A BAYESIAN HIERARCHICAL MODELING APPROACH FOR COMPARING WATER QUALITY MEASUREMENTS FROM DIFFERENT SOURCES

The U-M Water Center engages researchers, practitioners, policymakers, and non-profit groups with the goal of supporting, integrating, and improving current and future restoration and protection efforts.

The grants program is an important part of the Water Center’s efforts to enhance restoration and protection activities by engaging exceptional multi-sector teams in advancing evaluation and assessment of restoration projects.

FOR MORE INFORMATION

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Project Summary

Long-term monitoring is essential in providing information not only about a lake’s environmental and ecological conditions, but also about the effectiveness of various lake restoration projects. Because of its size, Lake Erie has been monitored by different organizations through a network of monitoring stations. These institutions, however, often use different sampling protocols and different laboratory analytical methods for important parameters. Consequently data from these institutions may not be comparable and when assessing water quality status and trends we are limited to using data from one source at a time. Because sites managed by different institutions have different spatial coverage, comparisons of trends in different areas of the lake is difficult. Furthermore, by using data from one source at a time, we are using smaller data sets that may lead to reduced statistical power for detecting trends.

This project will develop statistical models for linking data from different organizations collected using different sampling methods. It will allow existing data sets to be combined to carry out holistic lake analysis in a way that is not currently possible.

• Phase I: compile existing monitoring data, total phosphorus and chlorophyll \(a\) concentrations in the Western Basin of Lake Erie, from partners including USGS, Ohio EPA, Ohio DNR, National Center for Water Quality Research at Heidelberg University, Lake Erie Center at the University of Toledo, and Cooperative Institute for Limnology and Ecosystems Research of the University of Michigan, and develop models linking measurements from different institutions.

• Phase II: the models developed in Phase I will be used to design a field study to collect data from the same locations as the source data using multiple sampling and analytical methods. These data will be used for model assessment.

MODIS satellite image of Lake Erie.
Photo courtesy of NOAA CoastWatch