

Cape Neddick Water Quality Testing in 2007

Christopher Cayce Dalton
Shoreland Resource Officer, Town of York
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Summary

The Department of Community Development conducted bacterial testing in the Cape Neddick River and Harbor during the late summer of 2007. The Parks and Recreation Department tests at public beaches only. This upstream testing was the first step towards finding patterns of pollution so they could be fixed and beach closures prevented. The tests indirectly measure the risk of disease from water contact. The lower reaches of the Cape Neddick River showed very high levels of bacteria in both wet and dry weather. Surprisingly high and consistent readings were found at the point where the river enters the harbor. Fortunately, the lower reaches of the harbor (near Shore Road Bridge and the beach) showed low levels of bacteria, probably because of dilution by the tides. The results suggest most bacteria come from the river, and not the ocean.

The most likely sources are antiquated and neglected wastewater systems. Current rules and regulations are sufficient to fix these problems, but the Town must do more to enforce those rules. I recommend we build a database of septic systems and their pump-out dates. This database should be cross-referenced with sewer connections to identify structures with no recorded wastewater system. The information should be used to enforce the basic requirement that all structures have adequate wastewater and the Town's rules that septic tanks be pumped-out. I also recommend that the Community Development Department expand water testing to the watersheds above all public beaches, to guide enforcement and protect public health. We should also consider posting an advisory against water-contact recreation above the Clark Road Bridge in Cape Neddick Harbor.

Background

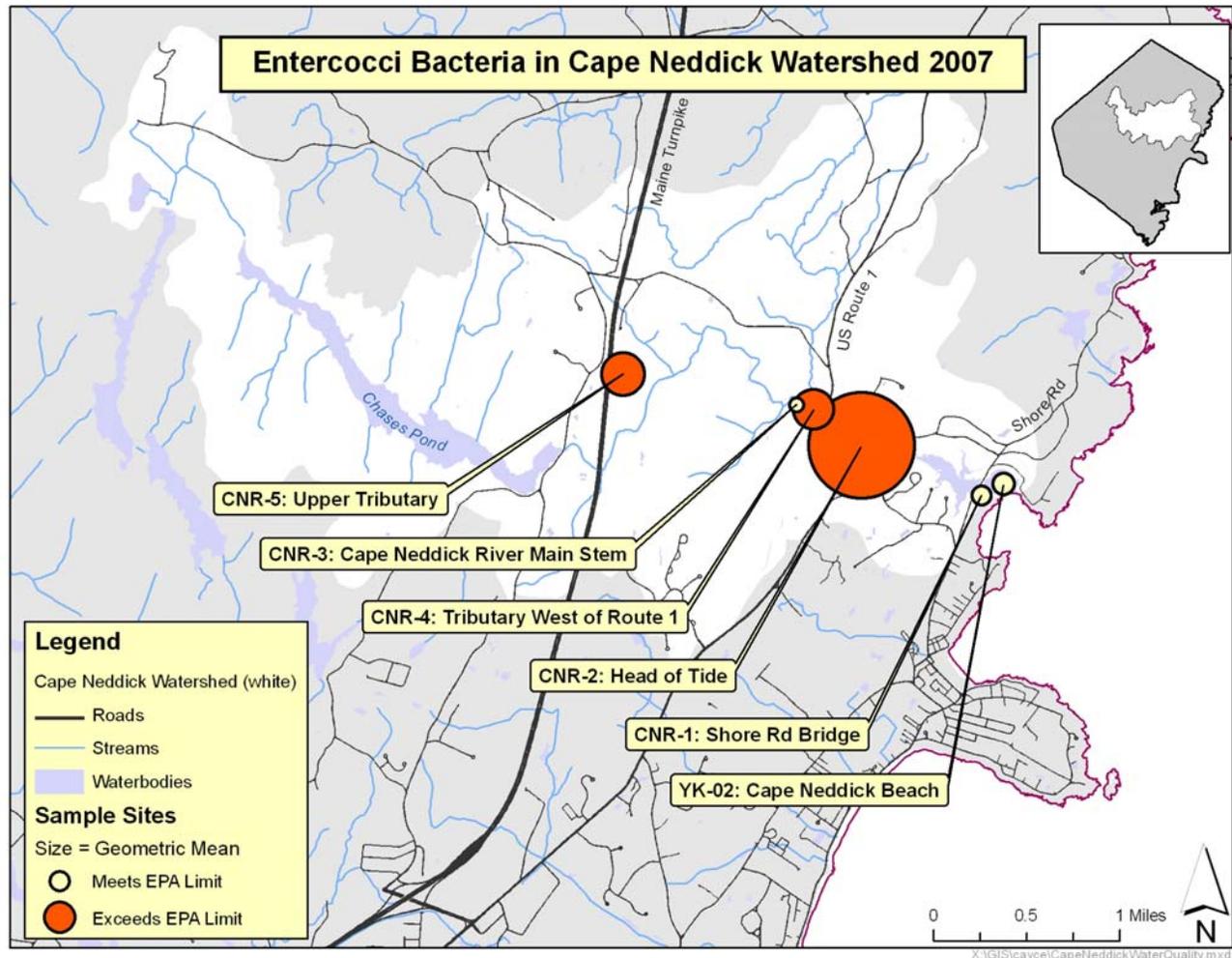
The Town of York Community Development Department began testing rivers and streams that drain to the Cape Neddick Beach in August 2007. The York Parks and Recreation Department requested our assistance due to a few high bacterial readings at the beach earlier this year as part of the Maine Healthy Beaches (MHB) program. The Town posted temporary advisories against swimming in response to the poor test results, and Parks and Recreation recommended we go the extra step of seeking the sources. Our goal was to identify (and eventually eliminate) sources of pollution to the Cape Neddick Beach, and to create a pilot study that could be applied in other beach watersheds in York.

