Expanded Water Quality Monitoring in the Western Lake Erie Basin

Summary/Background

Understanding, tracking, and predicting nutrient loads from the Western Lake Erie Basin (WLEB) watershed is difficult. This is due to the complex drivers of nutrient loss within sub-watersheds in the WLEB including variable weather, cropping systems, farm management, and nutrient cycling.

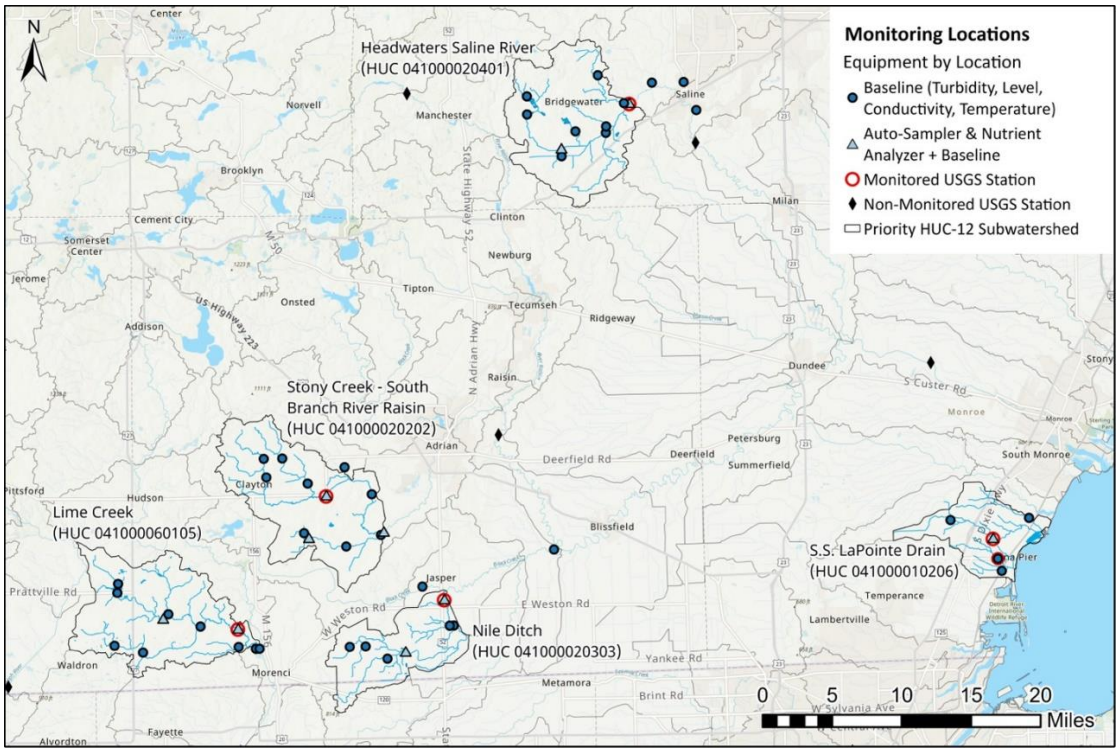
By increasing monitoring capacity in the WLEB at smaller sub-watershed scales, with a particular emphasis on deploying higher spatial density monitoring instrumentation, MDARD and partners can better understand the impact of various drivers on nutrient transport. For conservation practitioners, the use of higher-density instrumentation will aid in understanding the connection between land management decisions and water quality outcomes. Understanding this connection will allow Michigan Department of Agriculture and Rural Development (MDARD), partners, and practitioners to better target conservation and land management practices to meet phosphorus reduction goals set for Michigan's portion of the WLEB.

To better understand hydrologic conditions and phosphorus/sediment transport dynamics in Michigan's portion of the WLEB, a five-year monitoring project was launched in five of Michigan's priority sub-watersheds: Headwaters Saline River; South Branch River Raisin; Lime Creek; Nile Ditch; and S.S. LaPointe Drain.

Project Goals

1. Establish a monitoring network to begin to understand current water quality conditions in the upper headwaters of the Basin, specifically Michigan's priority HUC 12 sub-watersheds.
2. Assess the viability of a relatively lower-cost monitoring network – that leverages lab analyses combined with online sensors – for future monitoring in the WLEB headwaters.
3. Continuously monitor for SRP which Michigan has limited data on but a high degree of interest among agency officials and stakeholders.
4. Evaluate Soil and Water Assessment (SWAT) models with new water quality monitoring results and update existing SWAT models with more current weather conditions (2010-2020) and to the latest version of the software (SWAT+).
5. Understand temporal variation of soluble reactive phosphorus (SRP), total phosphorus (TP), total suspended solids (TSS), turbidity, conductivity, and stream flow & level at a finer spatial resolution relative to other monitoring efforts.
6. Produce twice-yearly data analyses and summaries describing water quality trends and conditions in the watershed.
7. Integrate monitoring data into the Great Lakes Watershed Management System – Nutrient Tracking Dashboard – and into the SWAT models.

Project Area with Monitoring Locations



Anticipated Outcomes

- 250 sensor/parameter site pair combinations (~50 sites) across the five priority sub-watersheds measuring water level, flow, turbidity, rainfall, and conductivity. These sites will generate approximately 66 million data points over the five-year period.
- 10 online nutrient analyzers and autonomous grab samplers across the five priority sub-watersheds. These samplers will generate over 250,000 measures of SRP over the five-year period.
- Grab samples throughout the priority sub-watersheds to measure TP, TSS, and SRP. Grab samples will capture wet and dry weather conditions and total approximately 2,700 grab samples from ~50 sites over the five-year period.
- Installation of up to 5 low-cost tile drain monitors in select locations throughout the watersheds. These monitors will provide additional context for measurements at the water quality gauges.

Data Availability

All monitoring data will be publicly available for download. Data collected during this project will be synthesized twice a year and a summary will be posted on the Great Lakes Watershed Management System website, hosted by Michigan State University IWR.

Timeline, Funding, & Project Team

This project runs from 2024-2029 with full data collection starting in 2025. Funding for this project is provided by the Michigan Department of Agriculture and Rural Development ($4.86M) and the Erb Family Foundation ($600,000). The project team includes the Alliance for the Great Lakes, LimnoTech, and the Michigan State University Institute of Water Research.

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