

SALEM SOUND COASTWATCH



Protecting the Coastal Habitats of the Salem Sound Watershed with the Communities of Manchester, Beverly, Danvers, Peabody, Salem, and Marblehead.

Salem Sound Clean Beaches and Streams Program Report for April through August, 2007

The following report is a summary of results from water quality testing that took place from April through August in Salem Sound Coastwatch's Clean Beaches and Streams Program. Table 1. displays results of tests performed by Salem Sound Coastwatch (SSCW) at coastal outfall pipes and streams. SSCW's water sampling follows a Department of Environmental Protection approved QAPP that was last revised July 7, 2006. All SSCW volunteer water samplers took the required training as spelled out in this QAPP. All sampling and chain of custody protocols were followed and a completeness range of 90 to 100 percent of the samples for collection was met.



#213 – Patch Beach, Beverly

US EPA National Water Quality Inventory reports runoff from urbanized areas is the leading source of water quality impairments to surveyed estuaries, harming fish and marine plants and animals, killing native vegetation, and making recreational areas unsafe and unpleasant.

(EPA 841-F-03-003)

Approach and Methods

While municipalities test bathing waters at public beaches, Salem Sound Coastwatch focuses on stormwater outfall pipes and coastal streams, many of which are located at bathing beaches and near boating areas. SSCW's samples are collected at sites of stormwater discharge at low tide, which means that bacterial counts tend to be higher than beach samples taken at high tide in three feet of water where the ocean has diluted the discharge. The importance of testing outfall pipes and streams is that it shows whether bacterial contaminants are making their way into our area waters.

EPA has concluded that *Enterococcus* is the best indicator organism in marine waters to show a correlation with adverse human health effects. Therefore, all states have been mandated to use this standard by April of 2004. Since 2004, all Salem Sound communities and SSCW have used *Enterococcus* as the indicator organism for marine water testing.

The EPA water quality standard for Class A, B, and C is met if the *Enterococcus* level of a single sample is less than 104 CFU/100mL or if the geometric mean of the most recent five (5) *Enterococcus* levels within the same bathing season does not exceed 35 colonies per 100mL (Massachusetts state sanitary code 105 CMR 445.000). This is a statistical averaging method used to even out the average when dealing with a wide range of numbers.

Definition of Dry vs. Wet Conditions

Rain can cause temporary elevated bacterial counts at discharge sites and within nearshore coastal waters. Runoff from impervious surfaces (parking lots, roofs, streets) flushes contaminants through storm drains, bringing pollution onto the beaches and other coastal habitats. Therefore, testing under dry conditions gives a better picture of on-going contamination problems.

SSCW defines “dry” conditions vs. “wet” differently than the municipalities. Under SSCW’s definition, **dry conditions are less than 0.2" precipitation the day of sampling or less than 0.5" within the three days preceding sampling. Wet conditions are defined as more than 0.2" precipitation on the day of sampling or more than .5" within three days preceding sampling.** Protocols for wet weather sampling are the same as for dry weather sampling. Graphs 1 & 2 show the precipitation for the sampling period.

The municipalities define wet conditions, or a “storm” event, as any occurrence of precipitation during the sampling or within the 24 hours preceding the sampling.

Salem Sound Coastwatch Test Results

Table 1. shows the results of samples taken from April 19 through August 30, 2007. Samples were taken every 2 weeks within two hours of low tide and driven to Gloucester where Biomarine tested all water samples. (16 East Main Street, Gloucester MA 01930).

All test results are included in the Table 1. Those values that are higher than EPA standard (EPA-823-R-03-008) are indicated in **bold: *Enterococcus* >104 CFU/100mL**. In addition this year, geometric means are included for all sites. All results including the two wet sampling days were included in determining the geometric mean. These results are in the last column of Table 1.



