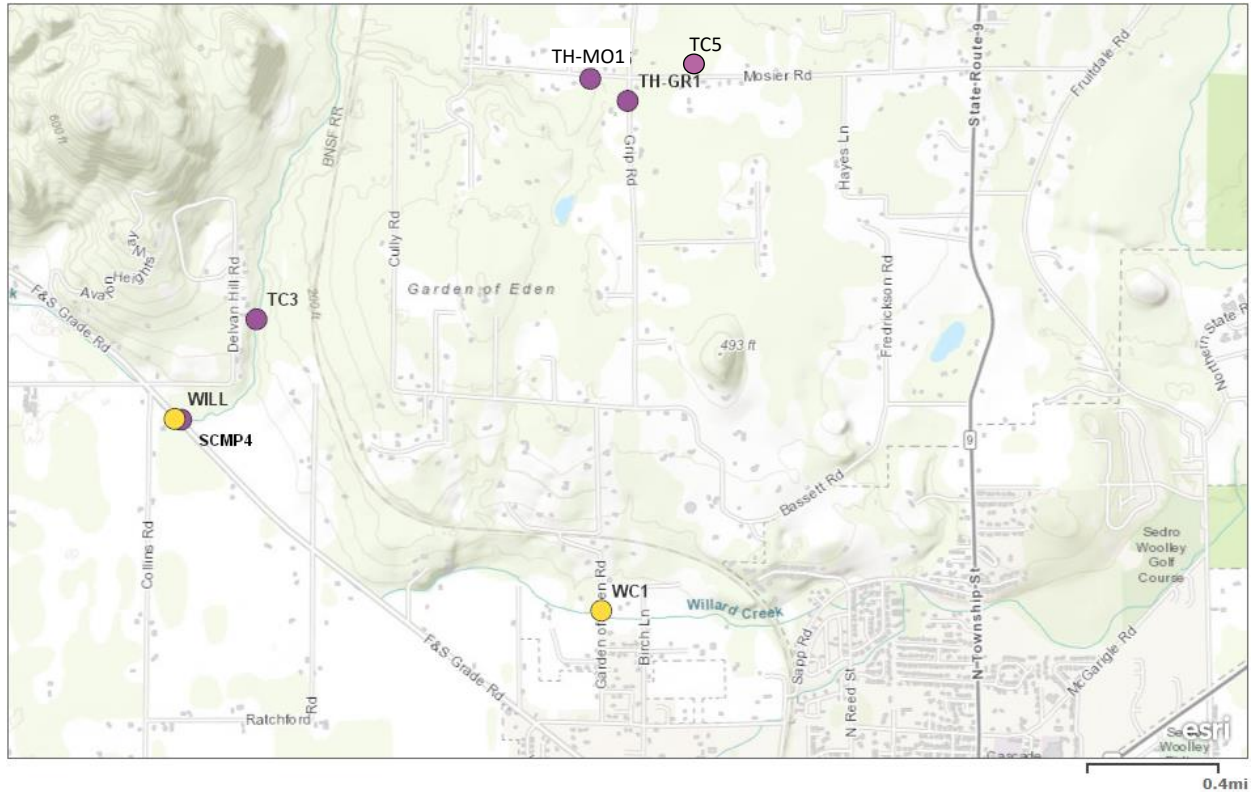
Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	1600	-	-	+	+	+	+
11/19/19	350	-	-	+	+	+	BLOQ
1/23/20	350	-	-	-	-	-	-
3/3/20	17	-	-	+	-	BLOQ	-

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL.

Similar to SW-GR16, this site has dog and human influence. There may be a small influence from the sheep/goat farm or wildlife.

THOMAS CREEK

Upper Thomas Creek, from site SCMP4 and above, has regular high fecal coliform bacteria hits all year long, including the summer. Because of the summer high bacteria, we sampled these sites an additional seven times during the dry season. The Thomas Creek sites sampled during this round are marked in purple below. TC5 and TH-GR1, and TH-MO1 are all tributaries that flow into the mainstem of Thomas Creek at TC3 and SCMP4.



