

Mats Mats Bay Water Quality Report

Water Year 2010-11

ECOLOGY GRANT G0900067

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Project Background

The Mats Mats Bay Water Quality Improvement Project is a program of the Jefferson County Water Quality Department intended to improve surface water quality in the Mats Mats Bay area. Commercial shellfish operations are threatened with a possible downgrade due to increasing levels of fecal coliform bacteria as measured by the Washington State Department of Health (DOH). Fecal coliform bacteria are from feces and indicate potential risk to human health from exposure to pathogens. Sources of fecal coliform typically include livestock and poultry manure, inadequately-treated human sewage, pet waste and wildlife. Health risks include exposure to pathogens from recreational activities such as swimming and from consumption of shellfish.

This report covers the water year (WY) 2010-11 or October 1, 2010 through September 30, 2011. This time period is further broken down into a wet season and dry season, here defined as wet: October 1 through March 31 and dry: April 1 through September 30.

Project Area

The project area is the 1,500-acre watershed of Mats Mats Bay. Contained in the basin are the marine waters of the bay, freshwater streams including Piddling Creek that drain into the bay and upland slopes that would drain surface runoff to the bay (Figure 1, Sampling Stations Map). Approximately 164 residences are located in the project area, primarily single-family homes, all on septic systems. One commercial shellfish growing operation is located in the bay. 17 to 25 moored boats are typically present on private buoys. Average annual precipitation is approximately 19 inches. Precipitation records are available nearby in Port Ludlow at the Community Collaborative Rain Hail and Snow (CoCoRaHS) network station WA-JF-2.

Water Quality Standards

Washington State sets standards for surface water for different parameters per Washington Administrative Code (WAC). For fecal coliform, there are separate standards for freshwater and marine water. Different levels of protection are granted to water bodies based on their designated uses and value as habitat. Mats Mats Bay receives a high level of protection as an Extraordinary Quality Marine Area. Streams flowing into the bay are designated for use as extraordinary primary contact recreation, and also receive the highest level of protection. Therefore for fecal coliform standards the following levels must be met:

Table 1, Washington State Water Quality Standards

Waterbody	Geometric mean	90 th Percentile
Freshwater	< 50 FC/100mL	< 100 FC/100mL
Marine water	< 14 FC/100mL	< 43 FC/100mL

Fecal coliform standards have two parts: a geometric mean threshold and a 90th percentile threshold. Geometric means (geomeans) are calculated on three or more samples and must be no greater than 50 fecal coliforms per 100 milliliters in freshwater or 14 FC/100mL in marine water. No more than ten percent of samples (or any sample when less than ten samples have been taken) can be greater than the 90th percentile threshold.

Shoreline Sampling

Jefferson County staff samples streams, seeps and outfalls flowing into the Mats Mats shoreline. The samples are taken twice per year, once in wet season and once in dry season, and analyzed for the fecal coliform by membrane filtration. Locations that have been sampled to date are identified by a number and have been mapped (Figure 1). Shoreline sampling provides screening to evaluate potential inputs of pollution to the bay. Any locations that exceed 100 fc/100mL are resampled. If three or more samples exceed the water quality standards investigation into possible sources begins. This can involve further sampling upstream, investigation of potential animal sources and inspection of septic systems in the form of "sanitary surveys". Investigations are prioritized as High, Medium or Low based on geomeans of greater than 500 (High) and between 200 and 499 (Medium) fc/100mL. Sites have also been given higher priority when any individual sample was greater than 1,000 fc/100mL. Precipitation records are consulted to identify significant rain events previous to sampling. Repeat sampling is performed during the same wet season or dry season, unless flow ceases on small seeps and streams and there is nothing to resample. Results are analyzed by season and provided in Table 2, Shoreline Freshwater Fecal Coliform.

Sampling in wet season 2011 confirmed that station 116 failed to meet state water quality standards with a geomean of 115.5. Continued monitoring of this station was planned, with a plan for keeping a lookout for potential sources. At this time, pet waste and wildlife are suspected contributors. Additional sampling during dry season showed a generally improving trend.

