

2019 Western Lake Erie Harmful Algal Bloom (HAB) Forecast

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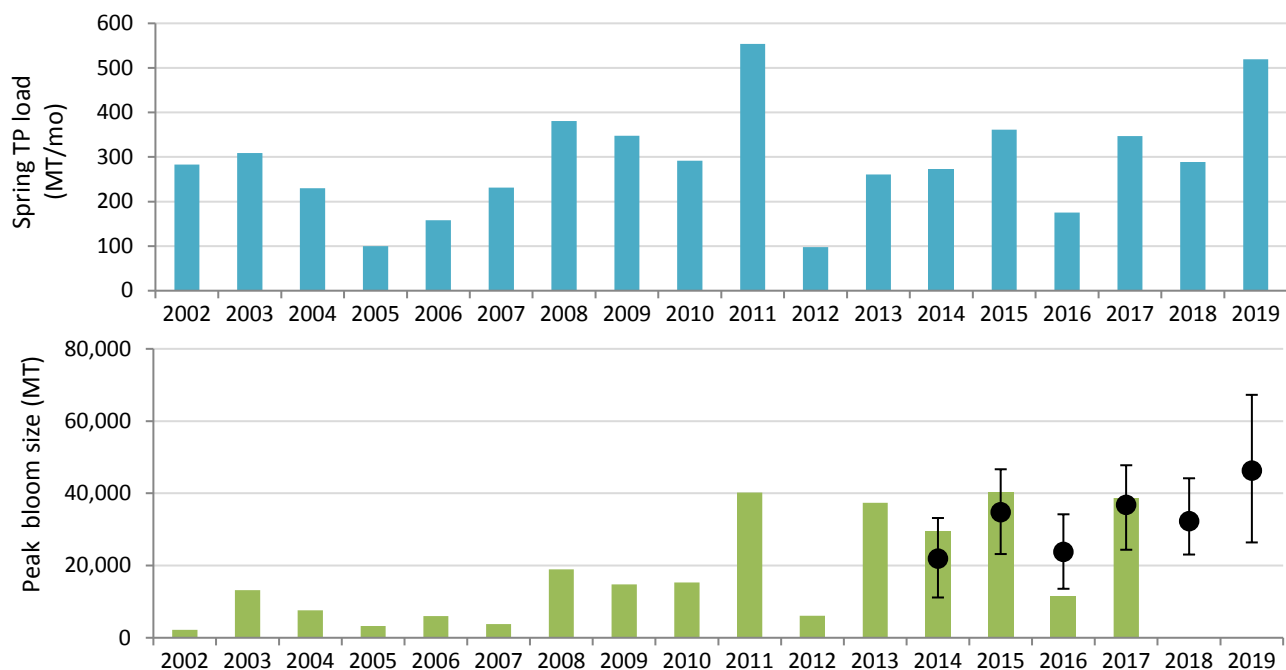


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Forecast summary: A cyanobacteria HAB of **46,300 metric tons (MT)** is predicted for the western basin of Lake Erie in 2019, with a 95% predictive interval of 26,400 to 67,300 MT. The bloom size over the last decade (2007-2018) averaged 24,600 MT, and the largest bloom to date was 40,000 MT in 2015, suggesting that this year's bloom is likely to be a **new record size**. The prediction is based on a probabilistic model developed by a team of researchers at UM, NCSU, and NOAA GLERL. This is one of several models NOAA uses to develop an ensemble bloom prediction.

Forecast details: This forecast is based on an empirical Bayesian model (Obenour et al., 2014; Bertani et al., 2016; Manning et al., 2019) relating bloom size (MT dry weight) to spring total phosphorus load (MT/month). The model also reflects the lake's apparent increasing susceptibility to HABs (i.e., less load is required to generate large blooms now than a decade ago), which is possibly due to invasive species, internal nutrient loading, and/or climate change. The model used here was developed by Bertani et al., 2016 and recalibrated by Manning et al., 2019 with a longer dataset from more updated sources. The current model was calibrated with 15 years of bloom observations developed by NOAA from satellite imagery (Stumpf et al., 2012) and by Michigan Tech Research Institute from MODIS-derived images of chlorophyll concentrations (Sayers et al., 2016). The 2019 bloom forecast compared to historical blooms and TP loads is shown below:



Spring phosphorus loads (top) and mean bloom observations with forecasts (bottom). Error bars represent 95% predictive intervals. Confirmed 2018 observation not available at time of this report.

Forecast motivation: The purpose of this forecast is to alert water resources managers and the public to the potential severity of the annual HAB bloom, which typically peaks in August or September. HABs, which are stimulated by nutrient loading from agricultural and urban sources, can produce toxins that are harmful to humans and other animals. HABs are also often responsible for taste, odor, and/or aesthetic problems in the lake, which discourage outdoor recreation and tourism. In Lake Erie, the magnitude of HABs has been increasing in recent years (Michalak et al., 2013; IJC, 2014; Wynne & Stumpf, 2015), compromising drinking water supplies and raising concerns among water resources managers and the public. Large algal blooms also contribute to hypoxia (low dissolved oxygen) in Lake Erie, which severely reduces the viable habitat of many fish species (Scavia et al., 2014).

Additional Lake Erie HAB resources: Additional Western Lake Erie HABs resources are available through NOAA GLERL (http://www.glerl.noaa.gov/res/HABs_and_Hypoxia/), including:

1. HAB tracking and forecasting information is summarized through the NOAA *Experimental HABs Bulletin*, which is updated regularly throughout the summer:

https://nccospublicstor.blob.core.windows.net/hab-data/bulletins/lake-erie/current/bulletin_current.pdf

2. Detailed 5-day forecasts of the spatial distribution of Lake Erie HABs based on remote sensing, monitoring, and hydrodynamic modeling are available from the *Experimental HABs Tracker*:

https://www.glerl.noaa.gov/res/HABs_and_Hypoxia/habTracker.html

3. GLERL also performs weekly water quality sampling, including **Microcystin (toxin) measurements**, which may be found here:

http://www.glerl.noaa.gov/res/HABs_and_Hypoxia/WLEMicrocystin.html

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