Cattle appear to be a minor influence in one site on Thomas Creek, and only seasonally. Human and dog markers are found consistently throughout the season, suggesting that there are still septic or illicit discharge sources that we have yet to identify. Human markers continue through summer in many areas, but other markers don't appear frequently during the dry season. Ruminants such as goats, sheep, and deer may also be a source.

TC5 - EAST THOMAS CREEK TRIBUTARY

This site has had occasional unexplained high fecal coliform counts. In 2016, we did a site investigation that identified the parcel as a forested wetland with no obvious sources. After a visit with the sewage sniffing dog, a septic system was repaired to the east of this site. Fecal coliform numbers have gone down since then, but not improved completely. There is one neighborhood dog who visits the area. This site can have very high fecal coliform numbers in summer, which is why it was chosen.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	130	-	-	BLOQ	+	-	-
11/19/19	79	-	-	+	BLOQ	-	-
1/23/20	49	-	-	+	-	-	-
3/3/20	14	-	-	BLOQ	+	-	+
6/16/20	230	-	-	+	-	-	-
6/23/20	7000	-	-	-	-	-	-
6/30/20	220	-	-	-	-	-	-
7/14/20	130	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected
7/28/20	18	-	-	-	-	-	-
7/28/20 DUP	18	-	-	-	-	-	-

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL. Rejected = this sample failed the lab's quality control rules.

Dry season fecal coliform at this site appear to be unrelated to human, cattle, or ruminant sources. While dog markers were found, the corresponding fecal coliform results were not very high. It is likely that large sources of fecal coliform here are due to wildlife sources, or degradation of organic matter from the forested wetland, or survival and regrowth of human sources.

TH-GR1 – MIDDLE THOMAS CREEK TRIBUTARY

This tributary runs past several homes and pasture for several horses. There are many advanced septic systems in this area. Several systems in the area are less than 5 years old with recent inspections showing no issues. One gravity septic system just upstream from the site was dye tested in 2015, and was cleared. A failure with surfacing effluent was noted in the records on 6/15/20, and was repaired two days later. The failed septic was about 500 feet from the stream; it is unknown how long it had been failing for and whether surfacing effluent was making it to the creek. All septic system inspections are up to date next to the creek. The site was chosen because it is one of several major tributaries to Thomas Creek.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	920	-	-	+	+	-	-
11/19/19	170	-	-	+	+	BLOQ	-
1/23/20	110	-	-	+	+	-	-
3/3/20	79	-	-	+	+	BLOQ	BLOQ
6/16/20	200	-	-	-	-	-	+
6/23/20	490	-	-	+	-	-	-
6/30/20	490	-	-	-	-	+	-
7/14/20	1300	-	-	-	-	+	-
7/28/20	130	-	-	-	-	-	-
8/11/20	140	-	-	-	-	-	-
9/15/20	170	-	-	-	-	+	-

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL.

Dogs and humans appear to be sources in this branch of the creek, with ruminants as a minor influence. We'll do more research on septic systems in the area, and look for signs of RVs. The area will be included in outreach for dogs.

TH-MO1 – WESTERN THOMAS CREEK TRIBUTARY

This site is downstream of land leased annually for cattle pasture, and several homes. Cattle are always off the property in November. We have requested that the pasture property owner end the lease sooner. Restoration and culvert replacement work was recently completed upstream of this site. This site was chosen because it is one of several tributaries to Thomas Creek.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	240	-	-	-	+	-	+
11/19/19	920	BLOQ	-	-	-	-	+
1/23/20	49	-	BLOQ	+	-	-	+
3/3/20	1600	+	+	+	+	-	+
6/16/20	400	-	-	+	-	-	BLOQ
6/23/20	110	-	-	+	+	-	-
6/23/20 dup	110	-	-	-	-	-	-
6/30/20	240	-	-	+	-	+	-
7/14/20	460	-	-	-	+	-	-
7/28/20	490	-	-	-	-	BLOQ	-
8/11/20	540	-	-	-	-	-	-
9/15/20	540	-	-	+	-	+	-
9/15/20 dup	540	-	-	+	-	+	-

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL.

