

## 2009 Cape Neddick River Water Quality Testing

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### Overview:

The Community Development Department has been testing the bacteria levels in the Cape Neddick River for the past 3 years. The testing was initiated because the beach testing that the Parks and Recreation Department conducted showed consistently high levels of bacteria at Cape Neddick Beach. In 2007, our department tested 33 water samples upstream of the beach. In 2008, we tested 76 water samples, and in 2009, we tested 160 water samples. We continued working with Maine Healthy Beaches program and they provided additional analysis of our water by testing the optical brightener levels. Optical brighteners are found in household detergents so they are a good indicator of a malfunctioning septic system. Testing procedures were generally kept the same as in 2007 and 2008, except that we decided to test for E. Coli at the freshwater sites rather than enterococci. The following is a brief explanation of why we began using E. Coli for some of the sites:

### **Enterococci vs. E. Coli**

The Environmental Protection Agency recommends using enterococci as a bacterial indicator in salt water. In fresh water, although enterococci can still be used, E. Coli seems to be more widely used. In 2007 and 2008, we used enterococci for both our fresh and salt water testing. In May of 2009, we found a site where a septic system was being piped into a catch basin, which was then going directly into the river. When we tested this discharge for enterococci bacteria, the test told us that the water was clean. I then asked the sewer district to test the same water for E. coli, and that test told us that the discharge had enormous levels of harmful bacteria in it. Because the E. Coli test correctly categorized the discharge as septic, and the enterococci test incorrectly categorized the discharge as safe for swimming, we changed our protocols. From that point forward we used enterococci for any test location subject to tidal influence, and E. coli for all freshwater locations. The drawback of this decision is that data synthesis and comparison becomes more difficult and the Maine Healthy Beaches Database does not support E. coli results.

One of the big successes of this season is the volunteer contributions to the water testing program. With the assistance of Chuck Ott and the Conservation Commission, we formed the “York Water Quality Volunteers”, which is comprised of 20 volunteers. Everyone completed the Maine Healthy Beaches water quality training and then helped take water quality samples throughout the season. The success of this group will be very important to the health of our rivers. In addition helping out with the time consuming sampling, the volunteers offer unique perspectives on how to tackle the problem and they provide valuable community outreach. Water quality is an important community issue and it is much more likely that we will solve this problem with the assistance of a motivated group of volunteers. The Conservation Commission also made a generous donation so we were able to do many more samples that we had anticipated.

### **Results:**

The results of our 2009 water samples are disappointing. The bacteria levels in the Cape Neddick River were unsafe for swimming several times throughout the summer. In my opinion, the primary reason for the unusually high bacteria was the high amounts of rainfall this year. The general correlation between rainfall events and elevated bacteria levels is well documented. In the summer of 2009 we had abnormally large amounts of rainfall. According to a NOAA weather station in Portsmouth, the average rainfall for June, July, and August is 9.91 inches. This past year (2009) we had over 18 inches of rain for those three months. This is 82% higher than average rainfall for our region. In comparison, for these 3 months, in 2008 we had 13.1 inches of rain and in 2007 we had 9.1 inches. Based on my conversations with the Maine Healthy Beaches staff, it seemed like most of the state saw higher than expected levels of bacteria and the increased rainfall is suspected as the cause.

It should be noted that the rainfall did not cause our bacteria problem; it simply made it worse this year. Heavy rains highlight and intensify a problem that is already there. During a season of average precipitation, I would hypothesize that the bacteria levels would still show unsafe levels, but they would not be nearly as high as our 2009 results. We suspect that failing or marginally functioning septic systems along with animal wastes are the cause of our bacteria problem. When it rains, animal feces (domestic, farm, and wild) travels downhill with the water. If there is a stream nearby, the feces will travel directly into the river. In the case of a septic system, if it is not functioning properly, a rainstorm will wash untreated wastewater downstream. During drier periods, the soil has the ability to absorb and retain the wastewater long enough to treat it. When soils are saturated, they are not absorbing and retaining wastewater as well, therefore more bacteria will reach waterbodies.