Thanks to funding from an EOEEA Volunteer Monitoring Grant, testing could begin earlier this year. All spring results when the weather is cooler and the rains more frequent were lower in bacterial counts than the summer test results. As soon as temperatures began to get hot, the bacterial counts rose in all locations. The correlation between higher bacterial counts and warmer temperatures should be studied. Another factor that should be studied is the relationship of resident animals and birds to water quality during the year. Sites in Danvers had resident ducks and raccoon tracks were seen at Stramski Way in Marblehead.

There were two Wet events, one in the spring (5/17) and one in the summer (7/5). On these dates, every site, but two, had bacterial counts well above EPA standard: *Enterococcus* >104 CFU/100mL.

Dry weather **Hotspots** are listed on page 6. A hotspot is defined as having *Enterococci* counts above 1000 CFU/100mL at least twice during the sampling season.

Results Summary

Manchester

Because the high bacterial counts during the 2006 summer sampling from the Wolf Trap estuary (#161) that flows onto Black Beach, 2007 testing was expanded to five sites in the Wolf Trap watershed. All sampling sites had low bacterial counts (<10 to 60) in April and May, even the May 17th wet sampling had fairly good numbers for a rain event (60 to 480). Two brooks flow into the Wolf Trap salt marsh, a small stream on the westerly side (#161W) and the Wolf Trap Brook (#161E) on the easterly side. Both had lower bacterial counts than samples taken from the marsh, except for the July 5th wet weather sampling day when #161W the westerly brook had the highest count (17,000) of all the Manchester sampling results. Sampling should continue to better understand the pattern and to pinpoint sources of bacteria. Possible contamination sources are failing septic systems in the watershed, particularly ones abutting the marsh, pet feces being washed in the brooks during rain events, and wildlife.

Beverly

Because bacterial contamination at Patch (Brackenbury) Beach has been high for the past few years, a Sanitary Beach Survey was undertaken in 2004 and 2005 by EPA New England. In 2006, SSCW continued to sample and found that the highest levels of bacteria coming from the two outfall pipes (#213 & #213A) occurred during the higher tides associated with the full moon. SSCW has begun working on EPA's recommendations by partnering with landowners including Endicott College, MA Coastal Zone Management Wetlands Restoration Program, and the City of Beverly to restore tidal flushing to the adjacent salt marsh. While the restoration is being developed and permitted, SSCW has expanded its water testing to include more Centerville Brook sites to identify the bacterial sources.

The highest bacterial counts of the four sites tested were just south of Hale Street below the area that is frequented by a large number of well-fed ducks.

#213E	420	140	640	1,800	NS	1,200	1,800	17,000	8,000	9,900	2,500
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The water then travels through an open three-sided channel before entering a granite culvert that has opening to the salt marsh and exits on to the beach. Although numbers are still high, the bacterial levels are lower at the outfall mouth than from the stream right after the duck area.

#213	120	80	550	380	NS	1,000	6,400	5,200	1,200	940	1,200
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Water from the brook was tested upstream of Hale Street at Tall Tree Road to see if the bacteria source was upstream as well. However, the bacterial counts were much lower.

#213F	NS	50	430	70	NS	170	270	9,200	390	220	330
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Only one sample was taken even farther upstream at Common Street on 6/14, but with a good result of 60 CFU/100mL, sampling was not continued at this site.

Waterfowl are a known source of bacterial pollution, particularly when they congregate in large numbers. The persistent feeding of ducks is contributing to increased bacterial pollution downstream and should be addressed by the Beverly Board of Health.

Sampling also took place at Rice Beach, Dane Street Beach (2 outfalls) and an outfall near the Kernwood Bridge that flows into the Bass River. The flow at Rice Beach (#214) is a stream that has been converted into a stormwater conduit so bacterial levels climb during rain events. Levels of bacteria were low in the spring, but

began to increase as temperatures increased. However, the flow stopped mid-July through August, because of the dry conditions. Lawrence Brook (#321) that flows out on to Dane Street Beach is also used for stormwater and is a source of pollution for the beach. Results from this brook have always been higher than from the outfall pipe in the center of the beach (#322). The storm drains in the Lawrence Brook watershed should be cleaned especially in July and August, during the hottest weather and residents in the brook's watershed should be reminded to pick up pet waste and proper disposal. The other Dane St. Beach outfall that was sampled had slightly lower counts than in 2006. Kernwood (#52) had low counts except when it rained, following the pattern of a typical storm drain. This should be visually inspected occasionally for increased flow or odor.

