

Summary of EOS Eco-Energy and Campbell Lab Water Sampling Blitz of August 18th, 2018

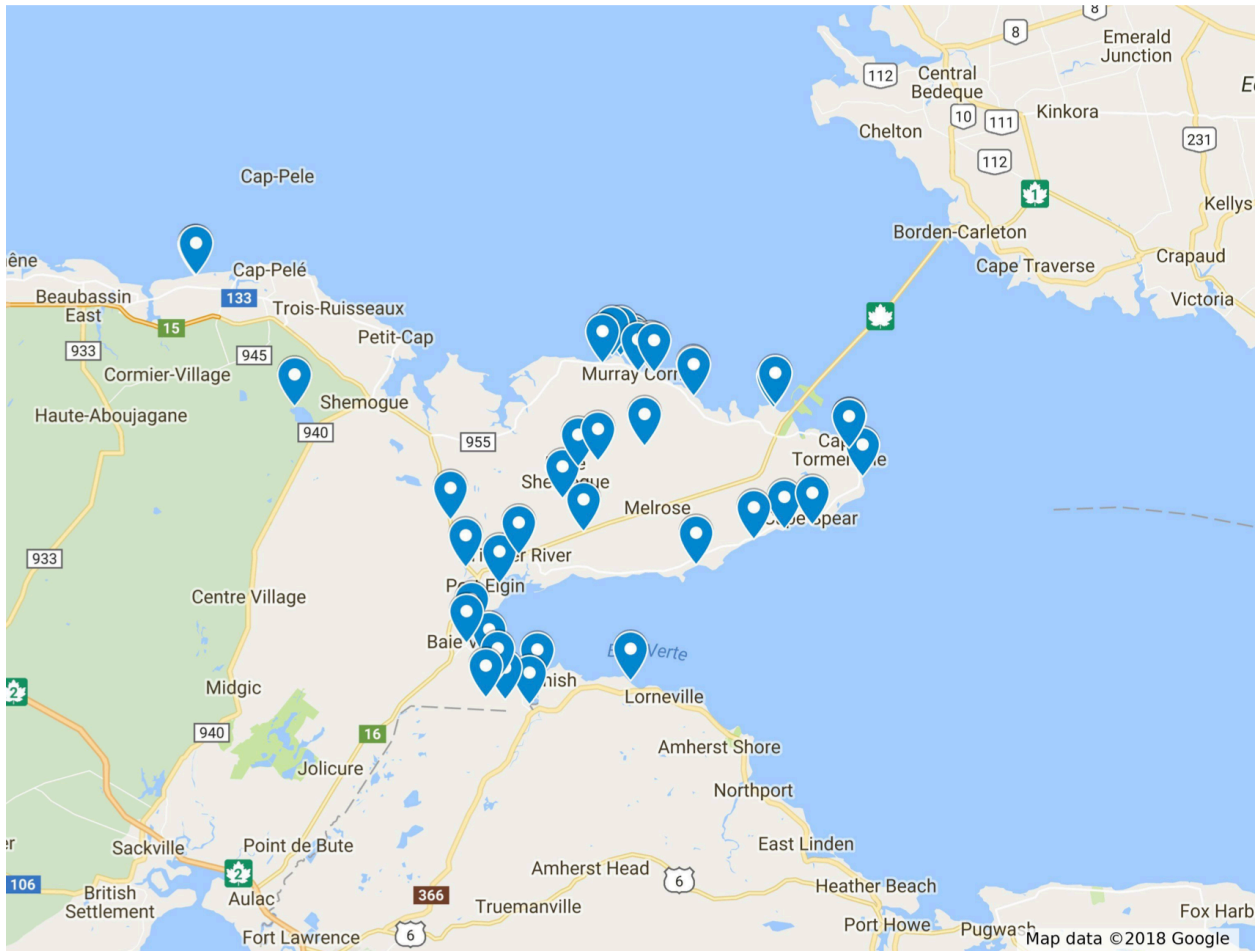


Figure 1: Map of samples collected during August 18th Blitz

EOS Eco-Energy's first water sampling blitz had a great turnout. It took place from Baie Verte to Murray Corner, New Brunswick. Sample locations are shown in Figure 1 on the map above. Thank you so much to all of the amazing citizen scientists who came out to grab samples for EOS. We had a great community turnout despite the weather conditions, and received a lot of positive feedback from community members who are very interested in their local water quality. They were excited to learn more and have a chance to physically participate in water sampling.

