



### ***Harmful Algal Blooms (HABs) Update***

This past week of heat and rain consisted of ideal bloom conditions. A number of HABs were reported, in addition to other bloom-like conditions that were observed by HABs monitoring volunteers. Rather than the usual dense surface accumulation produced by HABs, volunteers observed what appeared to be colonies of cyanobacteria spread throughout the water column. The Community Science Institute (CSI), Cayuga Lake watershed's local certified lab, hopes to collect more data through reports on these intermediate bloom conditions for analysis.



Bloom 20-3430-B1, located along the shoreline of multiple waterfront Properties on Taughannock Blvd.

Through public outreach, CLWN works with CSI to support their water quality research. To get the latest update, visit CSI's [Cayuga Lake HABs Reporting Page](#), which also provides a map visualizing where the blooms are located. Below is a partial chart showing the reported blooms from July 7th to July 14th.

Bloom Sample Code	Date Sampled	Location Description	Bloom Extent	Microscopy	Microcystin Toxin (ug/L)
20-3435-B1	7/9/2020	Along the southeast shoreline of Taughannock Falls State Park.	Small localized	Moderate levels of Dolichospermum.	< .30
20-3430-B1	7/9/2020	Along the shores of Taughannock Blvd.	Widespread	Moderate to dense levels of Dolichospermum.	1.00
20-3423-B1	7/9/2020	Across the southeast shoreline. Dense at McKinney's Point and East Shore Park.	Widespread	Dense levels of Dolichospermum.	< .30
20-3456-B1	7/9/2020	Along the southwest shoreline south of Taughannock Falls State Park.	Large localized	Moderate to dense levels of Dolichospermum.	< .30
20-3443-B1	7/12/2020	Along the shores of Lower Lakeshore Dr.	Small localized	Dense Dolichospermum and possibly sparse Anabaena.	Results pending

### ***What are Cyanotoxins?***

Cyanotoxins are toxins produced by cyanobacteria, which is what makes cyanobacterial blooms harmful to humans, other mammals, aquatic species, and birds through ingestion, inhalation, or skin contact. Symptoms from exposure to cyanotoxins include nausea, vomiting, diarrhea, skin, eye or throat irritation, breathing difficulties, and allergic reactions. *If you think you have had contact with a HAB and/or experience any of the symptoms listed above, rinse your skin immediately with clean water and seek medical attention.*

Cyanotoxins are generally categorized based on their toxicological effects into three major groups: hepatotoxins (i.e. chemical substances that damage the liver), neurotoxins (i.e. toxins that impair nerve tissue), and contact irritants (i.e. substances that aggravate the skin) (Carmichael and Boyer 2016). Some of the most commonly found cyanotoxins in the U.S. are microcystin, anatoxin-a and cylindrospermopsin, described below.

**Microcystin** is the most commonly found cyanotoxin in New York State and was first identified from the cyanobacteria *Microcystis aeruginosa* (Boyer 2007). Other cyanobacteria genera also produce microcystin, such as *Dolichospermum* (formerly *Anabaena*), *Nodularia*, and *Oscillatoria*. It is categorized as a hepatotoxin, but may also affect the kidney and reproductive system (Boyer 2007). Bioaccumulation (i.e. the gradual build-up of a substance in an organism) of microcystin has been observed in aquatic vertebrates and invertebrates such as fish, mussels and zooplankton (“Learn about Cyanobacteria and Cyanotoxins”). The New York State Department of Health (NYSDOH) has safety limits of total microcystin for public drinking water supplies set at 0.3 ug/L and for public swimming beaches set at 4.0 ug/L. The New York State Department of Environmental Conservation (NYSDEC) defines a “Confirmed with High Toxin Bloom” as 10 ug/L in open water and 20 ug/L at the shoreline (NYSDEC HABs Program Guide 2019). NYSDEC only has bloom status thresholds for total microcystin because there is a lack of published data and low rates of occurrence of other cyanotoxins in New York State.