Danvers

Testing in 2006 showed that the highest bacterial dry weather sampling results were from the Frost Fish Brook (#400), as it becomes the Porter River (at Rt. 62). Therefore, eleven sites were initially sampled upstream of #400 on June 11, 2007, but access was difficult to several of these Frost Fish Brook sites (chain link fencing) so future sampling was reduced to six sites. Two downstream sites (#401, #430) in the Porter and Danvers Rivers were also tested. Results show that there are definitely water quality issues in the Frost Fish Brook. The brook water sample site #458H at the end of Hemlock Street had some of the highest levels. Just upstream at least one pair of ducks was present on most sampling days. The neighbors appeared to be feeding them. The Donegal Brook tributary (#471) to Frost Fish Brook also had high counts. This brook is buried and connected to the storm drains. It was sampled as it flowed out of culvert into the Frost Fish Brook. SSCW will work with the Danvers Health Department to investigate possible solutions for remediation.

Salem

The two outfalls along Commercial Way that flow into the North River across from Leslie's Retreat Park continue to be sampled. The outfall near the footbridge (#559) continues to have lower levels of bacterial contamination than site #537. SSCW will work with Salem's DPW to see if storm drains can be cleaned in the #537 outfall's watershed. This site continues to have high counts for the third year in a row, although during this sampling period, the bacterial levels were lower than last summer's exceedance of 9,678 CFU/100mL.

SSCW considers the outfall (#630) at Derby Wharf, Salem Maritime National Historic Site, to be a hotspot, which must be monitored and investigated in more detail. In 2005, the two highest readings were 32,700 (a wet event in May) and 9,678 CFU/100mL (August). In 2006, the two highest readings were 92,080 (July) and 18,500 (August) CFU/100mL. On April 16, 2007 the test result came back at 8,200 CFU/100mL, but since then the bacterial counts dropped (ranging from 150 to 970 CFU/100mL) until June 28th when the count was 3,300 CFU/100mL. Further investigation discovered that water was being pumped into the last storm drain before the outfall to avoid flooding in the Brookhouse basement, a home for elderly women on Derby Street. Water flowing into the Brookhouse basement was sampled (site #BH) twice and also tested for Fluoride once. A low level of Fluoride 0.23 was detected which indicates the water source could be a broken water pipe. Both #BH samples tested below 10 CFU/100mL for Enterococcus. While it is good that this is not a source of the contamination, the flow of drinking water into the drain probably masked a problem in the outfall's watershed. The storm drain system feeding this outfall should be cleaned and examined in more detail by Salem's DPW. SSCW has notified Salem's Mayor, her assistant, City Council Environmental Health Committee, and spoke with the Director of Public Works. By August, some of the BrookHouse water leaks had been found and repaired or disconnected and water had stopped

flowing into the storm drain. The three August results were not as high as expected (1,600, 600, 770 CFU/100mL), but testing of this site will continue.

The inner harbor sites at Palmer Cove (#631) and Willow Ave Beach (#642) showed reduced levels of bacteria in the early part of the sampling season compared to previous years of sampling. The Salem Director of Public Works reported that over 1100 storm drains have been cleaned in Salem since November 2006. This may have contributed to the lower bacterial levels. However, in August, bacterial levels jumped to 2,300 CFU/100mL on August 2 and then hit the highest count (14,000 CFU/100mL) for all of Salem on August 16 before returning to counts more indicative of the summer (320 CFU/100mL). Determining what is causing this spike will be a challenge. Some ideas to be investigated include cleaning the drains and the outfall pipe in August and evaluating their condition, looking for pet waste runoff, and determining if there is any sewer leaks in the neighborhood.