Following the sampling blitz, samples were taken back to the Campbell Lab at Mount Allison University to be analyzed for microbial water quality indicators (*E. coli* and *Enterococci*). The freshwater samples e.g. rivers, streams, brooks, ponds, lakes, wetlands) were analyzed for *Escherichia coli* (*E. coli*), the most appropriate indicator of fecal contamination in fresh recreational waters, while the marine (or tidally influenced) samples were analyzed for *Enterococci*, the most appropriate indicator of fecal contamination in marine (or tidally influenced) recreational waters. Analyses were done using IDEXX colilert and enterolert tests. Results give Most Probable Number (MPN) of the microbial indicator/100mL.

The presence of these fecal indicators could mean there are other disease-causing pathogens present, such as bacteria, viruses, and parasites. Although many strains of coliform bacteria are harmless, certain strains (e.g. *E. coli* 0157:H7) may themselves cause illness. The results were then compared to the Guidelines for Canadian Recreational Water Quality. Water is safe for swimming when bacteria levels are below the guidelines, which Health Canada based off risk management decisions which evaluated the potential health risks and the benefits of recreational water use for

physical activity and enjoyment. For the case of our sampling, a single-sample was taken at each location, so we compared samples to the single-sample maximum guidelines (see table 1 below). Every time you take a water sample it is just a snapshot of the water quality at that location at that point in time. This is why an average of multiple samples taken from different locations along a beach is typically used for evaluating water quality. This is also why long-term monitoring is valuable as you can look at the natural variations in water quality and see the trends over time to get an idea of what is expected.

Table 1: Canadian Recreational Water Quality Guidelines

<u><i>Enterococci</i></u>	<u><i>E. coli</i></u>
A geometric mean of most recent five samples equal to or less than 35 enterococci/100 ml	A geometric mean of most recent five samples equal to or less than 200 E. coli/100 ml
A single-sample maximum equal to or less than 70 enterococci/100 ml	A single-sample maximum equal to or less than 400 E. coli/100 ml

Results

We received a total of 41 samples. Out of the 41 samples, 17 samples were from freshwater sources (e.g. rivers, streams brooks, ponds, lakes, wetlands), with 15 samples being over the Canadian Recreational Water Quality Guideline for freshwater and 2 samples being under the Canadian Recreational Water Quality Guideline of 400 E. coli/100ml in a single sample. These results can be seen below in Table 2, where the numbers in red indicate that the sample is over the Canadian Recreational Water Quality Guideline, and Figure 2, where the red line represents the Canadian Recreational Water Quality Guideline. The remaining 24 samples were taken from salt water (e.g. beaches, tidally influenced rivers and brooks). These results can be seen below in Table 3 where the numbers in red indicate that the sample is over the Canadian Recreational Water Quality Guideline for marine water, Figure 3 where the graph is zoomed in to better see the samples that fall under the red line representing the Canadian Recreational Water Quality Guideline for marine water, and Figure 4 showing the results to scale. Three of the salt water samples were below the Canadian Recreational Water Quality Guideline of 30 Enterococci/100ml in a single sample.

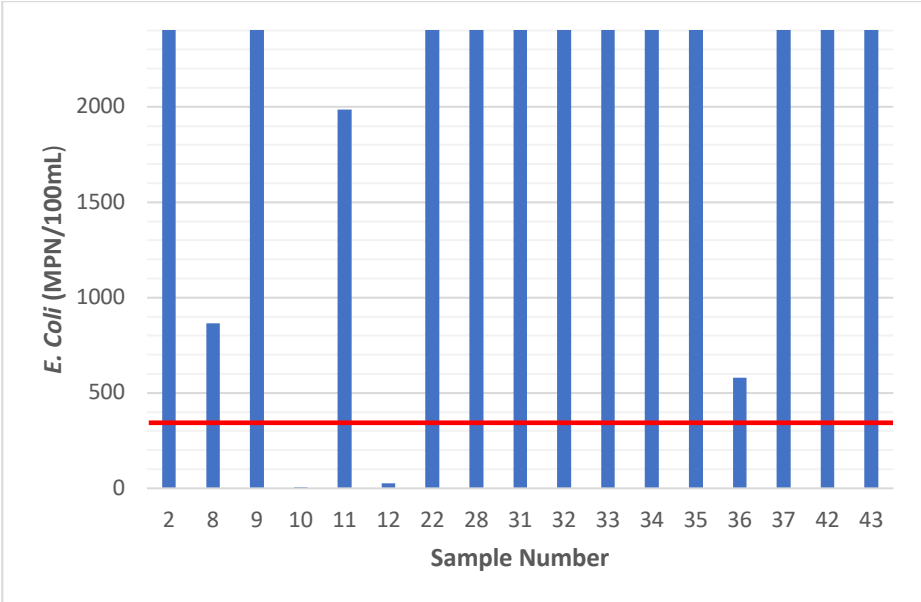


Figure 2: Freshwater E. coli results (red line represents Canadian Recreational Water Quality Guideline)