MHB provided equipment, training and lab work to the Town for free. We used their bacterial test method for *enterococci*, which is correlated with gastrointestinal disease from water-contact recreation. With the generous help of a citizen volunteer, Larry Reilly, we tested five upstream locations on six dates in late summer (see map on following page). York Parks and Recreation tested the beach itself all summer as part of MHB's ongoing state-wide program.

Rainfall tends to greatly increase bacterial concentrations. Moderate to heavy rains wash whatever is on the ground into streams and rivers. Leaky underground pipes and septic systems may also have their contents partially flushed out. Dry periods are usually associated

with lower bacterial levels. All dates except the last one were during very dry conditions, yet the high bacterial concentrations were found on all days, regardless of weather.

Bacterial levels also fluctuate greatly from day to day, so it is important to test multiple times in order to see beyond the short-term variations. We sampled on six dates and examined the geometric mean, which is the standard approach for bacterial tests. The EPA has determined the recreational water quality standard for *enterococci* is a geometric mean of less than 33 in freshwater, and less than 35 in marine water¹. There are single-sample standards of 61 for freshwater and 104 for marine water, however, the geometric mean provides a more reliable view of conditions over time.



Results

Bacterial levels were surprisingly high in the Cape Neddick River, even during periods of dry weather. Three freshwater sites out of four exceeded the EPA geometric mean standards. Site CNR-2, where the river enters the harbor, showed a geometric mean of over 440, far above the EPA standard of 33. Two other upstream locations showed geometric means over 80. Fortunately, geometric means in the harbor and near the beach were within the EPA standard, although there was a single-sample exceedence at the Shore Road Bridge. The relatively

¹ Numbers refer to bacterial colonies per 100mL of water.

cleaner offshore waters probably dilute the river water as the tide flushes in and out twice a day. The drought may have helped, because the river flow was very low during this period. During periods of higher river flow, such as after heavy rains or during the spring melt, freshwater runoff might overwhelm the ability of the tides to dilute the upstream waters. The more populated areas tend to have higher bacterial counts. Similar patterns of more bacteria in freshwater rivers than in the estuary were seen in Wells, Ogunquit and the Kennebunks over the past decade. It suggests that most bacteria in this region come from land-based activities and are transported to beaches by rivers flowing through the land, rather than from offshore sources. Even though the beach seemed clean most of the time, the extremely high bacteria levels in the river need to be reduced to protect the health of those who use the river and the beach.

Based on the small amount of data collected so far, it is possible to make an educated guess about likely sources. I believe the most probable sources are a few aging and malfunctioning wastewater disposal systems. It is unusual that such high bacterial levels were seen during a period of no rain and low river flow. A possible explanation is that malfunctioning septic systems, continuously supplied with water from structures they serve, provided a steady supply of bacteria regardless of rainfall. It is likely that a few older structures in Cape Neddick are still served by their original wastewater system.

