

2014 Lake Erie Harmful Algal Bloom (HAB)

UM/GLERL Experimental Forecast Retrospective Assessment

12 December 2014

Summary:

In July of 2014, researchers from University of Michigan and NOAA Great Lakes Environmental Research Laboratory (GLERL) forecasted a western basin Lake Erie cyanobacteria bloom of 22,000 metric tons dry weight (MT), with a 95% predictive interval of 11,000 to 33,000 MT. The average observed late-summer bloom intensity, derived from NOAA remote sensing and University of Toledo field sampling, was approximately 29,000 MT, in general agreement with the forecasted range.

Retrospective Assessment:

In the spring of 2014, there was an approximately average level of total phosphorus (TP) loading from the Maumee River basin (Figure 1A). However, due to Lake Erie's increasing susceptibility to HABs (Obenour et al., 2014), our forecasting model predicted an above-average cyanobacteria bloom (Figure 1B). The forecast compared well with the NOAA remote sensing HAB observation (e.g., Stumpf et al., 2012), which was approximately 4.5 (cyanobacteria index units) corresponding to approximately 21,600 MT dry weight. The University of Toledo (UT) field sampling HAB observation (e.g., Bridgeman et al., 2013) was approximately 34.5 (mL/m²/yr biovolume production) corresponding to approximately 37,300 MT dry weight. The discrepancy between the 2014 NOAA and UT bloom observations is larger than for any other year, and future research will investigate the possible causes of this discrepancy.

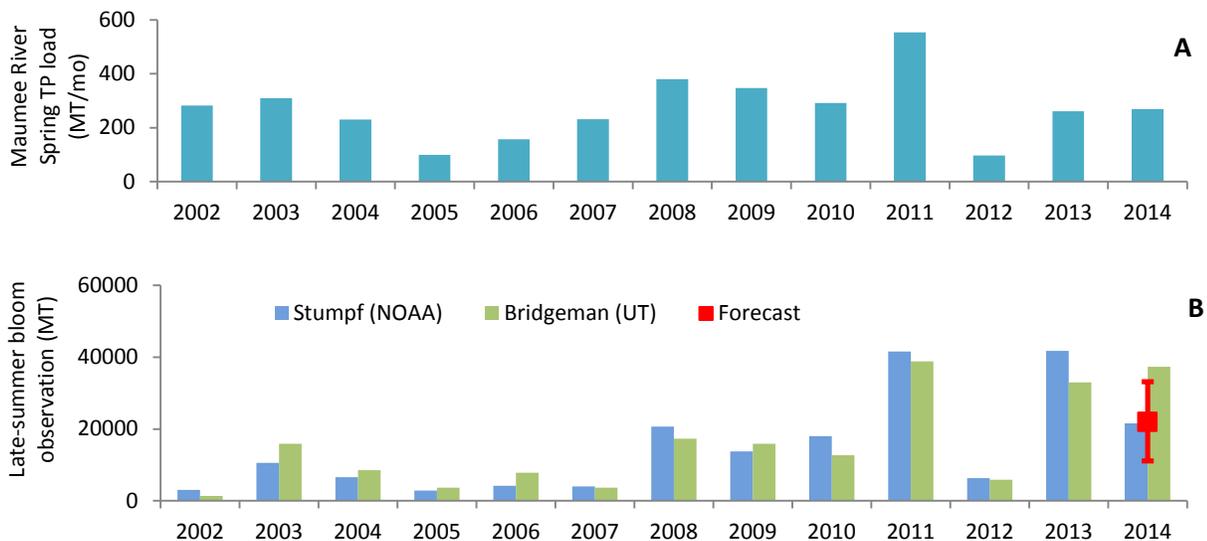


Figure 1: Spring TP loads (A) and western basin bloom observations (B) along with 2014 boom forecast and 95% predictive interval (red).

The 2014 model forecast and HAB observations shown in Figure 1 are also consistent with an estimate of HAB magnitude developed by researchers at Michigan Tech Research Institute (MTRI) and the Cooperative Institute for Limnology and Ecosystems Research (CILER), indicating a bloom of at least 13,000 MT (dry weight). This conservatively low estimate is based on an MTRI remote sensing algorithm and field data collected by GLERL/CILER staff. Future research will aim to further integrate the CILER/GLERL/MTRI data within the HAB forecasting model.

Additional Lake Erie HAB resources:

Throughout the summer, high-resolution HAB tracking and forecasting information is available through the NOAA *Experimental HAB Bulletin*. This bulletin includes the present location of any HAB and its likely future movement, as well as the results of in-lake cyanobacteria sampling:

<http://www.glerl.noaa.gov/res/waterQuality/?targetTab=habs>

More general information on HABs, including advice for individuals affected by HABs, may be found in the following Ohio Sea Grant publication:

<http://www.ohioseagrant.osu.edu/documents/publications/FS/FS-091-2011%20Harmful%20Algal%20Blooms%20In%20Ohio%20Waters.pdf>

References:

- Bridgeman, T. B., J. D. Chaffin, and J. E. Filbrun (2013), A novel method for tracking western Lake Erie *Microcystis* blooms, 2002–2011, *Journal of Great Lakes Research*, 39(1), 83-89.
- Obenour, D. R., A. D. Gronewold, C. A. Stow, & D. Scavia (2014). Using a Bayesian hierarchical model with a gamma error distribution to improve Lake Erie cyanobacteria bloom forecasts, *Water Resources Research*, 50, 7847–7860.
- Stumpf, R. P., T. T. Wynne, D. B. Baker, and G. L. Fahnenstiel (2012), Interannual variability of cyanobacterial blooms in Lake Erie, *PLOS ONE*, 7, e42444.

Assessment team: Daniel Obenour¹, Drew Gronewold², Craig Stow², Steven Ruberg², Thomas Johengen³, and Donald Scavia⁴

HAB data providers: Thomas Bridgeman⁵, Richard Stumpf⁶, Robert Shuchman⁷

¹North Carolina State University, ²NOAA GLERL, ³CILER, ⁴University of Michigan, ⁵University of Toledo, ⁶NOAA CCMA, ⁷MTRI