**Anatoxin-a** is another type of cyanotoxin first discovered from *Dolichospermum flos-aquae*, but is also produced by other cyanobacteria genera such as *Cylindrospermum*, *Microcystis*, and *Oscillatoria* (Carmichael and Boyer 2016). It is difficult to monitor and set bloom status thresholds because it degrades quickly in sunlight (NYSDEC HABs Program Guide 2019). Anatoxin-a is classified as a neurotoxin, affecting the central nervous system; there are studies that have associated exposure to anatoxin-a to the death of wild and domesticated animals (Boyer 2007, Aráoz et al. 2010). Further, aquatic bioaccumulation and biomagnification (i.e. the increased concentration of a toxin in the tissues of organisms at successively higher levels of a food chain) of anatoxin-a has been observed (Scarlett et al. 2020).

**Cylindrospermopsin** is a cyanotoxin first identified from the cyanobacteria species *Cylindrospermopsis raciborskii*, but similarly, is produced by various cyanobacteria genera such as *Raphidiopsis* (formerly *Cylindrospermopsis*) and some species within *Dolichospermum* (Carmichael and Boyer 2016). It is commonly found in New York and has been reported worldwide, although it is rarely traced in water samples (NYSDEC HABs Program Guide 2019). Cylindrospermopsin is categorized as a hepatotoxin but may also affect the kidney and has the potential to aquatically bioaccumulate and biomagnify (Boyer 2007, Scarlett et al. 2020).

More research is needed to better understand the mechanisms and conditions enabling the production and release of cyanotoxins. The relationship between algal biomass and toxin concentration is also in question. There is only a certified method of testing for the concentration of microcystin, so the presence of other cyanotoxins, like anatoxin-a and cylindrospermopsin, cannot be confirmed. Therefore, it is important to avoid any suspicious blooms even without the presence of microcystin, because other cyanotoxins may be present.

## ***Reporting a HAB***

If you observe a suspicious HAB, avoid it and report it! Email [habshotline@gmail.com](mailto:habshotline@gmail.com) with the location of the bloom, the date and time, and two pictures. If possible, include the GPS coordinates of its location using the Compass app or Google Maps on smartphones. Otherwise, an address or nearby landmark will do the job! You may also call CSI at (607) 257-6606.

## ***Stay Informed!***

Before heading on the lake, you can view the interactive map on CSI's [Cayuga Lake HABs Reporting Page](#) that is regularly updated. The DEC provides a similar interactive map of current HABs across New York State that you can view [here](#). You may also call your local park office on the most up-to-date water quality information (see below).

### Taughannock Falls State Park

(607) 387-6739

### Cayuga Lake State Park

(315) 568-5163

### Long Point State Park

(315) 364- 5637 or (315) 497-0130

### Lansing Myers Park

(607) 533-7388 ext. 17

## **References**

- Aráoz, Rómulo, et al. "Neurotoxic Cyanobacterial Toxins." *Toxicon*, vol. 56, no. 5, 2010, pp. 813–828., doi:10.1016/j.toxicon.2009.07.036.
- Boyer, Gregory L. "The Occurrence of Cyanobacterial Toxins in New York Lakes: Lessons from the MERHAB-Lower Great Lakes Program." *Lake and Reservoir Management*, vol. 23, no. 2, 2007, pp. 153–160., doi:10.1080/07438140709353918.
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- NYSDEC. *Harmful Algal Blooms (HABs) Program Guide*. 2019.
- Scarlett, Kendall R., et al. "Global Scanning of Cylindrospermopsin: Critical Review and Analysis of Aquatic Occurrence, Bioaccumulation, Toxicity and Health Hazards." *Science of The Total Environment*, vol. 738, 2020, p. 139807., doi:10.1016/j.scitotenv.2020.139807.

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*The Cayuga Lake HABs Monitoring Program is a collaborative effort led by a local consortium of three nonprofits: the Community Science Institute (CSI), the Cayuga Lake Watershed Network (CLWN), and Discover Cayuga Lake (DCL), working in collaboration with the New York State Department of Environmental Conservation (NYSDEC) and the State University of New York Environmental School of Forestry (SUNY-ESF).*

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