Available Water Data Are Inadequate to Evaluate Agricultural Management Practices for Improving the Health of Lake Erie

Record harmful algal blooms driven by nutrient loadings to Lake Erie have affected water quality, fish populations, tourism and the economy across the entire Lake Erie region for the past several years. A bloom in August 2014 resulted in a drinking water advisory for the city of Toledo, Ohio, restricting water use for 400,000 people for three days. Agriculture is the dominant land use in the western Lake Erie drainage basin where nonpoint nutrient sources account for 71 percent of the nutrient load to Lake Erie (Ohio Lake Erie Phosphorus Task Force, 2010). Consequently, agricultural management practices are among the most important tools for reducing nutrient loads that lead to harmful algal blooms in Lake Erie.

How effective are agricultural management practices at reducing nutrients from nonpoint sources at the watershed scale?

Satellite view of the 2013 Lake Erie harmful algal bloom. Photo credit: NASA.

This policy question was the subject of a study by the Northeast-Midwest Institute evaluating available water data to answer urgent water policy questions. The study found that current water quality monitoring in the Lake Erie drainage basin is inadequate for measuring the effectiveness of agriculture management practices at the watershed scale. The monitoring challenges identified in the Lake Erie drainage basin, such as the lack of overlap between monitoring sites and areas targeted by conservation incentive programs, likely apply in other regions across the country. Moreover, a substantial increase in agricultural management practice use is needed to generate and detect statistically significant reductions in nutrient loads to Lake Erie, even in places where the needed water data are collected.

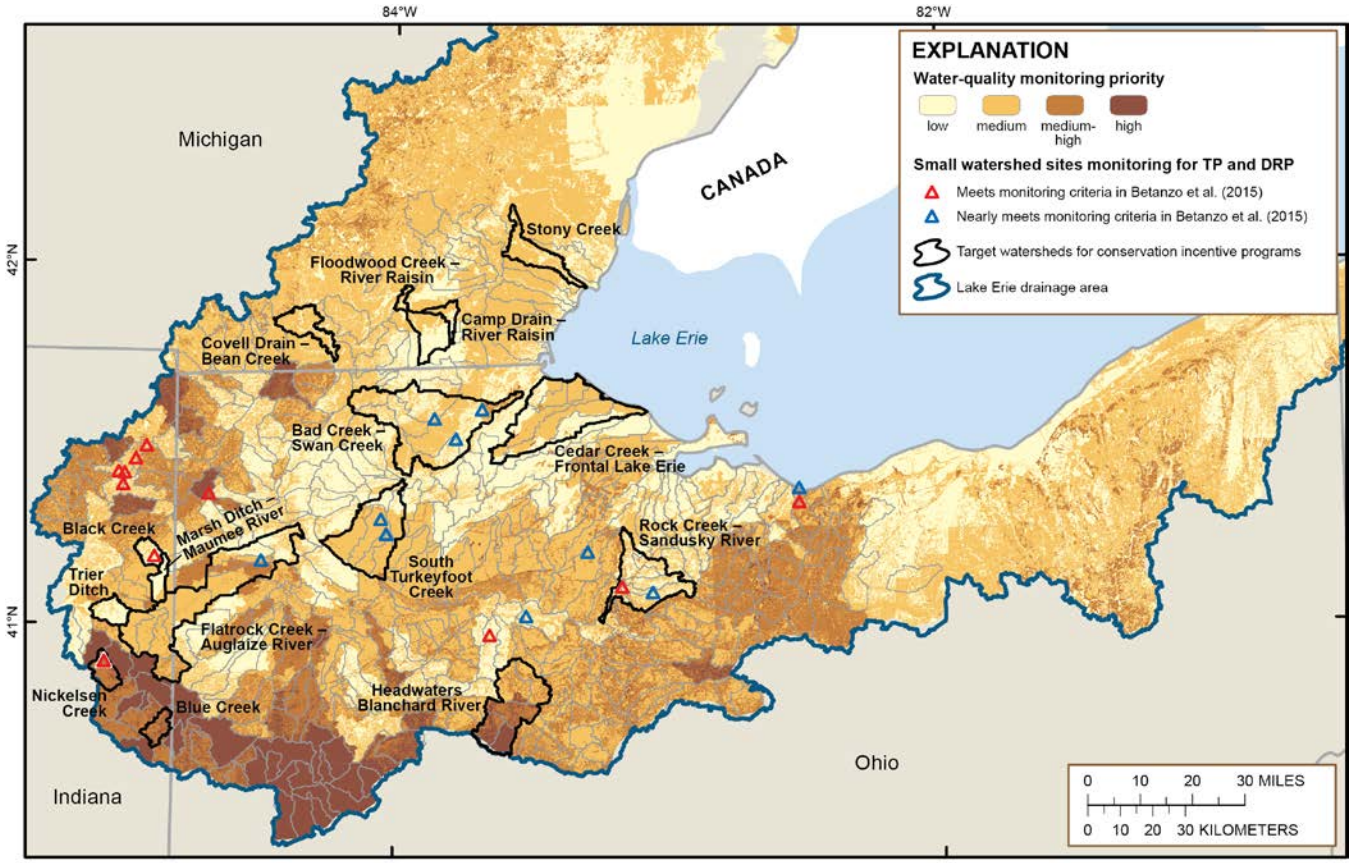
The study presents important findings regarding existing water data in the Lake Erie drainage basin:

- Only 15 of the 1,890 active and historical water quality monitoring sites are located in small (50 square miles and smaller) and large watersheds, and sampled with sufficient frequency to detect reductions in nutrient loads at the watershed scale. Nutrient reductions resulting from agricultural management practices can be measured sooner in small watersheds as compared to larger watersheds. Watersheds 1,000 square miles and larger that drain directly to Lake Erie are responsible for the largest agricultural nutrient loads that contribute to harmful algal blooms in Lake Erie.
- There is a lack of small watershed monitoring sites in priority areas for water quality monitoring (areas vulnerable to soil loss and with high phosphorus yield), and areas with conservation incentive programs.
- Active monitoring sites are collecting necessary large watershed data in the Maumee River, Sandusky River, and the River Raisin watersheds. Continued, long-term water quality monitoring is essential in these large agricultural watersheds to detect nutrient load reductions to Lake Erie.

The study also presents recommendations for immediate action:

- Locate new small watershed monitoring sites and conservation incentive areas in unmonitored high priority watersheds.

- Identify modifications to existing water monitoring and conservation incentive programs that allow for the most efficient use of small watershed monitoring resources. A coordinating entity should lead this collaborative planning process enlisting both water monitoring and agriculture organizations.
- For both existing and new water quality monitoring sites, maintain sampling for a minimum of ten years after new agricultural management practices are installed to evaluate their effectiveness in reducing nutrient loading.
- Substantially increase the use of agricultural management practices to generate statistically significant nutrient load reductions at both small and large watershed scales in the Lake Erie drainage basin.
- Ensure access to management practice implementation and land use data in monitored watersheds to quantify the relationship between these practices and water quality trends.



This map shows 1) that priority areas for water quality monitoring lack small watershed monitoring sites (as of February 2015), and 2) there is a lack of overlap between monitoring sites and areas targeted by planned conservation incentive programs. Modified from Figure 4 of the Addendum (Betanzo et al., 2015).

The study is summarized in a report prepared by Elin A. Betanzo, Anne F. Choquette, Kenneth H. Reckhow, Laura Hayes, Eric R. Hagen, Denise M. Argue, and Allegra A. Cangelosi. The complete study report and an addendum that describes new water quality monitoring and conservation incentive programs starting in spring 2015 can be found at www.nemw.org.