In 2006, the Juniper Beach outfall (#620) started off the sampling season with the same record high numbers as in the past (16,740 CFU/100mL). But after the Salem DPW cleaned the pipe and installed a



#620 – Juniper Beach, Salem

TideFlex “duckbill” tide gate, the numbers dropped into the low hundreds, a dramatic improvement. In the spring test results were in the low range from <10 to 40 CFU/100mL and the majority of tests were in this range through August except for two days. On June 14th, bacterial counts were 3,600 CFU/100mL and on August 30 they were 7,000 CFU/100mL. Both these days were dry weather sampling (Note that the two wet samplings had counts of 10 and 680 CFU/100mL). One idea that needs to be investigated further is the relationship of tide elevation and bacterial counts. There was a new moon on June 15th and a full moon on August 28th. Perhaps the higher tides forced more water through the duckbill tide gate and the water reached further up the outfall pipe.

Marblehead

The stream flowing on to Grace Oliver Beach (#700) continues to be a source of bacteria. A Sanitary Beach Survey was conducted by EPA New England this summer, but the report has not been released at this time. Cleaning of the culvert should be a recommendation. By the end of the summer the culvert was clogged with debris, sand and cobbles. Some kind of closure similar to the TideFlex duck-bill tide gate installed by Salem at Juniper Beach might be considered. In addition, other marine sources of bacteria should also be investigated to gain a better understanding of the beach closures in this cove.

SSCW sampled one of the two large Riverhead Beach culverts (#701A). The stormwater flows from the Goldthwait salt marsh and from downtown Marblehead and joins to flow through these two large culverts. The Goldthwait salt marsh has been added to the sampling sites. The fresh water inlet to the marsh (#741) was tested as well as the water flowing out of the marsh (#740) into the Riverhead culvert. The spike on May 3 (4,500 CFU/100mL) at Riverhead Beach culverts (#701A) did not correspond to the marsh results so the contamination may have originated from the downtown area.

This is the first year SSCW has gathered salinity data at outfalls where saltwater intrusions are expected. This data will be used to help determine if marine waters intrusions are contributing to the pollution problems.

While the water quality does not meet EPA standards for Class A, B, C, the northwest fresh water inlet (#741) and the east outlet (#740) at Goldthwait marsh had low geometric means of 237 and 233 CFU/100mL respectively. The

Riverhead culvert had a higher geometric mean of 553 CFU/100mL, which reflects the stormwater input from the downtown area.

Results from the three outfalls in the Stramski Beach watershed (#722, 722A & B) had lower levels of bacteria through the spring, but started increasing on June 28 after a heat spell and stayed greater than 1,100 CFU/100mL the rest of the summer. The Marblehead Water and Sewer Commission recently cleaned the storm drains and inspected the pipes in this watershed. However, the presence of raccoons and the low flow, which creates stagnant conditions, may be contributing factors to this persistent watershed problem.

		4/19	5/3	5/17	5/31	6/14	6/28	7/5	7/19	8/2	8/16	8/30
Stramski Beach-Stream draining across beach	722	9	80	430	180	740	1,900	13,000	3,500	2,000	1,100	Dry
Stramski Way-Dodge Road drainage	722A	10	130	120	80	160	3,600	14,000	4,000	16,000	1,600	Dry
Stramski Way-Pitman Street drainage	722B	10	90	430	250	230	1,100	9,000	4,800	36,000	5,900	15,000

The geometric means for the stream were 616 CFU/100mL from at Stramski Beach, 633 CFU/100mL at Dodge Road culvert and 1,117 CFU/100mL at the Pitman Street culvert.

