

Minnesota's Lake Superior Coastal Program

Interactive Animation and Visualization Tool for Exploring Lake Superior Beach Monitoring Program Bacteria Data

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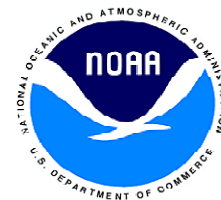
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Introduction

Lake Superior Beach Monitoring Program staff collaborated with the Natural Resources Research Institute (NRRI-UMD) staff to develop and implement interactive online tools for viewing lake and estuary indicator bacteria data with a new perspective. This data visualization tool was installed on the www.lakesuperiorstreams.org (originally www.duluthstreams.org) website with appropriate links from the Lake Superior Beach Monitoring website (www.mnbeaches.org also developed in collaboration with NRRI) to allow users to visualize changes in bacteria counts over time compared to temperature, precipitation, wave height and wind direction. The tool enhances the use of ambient surface water (MPCA program priority #4) data by professionals at resource agencies, consulting firms, NGOs and universities; by teachers and students, and by the general public. It assists the Lake Superior Beach Monitoring Program in achieving its goal of providing data and education to the water recreating public.

Work Completed

An existing contract with the Natural Resources Research Institute (NRRI) was amended and was signed August 30, 2005 to begin work on the development of the Data Visualization Tool for the Lake Superior Beach Monitoring Program.

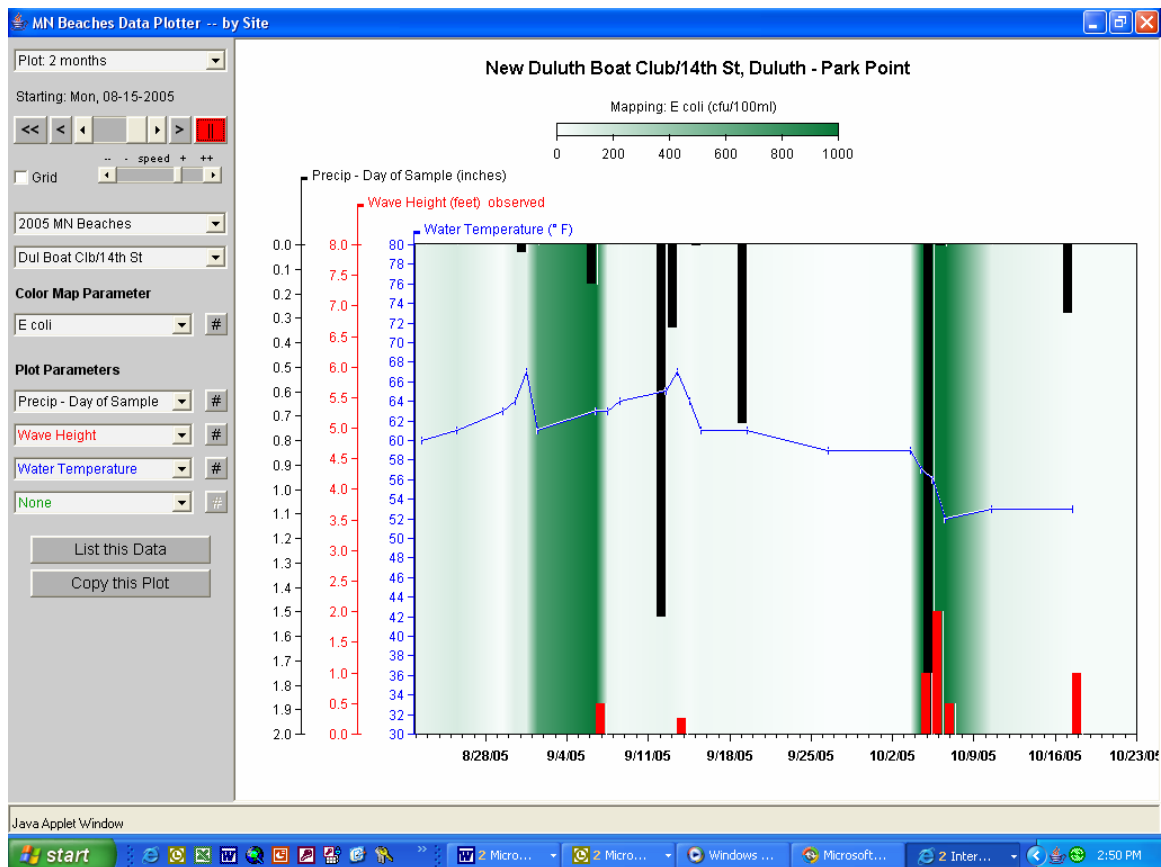
Work focused on adapting and extending the data structures used by the existing data visualization tool to accommodate the additional requirements for plotting the bacterial data. Among these changes:

- Adding the ability to import, interpret, and plot data that is not strictly numeric (e.g., <1, >5000, TNTC).
- Adding coordinate fields, and developing a mechanism to indicate the sampling site locations on maps and photos.
- Adding comment fields which can be included in the graphs.
- Adding the ability to display action thresholds and to visibly indicate when they have been exceeded.
- Evaluating and utilizing the GoogleMaps API as a tool for displaying interactive map information.