Many stations throughout the shoreline had elevated fecal coliform counts in July of WY 2010-11 and this triggered more rounds of sampling and investigation. After much resampling and taking additional samples from upstream areas to try to bracket areas of concern we were able to narrow the field of sites. Three sites were ranked High Priority for PIC investigations: 112, 127 and 130. One station was located at the south end of the bay and two at the north end. Station 112 was investigated by further sampling, sanitary surveys and a dye test at the closest septic system to the high hits. The dye test results were negative. A sanitary survey was performed of the septic system upslope of station 130 at the end of Prospect Street and additional samples were taken on the property with landowner permission. The septic system appeared to be functioning well but a chicken coop was found to be located near a flowing ditch. It was recommended that the landowner relocate either the coop or the ditch. Additional sampling upstream of station 127 uncovered additional possible septic system sources and sanitary surveys were completed on four parcels in this drainage. At least two remaining sanitary surveys in this area will be done in WY 2011-2012.

A cluster of sites (105, 106 and 108) at the south end of the bay near a stream drainage was investigated by further sampling upstream. Fecal coliform results have not been consistently high in this area but the priority will be kept as Medium to allow further investigation as time allows. Two samples above 500 fc/100ml at station 121 led to further investigations there. Sanitary surveys were denied by the two residences upstream of that location. Resampling will occur when possible (due to intermittent flows) at 121 and if geomeans reach high priority criteria (> 500 mL) additional outreach will be pursued with the landowners, with the possibility of enforcement activities. Six sites in the project area with at least one sample above 100 fc/100mL have been flagged for resampling in Table 2.

Marine Sampling

Marine sampling is done every other month by Jefferson County staff to augment DOH data collected in the alternating months. Nine established DOH sampling stations are distributed throughout the bay

(Figure 1) and are used by DOH and County staff. These sites are accessed by boat and located by gps receiver and landmarks. They have been sampled by DOH for many years. County sampling began in October 2009. Increased levels of fecal coliform previous to 2009 at Station #10 led to the initial concerns by DOH. Current results are analyzed by water year and provided in Table 3, Marine Fecal Coliform WY 2010-11.

Marine sampling by JCCD resulted in one sample with greater than 43 FC/100mL: Station 9 in wet season. All dry season results were low. Geomeans all remained below 14 FC/100mL. DOH sampling during wet season included two samples above 43 FC/100mL: Stations 2 and 8. Including DOH data in the calculation of geomeans still resulted in every station meeting part 1 of the fecal coliform standards. A running count of all samples (JCCD and DOH) throughout the project period (WY 2009 to present) was also analyzed. In this analysis, the highest fecal coliform results were found at station 8, but were still within standards for extraordinary primary contact recreation. The running geomean at station 8 is 3.6 and the 90th percentile is 36.2.

Assessment

Water year 2010-11 showed declining water quality in shoreline freshwater discharges and essentially stable marine water quality in terms of fecal coliform levels. Freshwater monitoring was increased to try to identify pollution sources. Sampling areas were expanded to upstream locations to try to bracket potential sources. Staff field time was increased to conduct additional sanitary surveys of onsite septic systems and perform inspections and dye testing as appropriate. Outreach is planned in the form of public meetings to disseminate these findings and make the public aware of how they can help by participating in our sanitary surveys and getting regular Operations and Monitoring inspections of their OSS.