HOTSPOTS: DRY weather sampling - two or more test results Enterococcus > 1000 CFU/100mL

# results > 1000 CFU/100mL /total samples	Site ID - Site Description	Geometric mean
MANCHESTER		
2/9 161E	Wolf Trap Estuary - East side from wooden bridge in marsh	433
3/9 161	Wolf Trap Estuary- Downstream of Ocean St. at Black Beach	442
BEVERLY		
6 /8 213E	Centerville Brook - South of Hale Street	1,859
4/8 213	Brackenbury Beach – Centerville Brook from 4' x 4' Culvert	786
DANVERS		
5/5 474S	Frost Fish Brook - End of Princeton St.	2,964
4/5 471	Donegal Brook Tributary to Frost Fish Brook	2,357
6/6 471U	Frost Fish Brook - Between Colgate and Bowdoin Streets	2,653
5/6 458H	Frost Fish Brook at Hemlock St.	2,819
5/6 400	Porter River at Rt. 62 and Holten-Richmond School	2,733
SALEM		
4/8 537	North River - Upstream of Rt. 114 overpass, Commercial Way	1,201
2/6 620	Juniper Beach - Storm drain on beach	133
3/8 630	Derby Wharf - Storm drain	1,317
3/8 642	Willow Ave. Beach	419
MARBLEHEAD		
2/9 701A	Riverhead Beach Culvert	553
4/8 722	Stramski Beach-Stream draining across beach	616
5/9 722B	Stramski Way-Pitman Street drainage	1,117

For Additional Information about SSCW’s Clean Beaches & Streams Program, including information on how one can become a volunteer in this important, environmental monitoring program, please call Salem Sound Coastwatch at 978-741-7900 or email barbara.warren@salemsound.org

Table 1. Salem Sound Water Quality Monitoring Results April through August 2007 From Outfall Pipes and Streams

Full Moon – May 2, June 1, June 30, July 30 and August 28

New Moon – April 17, May 16, June 15, July 14 and August 12.