Wastewater systems prior to 1974 required no permitting, and may consist of nothing more than a pit or perforated tank in the ground. They may be undersized relative to the use they receive. As long as a property owner does not experience any trouble with indoor plumbing or sewage breakouts in the yard, they may be totally unaware that their system is discharging untreated wastewater into a stream or shallow groundwater. The Town adopted an ordinance many years ago that requires pumping of septic tanks every five years. This ordinance could help reveal failing septic systems, but it has never been enforced. A new reporting requirement for those who pump-out septic tanks will take effect in January 2008. Complete pump-out data will take five years to compile using these reports. In areas where water quality is poor, we can actively research septic permits and require documentation of adequate wastewater treatment for structures with no recorded system. This approach does not require additional rules or regulations. We simply need to develop the necessary database and administer the rules already on the books.

Recommendations

Expand Water Testing: We should continue monitoring the Cape Neddick watershed, and expand the testing to include tributaries to other public beaches beginning in 2008. The Maine Healthy Beaches program provides training, equipment and lab analysis for Parks and Recreation's weekly beach testing, and they have offered similar support to watershed testing. No additional staff or equipment would be required. Cape Neddick testing can be streamlined (just CNR2, CNR3, and CNR4) to facilitate testing in other areas. Sampling should occur every two weeks in June, July and August, coinciding with MHB days and including post-storm days when possible. Testing during spring melt would be useful, but optional. Other towns have begun upstream testing because they are experiencing water quality problems. York is taking a preventative approach, with the goal of understanding the patterns of bacteria in our watersheds before beach closures become a problem.

Upgrade Databases: Septic system data has never been entered into a searchable database. Although we have inspected every new septic system in town since 1974, we have no list of

where they are. We need to know with certainty which structures have public sewer, which have septic, and which have no recorded wastewater system. It is especially important to identify structures for which no records exist, because they are the most likely systems to be outdated and malfunctioning. The need to modernize septic-system record-keeping is shared by other towns and the state. If we can work with the Maine Division of Environmental Health or other interested towns, we may be able to draw upon additional resources and create a lasting and efficient solution that can be widely adopted.

Use Water Quality and Septic Database to Guide Enforcement: The Community Development Department intends to begin enforcement of the septic pump-out rules in 2008. It is not feasible to check every septic system in town at once, because the records are incomplete, not organized for this purpose, and cover too many households. The new requirement that septic haulers file a monthly report helps us achieve our goal, but it will take five years before records are complete enough to see which properties have failed to pumped-out within the required time period. Additional water testing can overcome these limitations by showing where the problems occur so we can intelligently focus our enforcement efforts in the surrounding area.

Advise Against Water-Contact Recreation in Upper Cape Neddick Harbor: In light of the high bacterial levels found in the Route 1 and upper Cape Neddick Harbor areas, I propose we post an advisory against water-contact recreation in the Cape Neddick River from Hutchins Lane to the Clark Road Bridge. I hope we can find and fix the sources of the bacteria in this area, and remove that advisory soon. Continued water monitoring there is essential to measuring our progress. In the meantime, we should recommend that people avoid water contact there.

Appendix: Table of Results

Enterococci results for Cape Neddick Watershed. The shaded cells exceed the EPA standards (single sample results: 61 for freshwater, 104 for marine water, geometric mean: 33 for freshwater and 35 for marine water). Units are CFU/100mL.

Site name	Location	8/15/07	8/22/07	8/29/07	9/4/07	9/6/07	9/11/07	Geometric mean
YK-02	Cape Neddick Beach	5	10	31	Not tested	Not tested	Not tested	25.4*
CNR-1	Shore Rd. Bridge	30	5	199	10	5	52	20.7
CNR-2	Head of Tide	85	1010	677	2143	169	355	442.2
CNR-3	Hutchins Ln.	20	5	10	52	5	84	16.7
CNR-4	West of Route 1	20	52	97	10	84	3654	82.3
CNR-5	Near Turnpike	183	63	168	107	5	663	93.9

* Calculated from all 2007 data. Earlier sample dates not shown.

Complete *Enterococci* results for Cape Neddick Beach only. The shaded cells exceed the EPA standards (single sample results: 104 for marine water, geometric mean: 35 for marine water).

Site name	6/6/07	6/13/07	6/15/07	6/20/07	6/27/07	7/5/07	7/9/07	7/11/07	7/18/07	7/25/07	8/1/07	8/3/07	8/8/07	8/15/07	8/22/07	8/29/07	Geometric mean
YK-02	108	206	41	0	5	563	20	30	31	5	250	63	5	5	10	31	25.4