Cattle appear to be a source during the first few months after cows are removed from the property, and also in March. We should check back with the property owner to alert him to this information, and potentially work towards increased buffers on the stream. Dogs and humans also appear to be a source. We may want to consider trying to dye test all septic systems bordering the creek. This area should be added to any dog outreach.

TC3 – MIDDLE MAINSTEM THOMAS CREEK

This site is accessed with permission from private property, and is located down a steep canyon. It is after the confluence of the three previous sites. It is about ¾ of a mile upstream of our main Thomas Creek site SCMP4. We dye tested several septic systems above this site in 2015 and 2016, with no problems found. This section of Thomas Creek hosts a Coho salmon run.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	920	-	-	+	-	-	-
11/19/19	240	-	-	+	+	-	+
1/23/20	130	-	-	+	+	-	+
3/3/20	540	+	-	+	+	-	+
6/16/20	230	-	-	-	+	-	-
6/16/20 dup	230	-	-	-	+	-	BLOQ
6/23/20	130	-	-	-	+	-	-
6/30/20	260	-	-	-	-	BLOQ	-
6/30/20 dup	260	-	-	-	-	BLOQ	-
7/14/20	490	-	-	-	-	-	-
7/28/20	78	-	-	-	-	-	BLOQ
8/11/20	220	-	-	-	-	-	BLOQ
9/15/20	79	-	-	-	-	-	-

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL.

It appears some of the cattle marker from TH-MO1 may be reaching this site on occasion, based on the results from the March 3 storm. Otherwise, there appears to be little to no cattle influence, but influence from other ruminants such as deer, goats, and sheep. We should revisit the area again looking for ruminant sources. Sewage appears to be a regular source in the area, at least until the dry season arrives. We should review the area again, looking for potential septic issues and lived-in RVs, and set conductivity and water level loggers to look for illicit discharges. The area should be included in dog outreach.

SCMP4 - MAIN UPPER THOMAS CREEK SITE

This site is regularly visited for our ambient monitoring program as well as during storm runs. The majority of the fecal pollution in Thomas Creek appears to come from upstream of this site. The site includes a small amount of commercial agricultural influence, but most of the watershed above it is rural residential.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	350	-	-	+	-	-	-
11/19/19	130	-	-	+	-	BLOQ	+
1/23/20	130	-	-	+	BLOQ	-	+
3/3/20	350	-	-	+	+	-	+
6/16/20	780	-	-	-	+	-	+
6/23/20	460	-	-	-	+	-	-
6/30/20	490	-	-	-	-	-	-
7/14/20	230	-	-	-	-	-	-
7/14/20 dup	230	-	-	-	-	-	-
7/28/20	490	-	-	-	-	-	+
8/11/20	920	-	-	+	-	-	-
8/11/20 dup	920	-	-	-	-	BLOQ	-
9/15/20	350	-	-	-	-	-	+

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL.

All cattle influence has disappeared by the time we reach this site. Dogs, humans, and ruminants appear to be major sources. It is possible that the ruminant hit could be leftover from cattle influence upstream. Human markers appear to decrease a little by the time we reach this site, so it's possible that any human source is located upstream of TC3 rather than below it. The area should be included in dog outreach.