Results

This project developed a web-based data visualization tool (DVT) that imports all of the previously collected (2003, 2004, and 2005) fecal coliform and *E. coli* data from the Lake Superior Beach Monitoring Program and allow it to be displayed interactively. The tool allows the user to select either a specific sampling station and then “run” a movie-like animation of the data over time, varying the speed and time scales; or select a particular sampling date and then display all other sites. In each case, the tool allows for the display of bacterial concentrations, and other ancillary data such as precipitation during the previous 24 or 48 hrs, wind speed, turbidity, air and water temperature, wave height, etc. One parameter can be color mapped for ease of visualization and the others depicted graphically as line plots. Parameters can be switched to the color mapper “on-the-fly” allowing users to rapidly examine potential relationships between bacteria, water quality, and weather variables, as well as concordances between stations. Stations from the Duluth-Superior Harbor, Park Point and the North Shore are grouped for convenience.

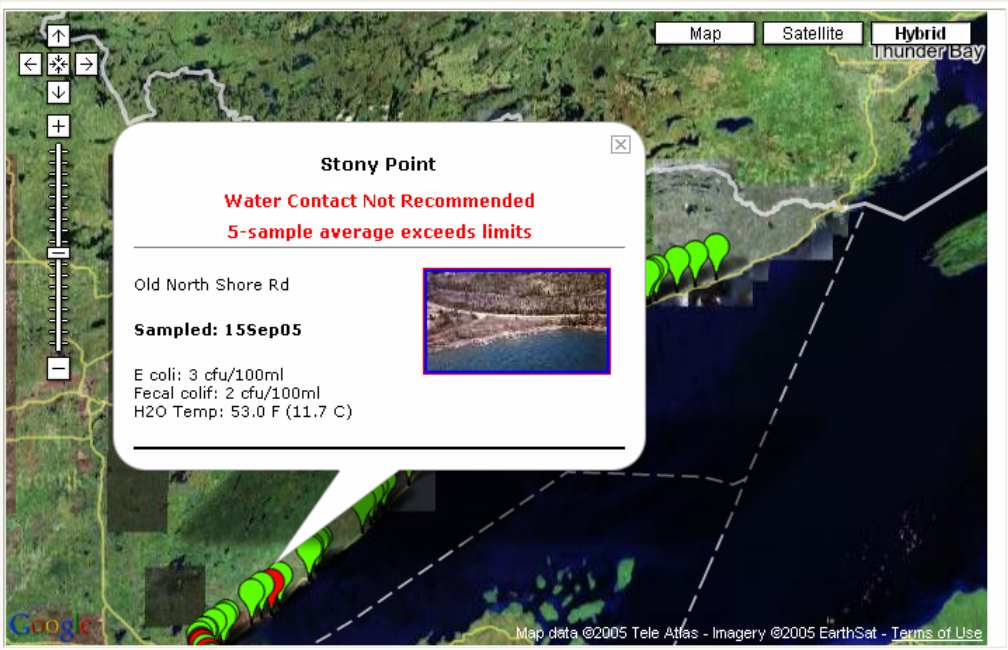
Data Viewer Example:



Advisory Mapper Example during monitoring season:

MN Beach Status (W. Lake Superior) -- for Thursday, 15Sep05

Zoom to an area -- [All](#) | [Duluth](#) | [Two Harbors](#) | [Silver Bay](#) | [Schroeder](#) | [Grand Marais](#)



Stony Point

Water Contact Not Recommended
5-sample average exceeds limits

Old North Shore Rd

Sampled: 15Sep05

E coli: 3 cfu/100ml
Fecal colif: 2 cfu/100ml
H2O Temp: 53.0 F (11.7 C)

Map data ©2005 Tele Atlas - Imagery ©2005 EarthSat - Terms of Use

Water Contact Acceptable | Water Contact Not Recommended | No Recent Sampling Data

[View a page showing all the pop-up info-window content \(new window\).](#)

Pop-up Information Window Content Page Example:

MN Beach Status (W. Lake Superior) -- for Thursday, 15Sep05

Paradise

Water Contact Acceptable

East Grand Marais

Sampled: 12Sep05

E coli: 2 cfu/100ml
Fecal colif: <1 cfu/100ml
H2O Temp: 55.0 F (12.8 C)

Kadunce Creek

Water Contact Acceptable

East Grand Marais

Sampled: 12Sep05

E coli: 15 cfu/100ml
Fecal colif: <1 cfu/100ml
H2O Temp: 55.0 F (12.8 C)

Durfee Creek Area

Water Contact Acceptable

East Grand Marais

Advisory Mapper Example during non-monitoring season:


MN Beach Sampling Will Resume May, 2006

Zoom to an area -- [All](#) | [Duluth](#) | [Two Harbors](#) | [Silver Bay](#) | [Schroeder](#) | [Grand Marais](#)

Map Satellite Hybrid




Tettegouche State Park Beach

Sampling Season Over
will resume May, 2006



Thunder Bay

Map data ©2005 Tele Atlas / Imagery ©2005 EarthSat - Terms of Use

 Water Contact Acceptable	 Water Contact Not Recommended	 No Recent Sampling Data
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Conclusions

The challenge for this project was characterizing the data available for the Lake Superior Beach Monitoring Program in an interactive manner and tells a visual story. Our desire was to use the data to give the general public a picture of what is going on at the beaches we monitor while having enough detail to be useful for the scientists. It can become overwhelming if too much information is on the visualization tool but the staff at NRRI did a nice job making this data visualization tool useful to all groups.