Table 2: E. coli results for freshwater samples (red indicates sample is over the Canadian Recreational Water Quality Guideline of 400 E. coli/100mL)

Analyte:					E. Coli
Units:					MPN/100mL
Date Analyzed:					19-Aug-18
Sample Number	Location	GPS Coordinates	Date Sampled	Time Sampled	
2	Rte 970 culvert downstream	46.0050, -64.0843	18-Aug-18	10:00:00 AM	>2419.6*
8	Beaver Pond	45.983, -64.071	19-Aug-18	2:45:00 PM	866.4
9	Brook on Cottage Lane Rd.	45.994, -64.077	20-Aug-18	2:00:00 PM	>2419.6*
10	Spring on Uniacke Rd.	45.984, -64.087	21-Aug-18	3:20:00 PM	6.3
11	Pond behind Baie Verte Community Hall	46.0154, -64.1031	22-Aug-18	10:40:00 AM	1986.3
12	Square Lake	46.1523, -64.2465	23-Aug-18	11:23:00 AM	25.6
22	Downstream of culvert on Cape Tormentine Beach Campground	46.1281, -63.7845	24-Aug-18	2:48:00 PM	>2419.6*
28	Stream to east of Bridgeview Lane	46.158, -63.913	25-Aug-18	3:50:00 PM	>2419.6*
31	Stream off Highway 15 (feeds into Gaspereau)	46.0868, -64.1167	26-Aug-18	1:41:00 PM	>2419.6*
32	Timber River off TCH	46.0668, -64.0597	27-Aug-18	2:02:00 PM	>2419.6*
33	Matt Brook off TCH	46.0802, -64.0055	28-Aug-18	2:12:00 PM	>2419.6*
34	Chapman Brook off Hardy Rd.	46.0993, -64.0232	29-Aug-18	2:26:00 PM	2419.6
35	Blacklock Brook off of Murray Rd.	46.1176, -64.0102	30-Aug-18	2:33:00 PM	>2419.6*
36	Trout Brook off of Murray Rd.	46.1209, -63.9935	31-Aug-18	2:40:00 PM	579.4
37	Scott Brook off Noonan Dr.	46.1294, -63.9550	01-Sep-18	2:48:00 PM	>2419.6*
42	Gagnon Beach site C Marsh Pond	46.227, -64.329	02-Sep-18	3:15:00 PM	>2419.6*
43	Beau Rivage Site A (marsh outlet)	46.228, -64.328	03-Sep-18	3:15:00 PM	>2419.6*

*Note: The IDEXX Colilert test provides E. coli counts to 2419.6 MPN/100mL. The samples that are >2419.6 MPN/100mL exceeded the limit of detection.

Table 3: Enterococci results for marine & tidally influenced water samples (red indicates sample is over the Canadian Recreational Water Quality Guideline of 70 Enterococci/100mL)

