

Forecasting the Causes, Consequences, and Potential Solutions for Hypoxia in Lake Erie

Donald Scavia, Larissa Sano, J. David Allan, Dmitry Beletsky, Tomas Höök, Thomas Johengen, Edward Rutherford, (University of Michigan)

Stephen Brandt, Stuart Ludsin, Tom Croley, Doran Mason, Steven Ruberg, David Schwab, Henry Vanderploeg (NOAA-GLERL)

Steven Bartell (E2, Inc.); Joseph DePinto (LimnoTech, Inc.); David Dolan (University of Wisconsin – Green Bay); Chansheng He (Western Michigan University); Roger Knight (Ohio DNR); Peter Richards (Heidelberg College)

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Lake Erie hypoxia increased during the mid-1900s due to excessive phosphorus (P) inputs, and may have contributed to the decline of several commercially important fishes by the 1960s. In part due to P load reduction and enhanced oxygen levels, several of these species had begun to recover by the mid 1990s. More recently, however, large-scale low-oxygen conditions have returned to levels comparable to those during the height of eutrophication. It is not clear why this has happened.

Lake Erie hypoxia is driven primarily by the interaction of non-point sources of nutrients and climate variation, with potential impacts from alterations in material flow caused by the invasion of Dreissenid mussels.

This project will create, test, and apply models to forecast how anthropogenic (land use, invasive species) and natural (climatic variability) stresses influence hypoxia formation and ecology, with an emphasis on fish production potential.

This will be done through a linked set of models to forecast changes in nutrient loads, responses of central basin hypoxia to those changes, and potential ecological responses to changes in hypoxia. All three components will use multiple models and generate ensemble forecasts that explicitly recognize the range of uncertainties in model drivers and models.

This ensemble approach should improve the reliability of forecasts by integrating output from different models, each with different strengths and weaknesses. In addition, assessment of the variations in model output will help identify key uncertainties in the forecasted scenarios. These forecasts will be conducted within an Integrated Assessment framework that provides legitimate, useful, and timely information and advice over time and space scales relevant for land-use and fisheries management. The input and feedback from these managers is critical to the success of this project and key representatives of relevant agencies have been included in the development of this project.