Assessing the Sources and Management Options for Detroit River Nutrient Loads to Lake Erie

The rivers flowing into Lake Erie carry nutrients such as phosphorus that can lead to nuisance and harmful algal blooms in its western basin, and hypoxic (low oxygen levels) conditions in its central basin. Despite nutrient management efforts, algal blooms that impact fishing, swimming, tourism and drinking water systems have become larger and more frequent in recent years. The Detroit River's contribution of phosphorus to Lake Erie is somewhat uncertain due to limited data and lack of attention to its watersheds, and this uncertainty has complicated efforts to develop a regional strategy for reducing nutrient inputs.

Through the 2012 Great Lakes Water Quality Agreement, the U.S. and Canadian governments are developing strategies and domestic action plans to reach specific water quality goals. Phosphorus inputs (loads) have been identified as a central driver for Lake Erie, but it is not clear which management techniques and locations should be targeted to most efficiently and effectively reduce inputs. For example, what level of emphasis should be placed on combined sewer overflow releases, run-off from agricultural lands, or point sources of nutrients?

Watershed Modeling

This study will model the nutrient dynamics within the watersheds that drain into the St. Clair and Detroit rivers. This bi-national watershed includes the Clinton, Rouge, Sydenham and Thames rivers, as well as inputs from the cities of Detroit and Windsor (see map over). The planned modeling approach is designed to characterize nutrient loads to the Detroit River and then compare the efficacy of different management options.

Photos: *Left:* Satellite image of Lake Erie, October 2013. Credit: NOAA Coast Watch. *Right:* Algae bloom near Kelly Island, Ohio, October 2011. Credit: NOAA GLERL.

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PROJECT PERIOD
January 2016 – December 2018

Based on a broad suite of water quality measurements and watershed parameters (e.g., soils, topography, land use, climate), the model will simulate the hydrology and water quality throughout the St. Clair and Detroit river watersheds. The effort will link several types of models to characterize agricultural and urban inputs, as well as nutrient retention within Lake St. Clair. The University of Michigan team conducting this effort has modeled other river systems connected to Lake Erie, including the watersheds for the Maumee, Huron, and Raisin rivers.

Input from Policy and Mangement Advisors

A project advisory group has been assembled to provide feedback on the policy context, planned research approach, and resulting products. The advisory group includes representatives from federal, state, and provincial governments; non-profits; universities; and local organizations actively involved in watershed management, policy development or applied research. Through bi-annual meetings and ongoing communication, the advisory group will help ensure the research is scientifically credible and the results are relevant and usable for the Great Lakes policy and management community.

Anticipated Results

This three-year collaborative research project is designed to inform regional planning and the selection of nutrient reduction strategies to help achieve agreed upon water quality targets. Final products will be developed in consultation with the advisory group and other stakeholders, but will likely include:

- A fully calibrated model simulating hydrology and water quality for the St. Clair and Detroit river watersheds (see map).

- Maps depicting nutrient contributions from different areas, land types, and point sources.

- Estimates of variability in nutrient loads and identification of the factors driving those loads.

- A robust comparison of different nutrient reduction practices specific to this watershed under a range of climate conditions.

- Succinct, graphical summaries of project results to inform regional planning.

- Two symposia to discuss this and other related projects.
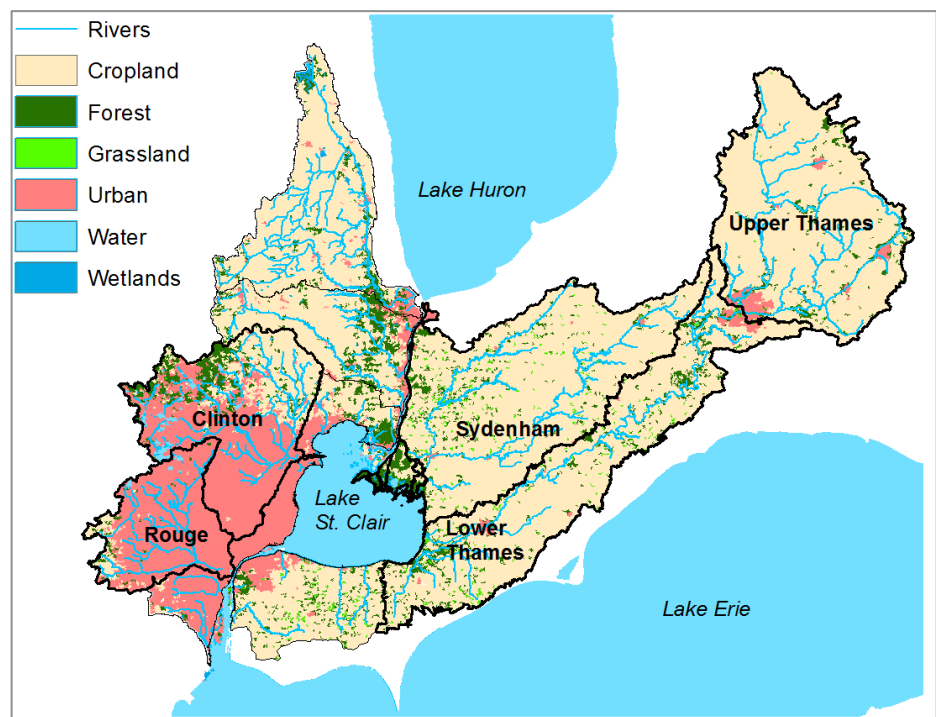
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SUPPORT
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The U-M Water Center addresses critical and emerging water resource challenges through collaborative research projects. The Center is part of the Graham Sustainability Institute, which integrates faculty and student talent across the University of Michigan, and partners with external stakeholders, to foster collaborative sustainability solutions at all scales.