Analyte:					Enterococci
Units:					MPN/100mL
Date Analyzed:					19-Aug-18
Sample Number	Location	GPS Coordinates	Date Sampled	Time Sampled	
1	Baie Verte Park (foot of stairs)	46.0225, -64.0987	18-Aug-18	9:45:00 AM	145
5	Rotary Beach Baie Verte	45.9933, -64.0442	18-Aug-18	10:22:00 AM	10
6	Browns Cove (West Side), Lorneville	45.9937, 63.9965	18-Aug-18	9:00:00 AM	110
7	Near 27 Cape de Upper Cape	46.0608, -63.9120	18-Aug-18	10:34:00 AM	30
13	Below Port Elgin Sewage Lagoon	46.0500, -64.0756	18-Aug-18	12:00:00 PM	5794
14	Gaspereau River	46.0598, -64.1028	18-Aug-18	1:00:00 PM	8664
16	Near 798 Rt 960, Cape Spear	46.0816, -63.8386	18-Aug-18	1:50:00 PM	830
17	Ann's Acres	46.1516, -63.8474	18-Aug-18	1:40:00 PM	369
18	Near 158 Rt 960, Cape Tormentine	46.1119, -63.7718	18-Aug-18	2:05:00 PM	259
19	Near 342 Rt 960, Cape Spear	46.0835, -63.8150	18-Aug-18	2:00:00 PM	5172
20	Off of Rt 960 near Oulton Rd.	46.0757, -63.8640	18-Aug-18	2:30:00 PM	432
21	Cape Tormentine Beach Campground	46.1285, -63.7843	18-Aug-18	2:45:00 PM	>24196*
23	Near 41 Lawrence Court, Little Shemogue	46.1771, -63.9664	18-Aug-18	3:30:00 PM	14136
24	Neighbour of Lawrence Court, Little Shemogue	46.1764, -63.9648	18-Aug-18	3:30:00 PM	15531
25	Near 1551 Rt955	46.1740, -63.9626	18-Aug-18	3:30:00 PM	>24196*
26	Stright Beach Road	46.18144, -63.9746	18-Aug-18	3:45:00 PM	12033
29	Down the beach from Stright Beach Rd.	46.1815, -63.9818	18-Aug-18	3:50:00 PM	3784
27	Bridgeview Lane	46.15893, -63.9143	18-Aug-18	3:40:00 PM	4886
30	Down from 28 Murray Rd.	46.1726, -63.9498	18-Aug-18	4:00:00 PM	408
41	Down the beach from Sample Number 30	46.1718, -63.9469	18-Aug-18	4:05:00 PM	52
40	Ann's Acres (near marshland & bridge)	46.1533, -63.8461	18-Aug-18	4:02:00 PM	708
4	Tidnish River	45.9800, -64.0508	18-Aug-18	9:57:00 AM	158
38	Trout Brook outflow off Rt 955	46.1725, -63.9605	18-Aug-18	3:08:00 PM	14136
39	Scott Brook outflow off Rt 955	46.1772, -63.9898	18-Aug-18	3:16:00 PM	12997

*Note: The IDEXX Enterolert test provides Enterococcus counts to 24196 MPN/100mL. The samples that are >24196 MPN/100mL exceeded the limit of detection.

