

Escherichia coli and its Presence in Beach Sands

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Introduction

Escherichia coli is a bacteria that is found in the lower intestine of warm blooded animals. Not all strains of *E. coli* are dangerous to human health however there are some strains of *E. coli* that can cause serious illness or death ¹.

E. coli is a major issue of water quality; today beaches are closed on a frequent basis due to *E. coli* levels being too high. In the past high levels of *E. coli* being present in waters has been blamed on sewage overflow getting washed into the water. Recent studies have shown that it may be possible for *E. coli* to live in beach sands causing the water to become re-infected when water passes through the beach sands.

The beach that we are sampling is located directly beside a wastewater treatment facility. Our project has the chance at potentially making the connection between *E. coli* levels and water levels at Port Weller to determine if this problem is in fact occurring at the beach. By establishing this connection we hope determine a method on how to prevent this from being a major problem at beaches.



Aerial Photograph of Municipal beach

Purpose

The Purpose of our project was to determine if *E. coli* is present in the beach piezometers which would indicate that *E. coli* is able to live in the sands at the beach. We also hoped to establish a connection with the water level of the lake and how it can effect the level of *E. coli* found in the water in the piezometers.

Acknowledgments & References

We would like to thank our project coordinator Kerry Kennedy, the City of St. Catharines, and the many NEC volunteers who helped with the sampling and lab analysis throughout the project

1. <http://www.textbookofbacteriology.net/e.coli.html>
2. <http://www.ene.gov.on.ca/envision/gp/3303e.htm>

Methodology

The sampling at municipal beach was split up to include field sampling and lab analysis. We sampled 4 times between December and March. There were eight piezometers installed at the beach which were set up in 2 rows of 4 to ensure that there would be enough data coming from the sampling as well as to ensure they would be easily found upon each visit.

Field Sampling

The field sampling is comprised of Surveying, Collecting the water chemistry data, and retrieving water samples to check for *E. coli*.

Surveying

We used surveying equipment to record the collar heights of the piezometers. This was done to record if there was any movement in the piezometers to ensure that water levels were accurate.



Using Surveying equipment

Water chemistry

Each of the 8 piezometers were sampled using a YSI meter to determine the water chemistry Of the wells.



Using the YSI meter

Purging the water

To purge the water we first had to determine the depth of the water in the piezometer to calculate how much water was needed to purge to get fresh water for our sample collection. For each of the piezometers sampled there was 2 samples taken to the lab for analysis. All the equipment used in the piezometer sampling was sterilized to ensure that the results were not contaminated.



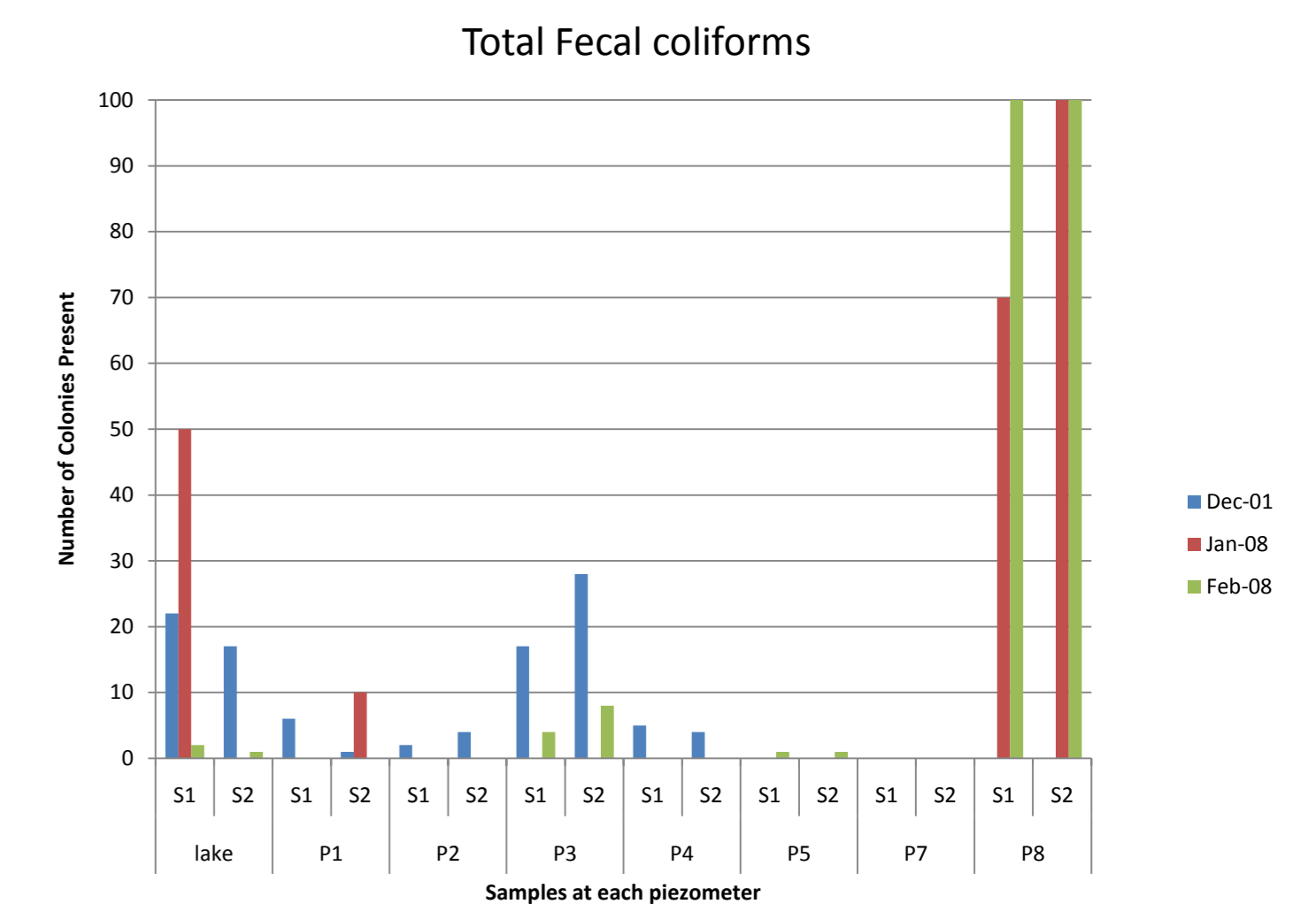
Purging the piezometer water

Lab Analysis

The samples taken from the piezometers were brought back to the lab to determine the *E. coli* concentrations. To perform the lab analysis we used 3 different dilutions of the sample with one being a pure 100ml sample, the 2nd being a 1/10 dilution of the sample, and the third being a 1/100 dilution. The samples were then put through a filter and placed into a Petri dish and placed in an incubator to allow the colonies to develop and then later counted .

Results

The results of the sampling show the *E. coli* concentrations found at our site which includes a lake sample and a sample from each of the eight piezometers. The results in the piezometers varied from week to week with different *E. coli* counts coming from each of the piezometers. Some piezometers were not sampled at every sampling date due to factors such as movement of the piezometer, and the well being dry, as a result there are missing data points for some of the piezometers.



The graph above shows the amount of fecal coliforms counted in each 100ml sample taken from the piezometers. It should be noted that the graph only shows up to 100 counts as according to the Ontario provincial water quality objectives water is not suitable to swim in if counts exceed 100 colonies per 100ml ².

Conclusion

Throughout our sampling we have found *E. coli* to be present in our piezometers that was far greater than *E. coli* concentrations found in the surrounding lake waters which indicates that the beach sands are in fact contaminating the water as it passes through the beach sands.