Harmful Algal Blooms (HABs) in the Great Lakes

Satellite image of the harmful algal bloom in Lake Erie, during the 2014 shutdown of Toledo's drinking water treatment facility. *Credit: NASA*

Harmful algal blooms threaten public health and recreation

Harmful algal blooms (HABs) in the Great Lakes occur when algae grow rapidly, forming dense scums and water discoloration. Some blooms can produce neurotoxins, liver toxins, and/or skin irritants. The toxins can contaminate drinking water, harm swimmers and pets in areas where toxins concentrate, and pose a severe nuisance to recreational and commercial boating and fishing.

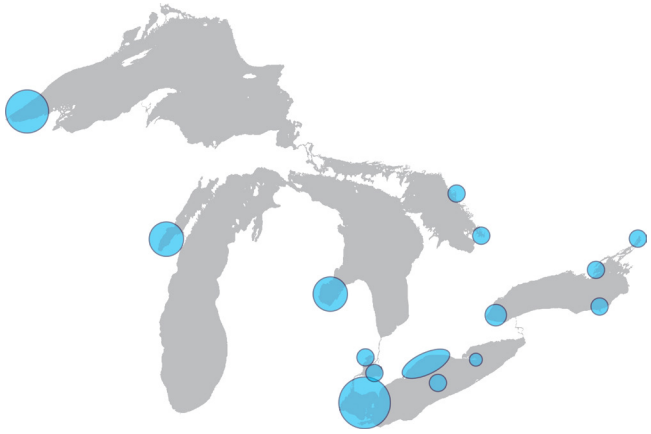
What causes the blooms?

Blooms are caused by excess nutrients entering the lake. Heavy rains wash soil and fertilizer containing phosphorus and nitrogen into rivers and streams that flow into lakes. Additional nutrient sources include sewage treatment plants, combined sewer overflows, water treatment plants, cleaning products, faulty septic tanks, and residential lawn fertilizers.

What happens if there is a big bloom?

The impact of the bloom depends on its toxicity, location, size, and duration. In the western and central Lake Erie basins, the NOAA-supported Lake Erie HAB Forecast and Lake Erie HAB Data Share provide information about the current location of the bloom and predict its location over the next few days. This helps stakeholders target their response to minimize impacts. Through the use of this information:

- Water treatment managers can chemically treat the water, or some plants use a temporary alternative source including a second intake or reservoir.
- State agencies can guide toxin sampling efforts and close beaches where toxins exceed recreational swimming standards as well as issue warnings for pets.
- Commercial and recreational boaters can plan activities that are outside of the bloom.



Known HAB locations in the Great Lakes

Harmful algal blooms occur throughout the Great Lakes basin. NOAA's Great Lakes Environmental Research Laboratory (GLERL) and the Cooperative Institute for Great Lakes Research (CIGLR), along with other partners, monitor areas in Lakes Erie, St. Clair, and Huron (Saginaw Bay) that are known to have the potential for HABs. For more, visit www.glerl.noaa.gov/res/HABs_and_Hypoxia. Credit: NOAA GLERL

The 2014 Toledo bloom

In 2014, Toledo, Ohio officials issued a two-day ban on drinking and cooking with tap water for more than 400,000 residents due to toxins concentrations that exceeded the World Health Organizations guideline level for safe drinking water. These toxins were a result of an algal bloom that was occurring in western Lake Erie. The economic impact of the 2014 bloom has been estimated at $65 million. This event served as a wake-up call that HABs can be incredibly costly, have serious economic impacts, and can pose serious threats to human health, drinking water safety, and water-dependent businesses and activities. As such, this event underscored the importance of HABs monitoring, forecasting, and research.

Sampling a harmful algal bloom in western Lake Erie near the Toledo water intake on August 4, 2014. For more on tracking toxicity of Lake Erie Algal Blooms, watch a video, produced by the University of Michigan, here: bit.ly/1OwuQHM.