2007 Salem Sound Water Monitoring Results	SITE	DRY	DRY	WET	DRY	DRY	DRY	DRY	WET	DRY	DRY	DRY	DRY	Geometric Mean
Manchester		4/19	5/3	5/17	5/31	6/11	6/14	6/28	7/5	7/19	8/2	8/16	8/30	
Wolf Trap Brook - 9 Magnolia Ave	160	<10	<10	210	10	NS	50	130	1,100	460	20	50	60	60
Wolf Trap Brook - Downstream of Rt. 127	160D	<10	10	60	40	NS	70	500	1,800	580	1,900	660	880	185
Wolf Trap Estuary - Downstream of Ocean St. at Black Beach	161	20	10	470	410	NS	2,800	1,700	10,000	460	640	210	1,120	442
Wolf Trap Estuary - east side from wooden bridge in marsh	161E	<10	<10	480	170	NS	480	2,700	5,300	600	960	1,100	3,500	433
Wolf Trap Estuary - west side at driveway off Ocean St	161W	60	<10	170	50	NS	10	250	17,000	360	170	90	40	114
Beverly														
Brackenbury Beach - stream from 4' x 4' Culvert	213	120	80	550	380	NS	1,000	6,400	5,200	1,200	940	1,200	NS	786
Brackenbury Beach - concrete culvert to the east (18" dia.)	213A	40	<10	250	1,700	NS	490	520	5,900	550	330	500	NS	340
South of Hale Street	213E	420	140	640	1,800	NS	1,200	1,800	17,000	8,000	9,900	2,500	NS	1,859
Centerville Brook at Tall Tree Dr	213F	NS	50	430	70	NS	170	270	9,200	390	220	330	NS	297
Centerville Brook at Common Street	213-G	NS	NS	NS	NS	NS	60	NS	NS	NS	NS	NS	NS	60
East Drainage to 213A - Endicott College	213AU	NS	NS	NS	NS	NS	410	NS	NS	NS	NS	NS	NS	410
Rice Beach - streamfall onto beach	214	NS	30	640	20	NS	840	DRY	9,800	Dry	Dry	Dry	NS	316
Dane St. Beach - Lawrence Street brook at beach	321	NS	800	660	800	NS	600	280	7,000	2,200	650	540	NS	899
Dane St. Beach - easterly storm drain at beach	322	NS	<10	160	80	NS	200	60	6,800	270	520	90	NS	170
Kernwood Bridge - 8" outfall	352	NS	NS	NS	NS	NS	NS	360	7,700	40	NS	NS	NS	480
Danvers														
Porter River Sandy Beach	430	NS	NS	NS	NS	210	NS	NS	860	NS	NS	20	40	110
Porter River Rt. 35 - boat ramp at Bunky's Marina	401	NS	NS	NS	NS	<10	NS	NS	4,100	230	50	70	40	168
Porter River at Rt. 62 and Holten-Richmond School	400	NS	NS	NS	NS	1,200	NS	13,000	7,600	7,700	1,300	1,000	960	2,733
Frost Fish Brook - Hemlock St.	458H	NS	NS	NS	NS	1,700	2,900	NS	11,000	9,200	1,700	1,700	980	2,819
Tributary to Frost Fish Brook - Short Rd	464A	NS	NS	NS	NS	1,300	NS	NS	NS	NS	NS	NS	NS	1,300
Frost Fish Brook - Coolidge Rd	465	NS	NS	NS	NS	1,300	NS	NS	NS	NS	NS	NS	NS	1,300
Frost Fish Brook - between Colgate and Bowdoin Streets	471U	NS	NS	NS	NS	1,100	1,000	NS	20,000	5,300	2,700	1,700	1,730	2,653
Donegal Brook Tributary to Frost Fish Brook	471	NS	NS	NS	NS	900	NS	NS	14,000	1,800	2,000	2,700	1,400	2,357
Frost Fish Brook - Cabot Rd	473	NS	NS	NS	NS	NS	110	NS	NS	NS	NS	NS	NS	110
Frost Fish Brook - end of Princeton St.	474S	NS	NS	NS	NS	1,000	NS	NS	11,000	6,000	3,200	1,900	1,690	2,964
Frost Fish Brook - Dartmouth St.	478	NS	NS	NS	NS	530	NS	NS	NS	NS	NS	NS	NS	530
Frost Fish Brook - Dartmouth St. side culvert	478A	NS	NS	NS	NS	40	NS	NS	NS	NS	NS	NS	NS	40
Frost Fish Brook - Perkins St. (north side)	479	NS	NS	NS	NS	550	NS	NS	NS	NS	NS	NS	NS	550