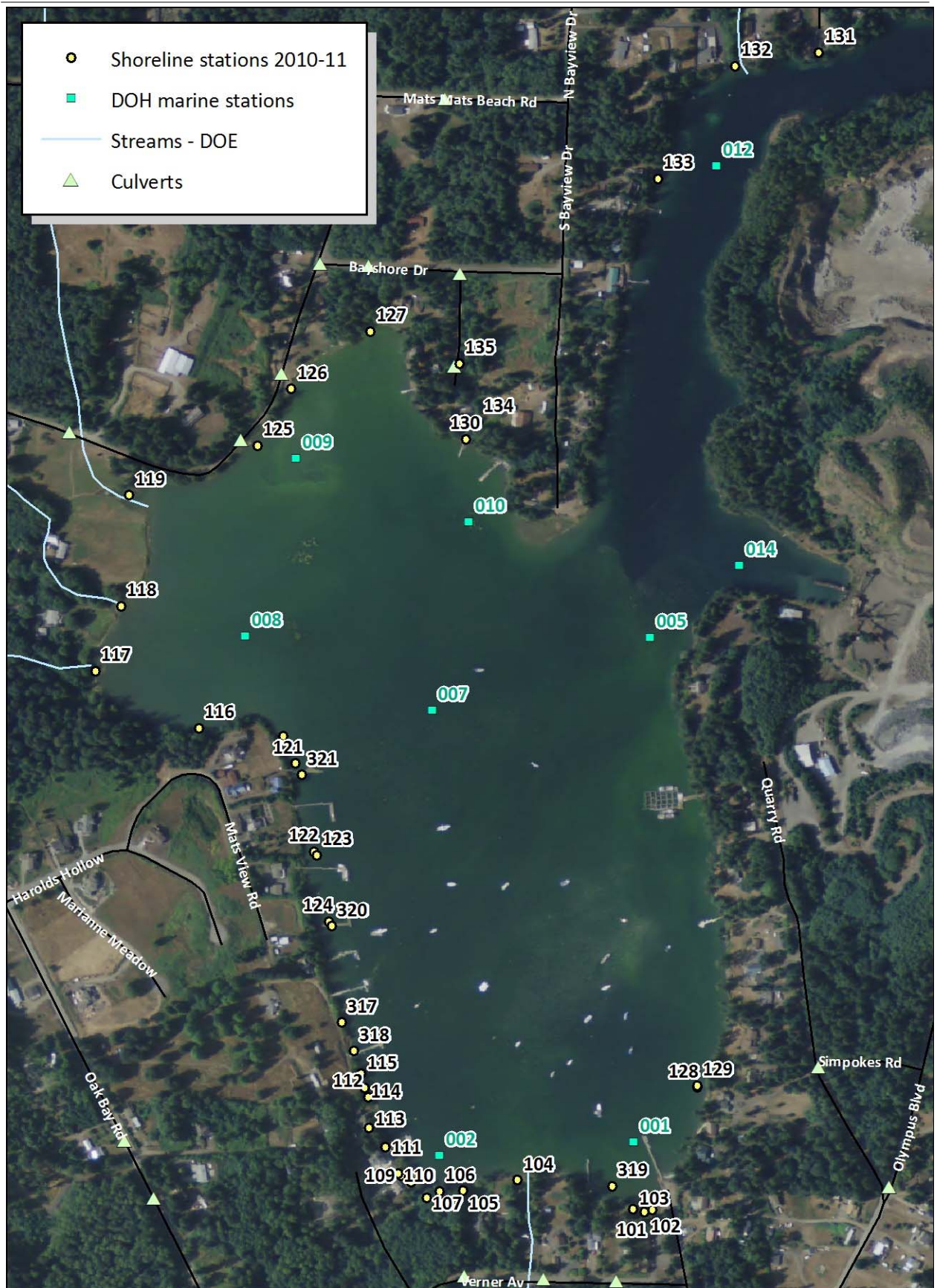


Figure 1, Sampling Stations Map

Table 2, Shoreline Freshwater Fecal Coliform

WY 2010-11					Project Total 2009-11			
Station	n	Range	GMV ¹	n samples >100	GMV ¹	n samples >100	Meets WQ Standard?	PIC Priority
101	3	0.5-50	10.0	0	6.3	0	YES	
102	0	0	N/A	0	N/A	0		
103	1	15	N/A	0	N/A	0		
104	1	92	N/A	0	N/A	0		
105	7	2-260	92.8	6	43.8	6	NO	MEDIUM
106	8	9-330	60.3	3	44.6	3	NO	LOW
107	0	0	N/A	0	N/A	0		
108	3	1-950	16.8	1	14.8	1	NO	LOW
109	2	33-64	N/A	0	N/A	0		
110	1	1	N/A	0	N/A	0		
111	4	2-490	29.8	1	18.8	1	NO	LOW
112	6	2-2000	169.7	3	90.0	3	NO	HIGH
113	0	0	N/A	0	N/A	0		
114	0	0	N/A	0	N/A	0		
115	0	0	N/A	0	N/A	0		
116	8	20-480	84.7	4	104.3	5	NO	MEDIUM
117	5	0.5-120	20.5	2	20.4	2	NO	LOW
118	5	0.5-110	17.6	1	16.0	1	NO	LOW
119	5	0.5-410	13.8	2	17.1	2	NO	LOW
120	1	76	N/A	0	N/A	0		
121	3	12-860	183.6	2	183.6	2	NO	MEDIUM
122	1	2	N/A	0	N/A	0		
123	1	210	N/A	1	N/A	1		
124	2	9-10	N/A	0	N/A	0		
125	1	0.5	N/A	0	N/A	0		
126	1	0.5	N/A	0	N/A	0		
127	5	17-1450	207.8	3	207.8	3	NO	HIGH
128	1	5	N/A	0	N/A	0		
129	1	10	N/A	0	N/A	0		
130	3	120-1980	343.1	3	343.1	3	NO	HIGH
131	1	80	N/A	0	N/A	0		
132	1	20	N/A	0	N/A	0		
133	1	60	N/A	0	N/A	0		
134	1	5	N/A	0	N/A	0		
135	3	20-40	31.7	0	31.7	0	YES	

¹ Geometric mean value calculated including substitutions of ½ of detection limit for non-detects: "0.5" for non-diluted and "5" for 10:1 dilutions.