UPPER JOE LEARY SLOUGH

Joe Leary Slough is a major tributary to Padilla Bay. Upper Joe Leary Slough includes several dairies, as well as an industrial area, rural residential homes, and occasional beef cattle. The entire industrial area used to be dairy fields. Drain tiles with unknown origins abound. It is also an area frequented by thousands of winter birds. Three of the sites are shown on the map below. JLR3 is not shown on the map, but is located along Old Highway 99 and the railroad tracks, just north of the map extent. The area has been explored using the UW chemical tracers work. That work identified dairy influence along Gear Rd, downstream of Gear-9.5 and Gear-12, and sewage influence at Tracks-0.



This area was the most surprising of all our sampling. While one dairy is at least partially implicated, the story is more complex than that. Human markers were found at all sites.

JLR3 – JOE LEARY SLOUGH AT OLD HWY 99

This site is downstream from the fields of at least three dairies and their fields. Dairy manure applications have consistently been in compliance with best management practices. The fields in this area are frequented by thousands of winter birds. The site has frequently high fecal coliform levels.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	33	+	+	-	BLOQ	-	-
11/19/19	350	+	+	+	+	-	+
1/23/20	170	Rejected	+	Rejected	Rejected	Rejected	Rejected
3/3/20	350	+	+	-	-	-	+

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL. Rejected = this sample failed the lab's quality control rules.

Cattle appear to be the major source for this area. There is evidence for a human source as well, and we should look closer into the septic systems in the area. Dogs appear to be a minor source, and we may want to include this area in future dog outreach.

GEAR-12 – UPPERMOST GEAR RD SITE

This site is at the far eastern edge of Gear Rd. The sample is taken directly out of a large drain pipe coming from the east. Smoke testing later confirmed that this drainage system extends throughout the dairy and far into the fields to the east. It is unknown whether it goes as far as Gardner Rd. Fecal coliform results at this site are almost always very high.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	9200	-	+	-	BLOQ	-	+
11/19/19	6300	+	+	BLOQ	+	BLOQ	+
1/23/20	5400	+	+	-	+	-	+
3/3/20	920	+	+	-	+	+	+

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL.

The dairy appears to be the major source for this site, which was confirmed by smoke testing this summer. What is surprising is the human contribution here. The dairy does not have any bathrooms in the main buildings that we are aware of, aside from the house along the driveway. The house was dye tested 4-5 years ago and was cleared. The dairy owner reports that the septic system there does not get much use. We will continue to explore the area for human sources, including residences that border the dairy fields to the east.

GEAR-9.5 – DRAIN TILE FROM UNDER INDUSTRIAL AREA

The origin of this drain tile was unknown until we smoke tested this summer. It is an old pipe that extends under the industrial area, back to the dairy. As with Gear-12, it has regular, very high fecal coliform bacteria when water is flowing. Smoke testing did not identify any sources within the industrial area (though large piles of compost and soils could block any smoke from exiting if a drain did exist). The pipe was not accessible for the 1/23/20 sample event.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	17000	+	+	-	BLOQ	-	-
11/19/19	22000	+	-	-	-	-	-
1/23/20	N/A	No sample	No sample	No sample	No sample	No sample	No sample
3/3/20	350	+	+	-	+	-	+

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL.

Again, the dairy appears to be the major source here, with a secondary human source. The November 19 sample is unique in that it was one of the highest fecal coliform numbers we had through the whole project, and cow markers were found with no corresponding ruminant markers. It is possible that cows contributing to these samples were young and did not have fully developed digestive systems yet. We should check with the dairy to see if they had calves at that time.

TRACKS-0 – ROADSIDE DITCH JUST BELOW A PIPE FROM BURLINGTON NPDES AREA

This site is just below a pipe that comes out of the industrial area included at the far northern edge of Burlington’s NPDES area. The source of the drain tile is well mapped. Sampling above and below the pipe point to the pipe as a source. The pipe is sometimes partially submerged, so Tracks-0 is most frequently sampled in the ditch rather than directly from the pipe. During a sampling event in the 2018-2019 chemical tracers season, a strong signature was discovered for human sewage. Individual chemicals from agricultural runoff, road runoff, and industrial runoff were also found.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	54000	BLOQ	BLOQ	+	-	-	+
11/19/19	5400	-	BLOQ	-	-	-	+
1/23/20	1600	BLOQ	+	-	BLOQ	-	+
3/3/20	220	+	+	-	-	-	+

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL.