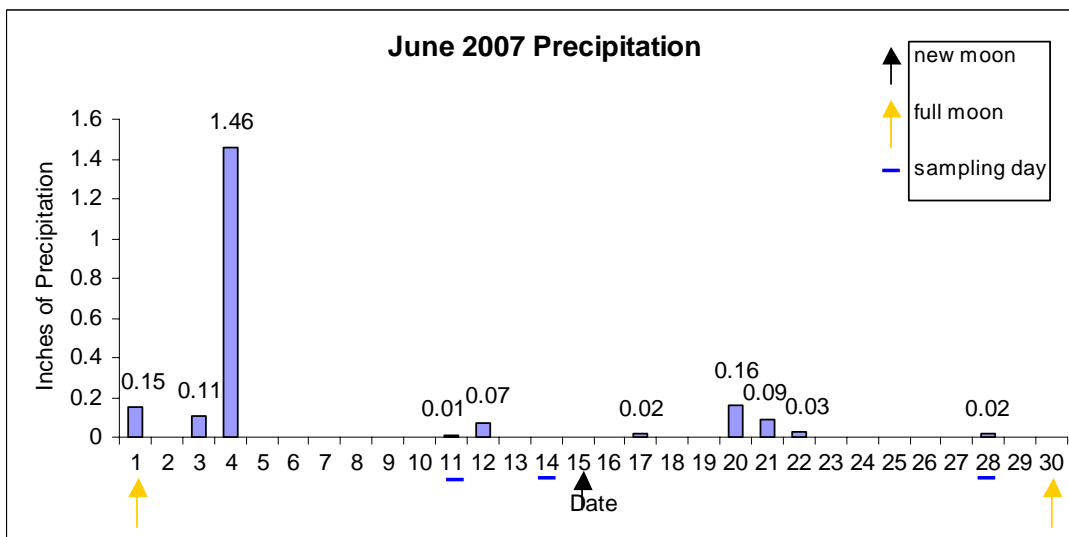
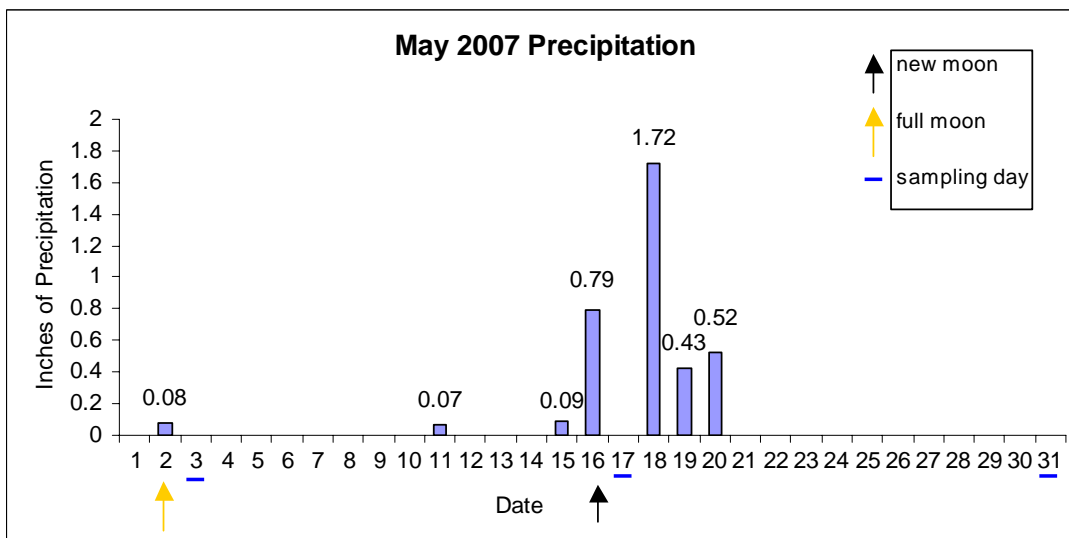
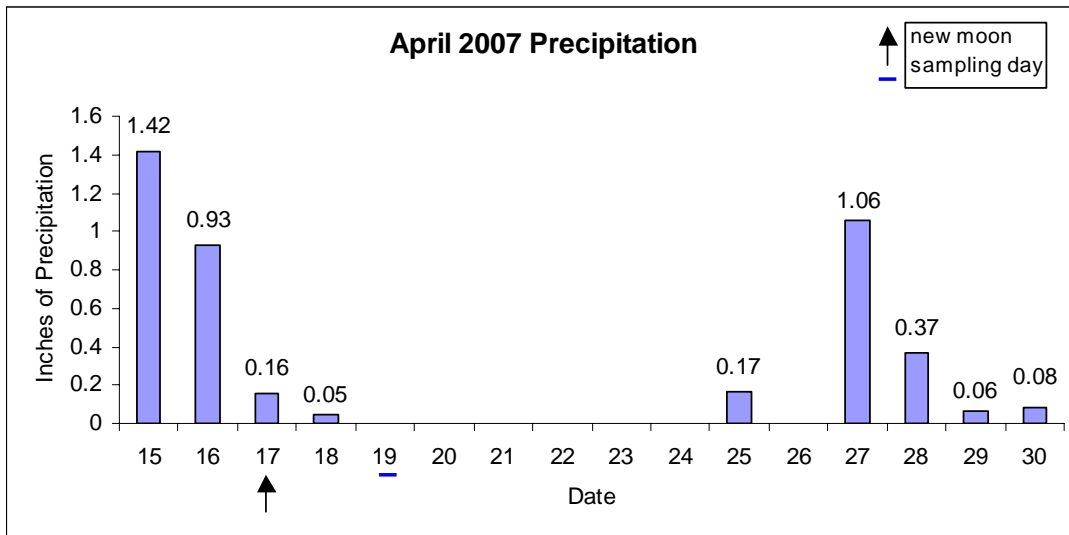
Table 1. cont. Salem Sound Water Quality Monitoring Results April through August 2007 From Outfall Pipes and Streams