Station	n	Range	GMV ¹	n samples >100	GMV ¹	n samples >100	Meets WQ Standard?	PIC Priority
136	2	5-710	N/A	1	N/A	1		RESAMPLE
137	1	60	N/A	0	N/A	0		
138	1	680	N/A	1	N/A	1		RESAMPLE
139	2	20-50	N/A	0	N/A	0		
319	1	60	N/A	0	N/A	0		
320	1	80	N/A	0	N/A	0		
321	1	180	N/A	1	N/A	1		RESAMPLE
500	2	400-490	N/A	2	N/A	2		RESAMPLE
501	1	80	N/A	0	N/A	0		
502	3	30-350	113.7	2	113.7	2	NO	LOW
503	1	20	N/A	0	N/A	0		
504	1	60	N/A	0	N/A	0		
505	1	30	N/A	0	N/A	0		
506	1	30	N/A	0	N/A	0		
507	3	50-250	100.0	1	100.0	1	NO	LOW
508	2	20-100	N/A	0	N/A	0		RESAMPLE
509	1	10	N/A	0	N/A	0		
510	1	90	N/A	0	N/A	0		
511	3	10-20	12.6	0	12.6	0	YES	
512	2	180-210	N/A	2	N/A	2		RESAMPLE
513	1	40	N/A	0	N/A	0		
514	1	10	N/A	0	N/A	0		

Table 3, Marine Fecal Coliform WY 2010-11

Season	Station	n	Range (MPN/100mL)	Geomean ² (MPN/100mL)	n samples > 43	Meets WQ Standard?
Wet	1	2	1-1	1.0	0	YES
Wet	2	3	1-4	2.0	0	YES
Wet	5	3	1-7	2.4	0	YES
Wet	7	2	1-2	1.4	0	YES
Wet	8	2	8-8	8.0	0	YES
Wet	9	2	2-80	12.6	1	NO
Wet	10	2	1-2	1.4	0	YES
Wet	12	2	2-4	2.8	0	YES
Wet	14	2	1-2	1.4	0	YES

² Geometric mean calculated including substitutions of ½ of detection limit for non-detects: "1"

Season	Station	n	Range (MPN/100mL)	Geomean ² (MPN/100mL)	n samples > 43	Meets WQ Standard?
Dry	1	1	1-13	2.3	0	YES
Dry	2	1	1-23	2.2	0	YES
Dry	5	1	1-13	3.0	0	YES
Dry	7	1	1-8	2.0	0	YES
Dry	8	1	1-17	2.6	0	YES
Dry	9	1	1-13	2.4	0	YES
Dry	10	1	1-13	3.0	0	YES
Dry	12	1	1-1	1.0	0	YES
Dry	14	1	1-23	2.8	0	YES