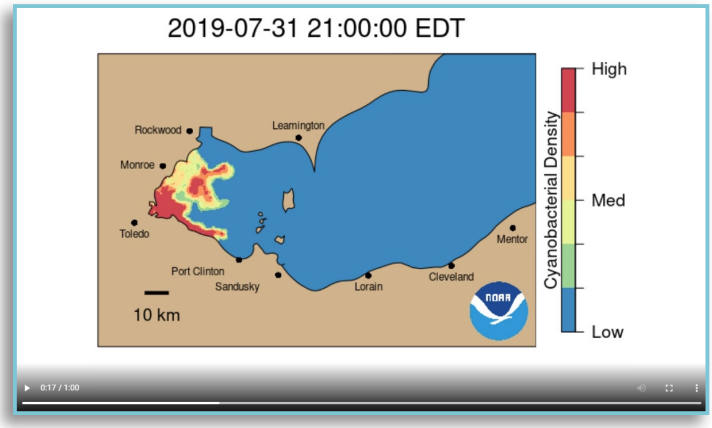
NOAA monitors and forecasts HABs for Lake Erie's drinking water and recreational managers.

Deployment of one of NOAA GLERL's 2nd Generation Environmental Sample Processors (ESP) in western Lake Erie. This 'lab in a can' technology allows for faster measurements of HAB toxicity. It autonomously collects water samples, analyzes, and sends data in near real-time. For more information about the ESP, visit go.usa.gov/xNGet.

NOAA GLERL uses a manned aircraft equipped with a hyperspectral camera to capture high-resolution images of HABs. The ability to fly underneath clouds and near shorelines fills in data gaps that satellite sensors are unable to capture. In summer 2020, scientists will incorporate an unmanned aerial vehicle (UAS) into this active area of research.

MONITORING

NOAA monitors harmful algal blooms in parts of Lake Erie and Lake Huron in partnership with state agencies, universities, water treatment facilities, and a citizen monitoring network. In addition to weekly sampling, robots, buoys, and sensors are deployed during the bloom season to measure toxins, nutrients, and algal pigments (chlorophyll). An Environmental Sample Processor (ESP) network provides near real-time toxin monitoring in two locations, neighboring the Toledo, Ohio water intake and Monroe, Michigan.



Screenshot of the cyanobacterial density animation within the Lake Erie HAB Forecast. The Forecast, which is issued twice-weekly throughout the bloom season, depicts the HAB's current location and forecasted movement, as well as the predicted winds, currents, and water temperature. The animation is a new feature that will be incorporated in spring 2020. To view the Forecast or to receive it via email, visit go.usa.gov/xdbAn.

Stone Laboratory, Ohio State University's island campus on Lake Erie (top), and the NOAA GLERL facility in Ann Arbor, Michigan (bottom) serve as bases for scientists addressing HABs research across the Great Lakes.

FORECASTING

HAB forecasts allow managers to prepare for and respond to blooms. NOAA starts estimating bloom severity in early May to guide water treatment facility managers in ordering the right amount of chemicals to keep tap water safe. In July, NOAA issues a Seasonal Lake Erie HAB Forecast of bloom severity—similar to NOAA's seasonal hurricane and tornado forecasts. Throughout the bloom season (July-October), the Lake Erie HAB Forecast is updated twice-weekly and provides information on current extent and trajectory of HABs as they form.

RESEARCH

NOAA research priorities include predicting toxicity, improving toxin detection, and understanding health and economic impacts of algal blooms. Research efforts by NOAA scientists are complemented by research grants funded by NOAA, EPA-Great Lakes Restoration Initiative, and the National Science Foundation. The State of Ohio is contributing $9.3 million to better track blooms, study health impacts, inform water treatment, reduce nutrients and engage citizens.

For additional information, please contact:
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www.noaa.gov/what-is-harmful-algal-bloom

Sea Grant Great Lakes Network
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