These results are surprising. We expected a human source, given what we learned from chemical tracers sampling, but we found only minor evidence of a human source during the January sampling event. There are several possibilities. There could, indeed, be a human source that is inconsistent and thus not caught during every sampling event. Human markers were found in low levels during the January event, which could represent the tail end of a flush of sewage, or dilution from stormwater to an extent that the markers were present but not found in high levels. Burlington should continue to investigate potential sources, including greywater sources.

The cattle and ruminant markers are the biggest surprise, given that we know of no pipes from the dairies that join with the industrial drainage system. We wonder if there might be a little bit of backflow from the cattle-confirmed Gear Rd ditch up to this site that might be influencing the sample when we cannot directly sample the pipe. Or perhaps minor track-out from the dairy across the street (though we have never noticed any significant track-out) that makes it to a nearby catch basin. This site may just have a high level of regrowth in the pipe.

This site also appears to have a minor dog poop component.

SAMISH RIVER SITE 32

Site SCMP32 is located on the Samish River, and is the major bellwether site for the entire Samish Basin. It is as low in the watershed as we can get without marine influence. While this site receives water from over 100 square miles, we sampled it to see whether we could identify major influences nearby that we should work on. The lower Samish area is heavily farmed, with dairy fields, crop fields, and rural housing. We know of one significant dog issue about 4 miles upstream. This site will be sampled in the 2021 water year as well.

Results:

Date	Fecal coliform	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	33	-	-	-	-	-	+
10/21/19 dup	70	-	-	+	-	-	-
11/19/19	350	BLOQ	-	BLOQ	-	-	+
11/19/19 dup	920	+	+	+	+	BLOQ	+
1/23/20	130	+	+	+	BLOQ	-	+
3/3/20	79	+	+	+	+	-	+

BLOQ = Present, but below quantifiable limits. Units for fecal coliform are CFU/100mL.

Unsurprisingly, markers were found for all sources at various times during the year. The evidence suggests our plan to look for cattle sources in the lower watershed is a good one. The evidence also shows that dog poop is a significant source. There are also still human sources to be found. Fishers on the Samish during September and October may not be a significant source of human fecal pollution.

QUALITY CONTROL REFERENCE SAMPLE RESULTS – 3/4/20

Reference samples are samples of poop from each type of animal. The samples are analyzed to ensure that the animals in the watershed carry the markers, and that the lab's analysis is working correctly.

Source	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
Beef cattle	+	+	-	-	-	+
Dairy cow	+	+	-	-	-	+
WWTP	-	-	+*	+	+	-
Farm dog	-	-	+	-	-	-
Goat	-	-	-	-	-	+

*Note: it is common for dog markers to show up in a sewage sample. Some people flush dog poop, and dogs and humans who live in close contact frequently carry a small amount of the other's marker.

QUALITY CONTROL BLANKS

Blanks are DNA-free water provided by the lab that is poured into a sample bottle just like a regular sample. They are used to ensure that there is no contamination introduced during sampling and transportation. No markers were found in any of the blanks done as part of this project.

Date	Cattle CowM2	Cattle CowM3	Dog DG3	Human HF183	Human HumM2	Ruminant Rum2Bac
10/21/19	-	-	-	-	-	-
11/19/19	-	-	-	-	-	-
1/23/20	-	-	-	-	-	-
3/3/20	-	-	-	-	-	-
6/16/20	-	-	-	-	-	-
6/23/20	-	-	-	-	-	-
6/30/20	-	-	-	-	-	-
7/14/20	-	-	-	-	-	-
7/28/20	-	-	-	-	-	-
8/11/20	-	-	-	-	-	-
9/15/20	-	-	-	-	-	-