Full Moon – May 2, June 1, June 30, July 30 and August 28

New Moon – April 17, May 16, June 15, July 14 and August 12

	SITE	DRY	DRY	WET	DRY	DRY	DRY	DRY	WET	DRY	DRY	DRY	DRY	Geometric Mean
		4/19	5/3	5/17	5/31	6/11	6/14	6/28	7/5	7/19	8/2	8/16	8/30	
Salem														
North River - upstream of Rt. 114 overpass, Commercial Way	537	820	1,200	630	500	NS	3,300	2,400	9,900	NS	350	2,300	320	1,201
North River - Commercial Way near foot bridge	559	510	300	1,000	70	NS	120	500	2,800	NS	430	410	70	342
Juniper Beach - storm drain on beach	620	40	<10	<10	NS	NS	3,600	20	680	40	290	NS	7,000	133
Derby Wharf - storm drain	630	8,200	970	150	680	NS	820	3,300	9,700	NS	1,600	600	770	1,317
Brookhouse - corner of Derby and Orange	BH	NS	NS	<10	<10	NS	NS	NS	NS	NS	NS	NS	NS	9
Palmer Cove - storm drain below Palmer Cove Playground	631	10	80	<10	<10	NS	10	<10	140	120	230	130	110	39
Forest River Park - Pioneer Village	634	NS	NS	NS	170	NS	NS	NS	NS	NS	NS	NS	NS	170
Willow Ave. Beach	642	50	30	180	210	NS	290	DRY	2,900	340	2,300	14,000	320	419
Marblehead														
Dolliber Cove Creek - Grace Oliver Beach	700	270	450	1,800	480	NS	610	830	16,000	4,300	400	520	Dry	973
Dolliber Cove Creek - upstream of Mill house	700CR	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	200	NS	200
Front St. - at Selmen Street	FS1	NS	NS		NS	NS	NS	NS	NS	730	270	180	550	374
Riverhead Beach Culvert - facing on left	701A	90	4,500	380	1,500	NS	280	470	3,100	630	930	90	300	553
Stramski Beach-Stream draining across beach	722	<10	80	430	180	NS	740	1,900	13,000	3,500	2,000	1,100	Dry	616
Stramski Way-Dodge Road drainage	722A	10	130	120	80	NS	160	3,600	14,000	4,000	16,000	1,600	Dry	633
Stramski Way-Pitman Street drainage	722B	10	90	430	250	NS	230	1,100	9,000	4,800	36,000	5,900	15,000	1,117
Goldthwait marsh - east outlet	740	160	20	280	230	NS	320	450	2,300	280	260	100	220	233
Goldthwait marsh - northwest fresh water inlet	741	80	20	130	170	NS	210	230	3,500	210	560	640	300	237
Numbers in bold exceed standards specified by the EPA (EPA-823-R-03-008):		Enterococci > 104 CFU/100mL				NS = not sampled								
Weather ratings: Dry - Less than 0.2" the day of sampling or less than 0.5" within three days preceding sampling						Lab abbreviation: Bio = Biomarine Inc. in Gloucester								
Wet - More than 0.2" the day of sampling or more than 0.5" within three days preceding sampling														

Graphs 1: Precipitation recorded at the Beverly Airport for April, May and June.



Graphs 2: Precipitation recorded at the Beverly Airport for July and August.

