

Harmful Algal Blooms (HABs) in Recreational Waters

What are Harmful Algal Blooms?

The term “harmful algal bloom” (HAB) generally describes large accumulations of cyanobacteria (also known as blue-green algae) that produce toxins (cyanotoxins). HABs can occur in waters of varying nutrient levels. Many blooms occur at the water surface, where sunlight is most plentiful, and can give water a bright green, blue-green, or brown appearance. Toxins can remain in the water even after the visible bloom disappears. The Michigan Department of Environmental Quality (DEQ) – Water Resources Division (WRD) defines an algal bloom in recreational waters as harmful if microcystin (the most common toxin) levels are at or above the World Health Organization non-drinking water guideline of 20 micrograms/liter ($\mu\text{g/L}$), or other algal toxins are present at or above appropriate recreational guidelines that have been reviewed by DEQ WRD. Additionally, a bloom is considered *potentially* harmful when the chlorophyll *a* level is greater than 30 $\mu\text{g/L}$ and visible surface accumulations of cyanobacteria are present on the water, or where algal cells are visible throughout the water column.

A key concept of this HAB definition is that while a high chlorophyll *a* concentration and visible algal accumulation at the water surface or in the water column can indicate potential problems, water samples must be analyzed for the presence of toxins to confirm that a bloom has the potential to be harmful to humans, pets, or livestock. Visible appearance of blooms cannot be used as a reliable predictor of toxin content.

Factors that often contribute to HABs include:

1. Shallow, calm water
2. Warm water temperatures
3. High phosphorus levels
4. The presence of zebra or quagga mussels, even in low nutrient waters.



Why are HABs a problem?

Toxins produced by cyanobacteria (i.e. cyanotoxins) vary in chemical structure and properties and are typically classified by the effects they have on organisms: neurotoxins (nervous); hepatotoxins (liver); cytotoxins (cells); irritants; and compounds that affect the gastrointestinal tract. In Michigan, microcystins (a hepatotoxin) are the most common and widespread toxins.

Toxin sensitivity varies widely among individuals. The most common symptoms of cyanotoxin exposure are skin rashes and gastrointestinal distress. Consumption of these toxins by humans or pets can result in muscle cramps, twitching, paralysis, and even cardiac or respiratory failure. Symptoms produced by liver toxins can include numbness of the lips and mouth, uncoordinated movement, nausea, vomiting, and acute liver failure.

Algal blooms are often followed by rapid algal population die-offs, which can result in large amounts of decaying matter in the bottom of the waterbody. The sudden large-scale decomposition process following a bloom crash may deplete dissolved oxygen in the water, which can cause fish kills and impact other aquatic life. Lake residents and visitors may reduce swimming and boating activities during heavy algal blooms because the blooms are aesthetically unappealing.



Current Advisory Values

Many government agencies use provisional guideline values for microcystin concentrations provided by the World Health Organization for drinking water (1 µg/l) and recreational water (20 µg/l). These guidelines are for microcystin-LR, which is the most studied toxin and is the microcystin type associated with the greatest number of reported cyanotoxin incidents.

No formal recreational values have been established for cyanotoxins, but the U.S. Environmental Protection Agency recently proposed a drinking health advisory for microcystin (0.3 µg/L for infants; 1.6 µg/L for school-age children/adults) and cylindrospermopsin (0.7 µg/L for infants; 3 µg/L for school-age children/adults). The DEQ WRD is currently reviewing available information to develop a water quality standard for microcystin in recreational waters. In addition, the DEQ will work with the Michigan Department of Health and Human Services and county health departments to establish a process for issuing water body advisories due to the occurrence of elevated toxin levels in recreational waters. A key component of this process will be to ensure timely and effective public notice.

What if a Person or Pet is Exposed to a HAB?

It isn't possible to visually determine whether an algal bloom is producing toxins. Therefore, the best course of action is "when in doubt, stay out." However, if there is contact with a cyanobacteria bloom, the following steps should be taken:

- Thoroughly rinse off with clean fresh water as soon as possible after exposure.
- Seek medical treatment ASAP if you think you or your pet may be experiencing health impairments due to algal toxin exposure.
- Report the algal bloom and your illness by calling the Environmental Assistance Center at 800-662-9278 or email at DEQ-assist@michigan.gov.

What is the DEQ doing about HABs?

The DEQ is working to improve our understanding of HABs in Michigan and to develop an effective monitoring strategy. In the summer of 2015, we sampled multiple targeted and randomly-selected lakes to assess the geographic extent of HABs, and to evaluate the timing and frequency of samples needed to accurately characterize the occurrence and duration of blue-green algal blooms and HAB toxins. We also continue to monitor several beaches along the Michigan portion of western Lake Erie. Using the 2015 findings, the DEQ will bring together local, state, tribal, and federal partners to ensure that Michigan is a national leader in technology for HAB monitoring, assessment, and rapid communication. This will include designing an efficient monitoring network and approach for HABs; supporting efforts by governmental and commercial entities to build capacity for existing and potential sampling and analytical methods; and working with our partners to ensure data availability and rapid dissemination of HAB threats to the public.

Two factors known to contribute to HABs in surface waters are high phosphorus inputs and the presence of invasive zebra and quagga mussels. The DEQ's water quality programs work to reduce phosphorus loads throughout the state. The Aquatic Invasive Species program partners with multiple stakeholders to prevent the spread of these invasive mussels into new lakes and rivers.



Zebra Mussel

Additional Information

Other information related to HABs, and efforts to control them, includes:

- [DEQ Drinking Water HAB Web site](http://www.michigan.gov/deqwater) at www.michigan.gov/deqwater, (select "Drinking Water")
- NOAA brochure: www.glerl.noaa.gov/res/Centers/HABS/docs/muck_brochure.pdf
- NOAA Lake Erie: <http://glos.us/HABsViewer>
- [Nutrient Framework: Information about Michigan's long history with reducing nutrient runoff into lakes and rivers.](#)
- [Non-point source reductions in nutrient loading to Michigan's waters.](#)
- [Michigan Natural Shoreline Partnership: Provides education to property owners about natural shorelines.](#)
- [Aquatic Invasive Species: Information on what is happening in Michigan related to AIS prevention and impacts.](#)
- [Michigan DEQ Fact Sheet: Algae: A Naturally-Occurring Phenomena](#)

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