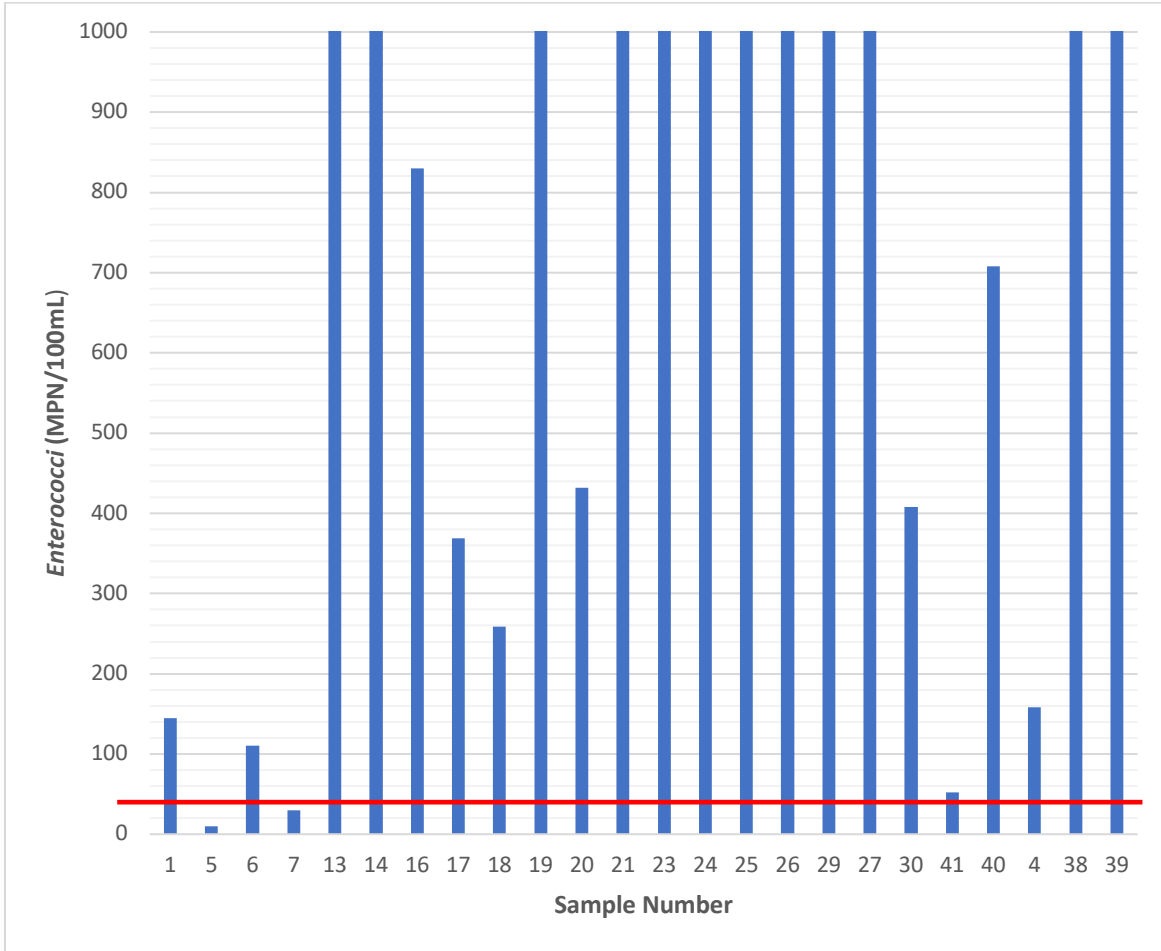


Figure 3: Marine & tidally influenced Enterococci results (zoomed in to show values under red line representing Canadian Recreational Water Quality Guideline)

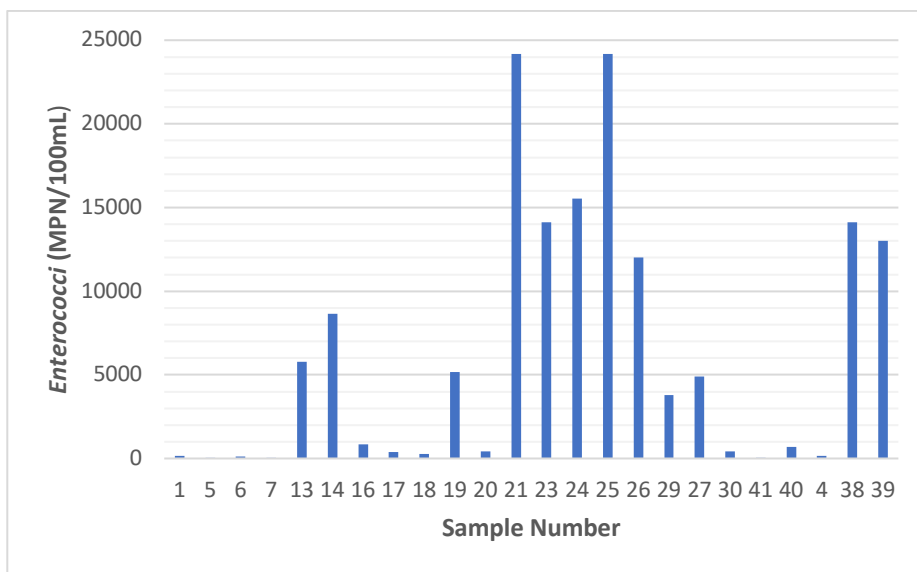


Figure 4: Marine & tidally influenced Enterococci results

Our results show very high counts for fecal indicators with only 5 samples being under the Guidelines for Canadian Recreational Water Quality. However, this may not be the case under drier weather conditions. A Community Collaborative Rain, Hail & Snow network (CoCoRaHS) rain gauge in Jolicure, NB recorded 64.5 mm of rainfall for our sampling blitz day. Heavy rainfall events, such as this one, create surface runoff that can lead to high levels of bacteria entering surface water (such as streams, river, lakes, and beaches). Fecal contamination washes off the landscape in the entire watershed and drains toward the lowest point. This is why closing beaches immediately after heavy rain is a good precautionary principle. EOS is planning a 2nd sampling blitz to revisit these locations under drier conditions to compare results. Regardless, these results highlight the importance and need for long-term water quality monitoring within our watersheds to ensure clean and healthy inland and coastal water, especially as we are seeing more intense rain events with the changing climate. The water sampling blitz also highlights the amount of community interest in water quality, and the power of community-based monitoring to sample a large geographic area.