The following is a chart that was created to merge the Enterococci and E. Coli data. Each sample is given a rating from 1 to 7. Scores from 1 to 3 are considered safe for swimming and scores of 4 to 7 are not safe for swimming. (See Attachment B for raw data.)

(Colonies per 100mL)

Score	Enterococci	E. Coli	Comments
1	0-35	0-79	Clean Water
2	36-70	80-157	Small amount of bacteria
3	71-104	158-235	Bacteria somewhat elevated
4	105-250	236-400	Bacteria levels become unsafe for swimming
5	251-450	401-700	Bacteria problem becoming serious
6	451-1000	701-1200	Serious bacterial contamination
7	>1000	>1200	Very serious bacterial contamination

### 2009 Summer Testing Results

	CNR-1	CNR-2	CNR-3	CNR-4	CNR-6	CNR-7	CNR-8	CNR-9	CNR-10	CNR-11	CNR-12	CNR-13	CNR-14	CNR-15
6/3/09	1	1	1	1	3	1		3	1	3	1	1	1	1
6/18/09	1	1	1	1	3	1	4	4	1	2	3	2	1	1
6/26/09	3	1	1	4	5	1	1	2	1	1	3	1	1	1
7/2/09	7	7	7	7	7	7	7		7	7	7	7	7	7
7/13/09	6	4	1	1	5	1	5	6	1	1	4	1	1	6
7/20/09	1	1	1	1	4	4	2	1	6	2	5	2	1	3
7/27/09	5	4	2	5	5	3	2	6	4	1	2	4	3	4
8/12/09	7	6	6	6	6	5	4	6	6	5	3	3	6	3
8/24/09		6		7	3		7	2		3		4	7	7
8/31/09	2	4	2	4	4	4	4	4	4	6	5	5	4	2
Average	4	4	2	4	5	3	4	4	3	3	4	3	3	4
		= Safe												
		= Unsafe												

As shown in the table above, 8 out of 14 test locations had an average level of bacteria that was unsafe for swimming. (See Attachment A for a map of the test locations.)

The intention of our group at the beginning of the season was to start out testing all 14 of the locations and then after three or four weeks of testing, focus our attention on the locations that were consistently unsafe for swimming. Unfortunately, we did not get the consistency that we needed in order to focus our testing. The bacteria problem appeared to expand to areas that

we didn't have problems with in 2008. It was decided that we would test all locations for the entire summer. Two of our volunteers wanted to test in the York River. We chose 2 locations in the upper York River to test and we tested each of them three times. That data is not included in this report but it is valuable to have for our future monitoring of the York River.

On October 8, 2009 the York Water Quality Volunteers met at Town Hall to talk about the summer test results and to decide how to move forward. At this meeting, we decided that the problem needs to be addressed by studying the sub-watersheds of each test location individually. We chose to start with the watersheds of CNR-9, CNR-10, and CNR-4. We expanded our testing upstream in these watersheds and tested 8 locations on 2 different days in October. Only one of the 16 samples was unsafe for swimming. The group also decided that community outreach would be a good use of time during the winter months.

### **Conclusions:**

2009 was a difficult year to study water quality because of the abnormally large amount of rainfall. Fecal bacteria levels in the Cape Neddick River and its tributaries were often at unsafe levels throughout the summer. On a positive note, we found one direct source of bacteria going into the river and eliminated it. We have plenty of data now to form trends at our test locations along the river. Unfortunately, data and trends will not solve the problem. We need to go upstream in each sub-watershed until we find a source. In 2010, the York Water Quality Volunteers and I will focus our efforts on individual sub-watersheds. We will survey and sample each watershed until we find a bacteria source or determine that it does not contain a human-sourced bacteria problem. July and August have consistently had the highest bacteria counts. We will focus our sampling as much as possible during these two months. In the spring, we will focus on public outreach, watershed surveys, and other data gathering. On February 24<sup>th</sup>, at the library, there will be a *Brown Bag Lunch* informational and discussion forum on water quality. This will be the kickoff of our public outreach campaign.