

Patterns of Harmful Algal Blooms (HABs) and Associated Toxins in Cayuga Lake: Findings from Three Years of Bloom Monitoring

Speakers and Topics

Introduction to Cyanobacteria Monitoring on Cayuga Lake

Dr. Stephen Penningroth, *CSI Executive Director*

Dealing with HABs: Perspectives from the Lakeshore

Shelley and Si Meyer, *HABs Harrier Volunteers*

Cyanobacteria “Signatures” During Non-Bloom Conditions

Adrianna Hirtler, *CSI Biomonitoring Coordinator*

An Overview of Monitoring HABs on Cayuga Lake

Nathaniel Launer, *CSI Outreach Coordinator*

Anatoxin-a in Select HABs on Cayuga Lake

Noah Mark, *CSI Technical Director*

Patterns of “High” Microcystin HABs Occurrence 2018 - 2020

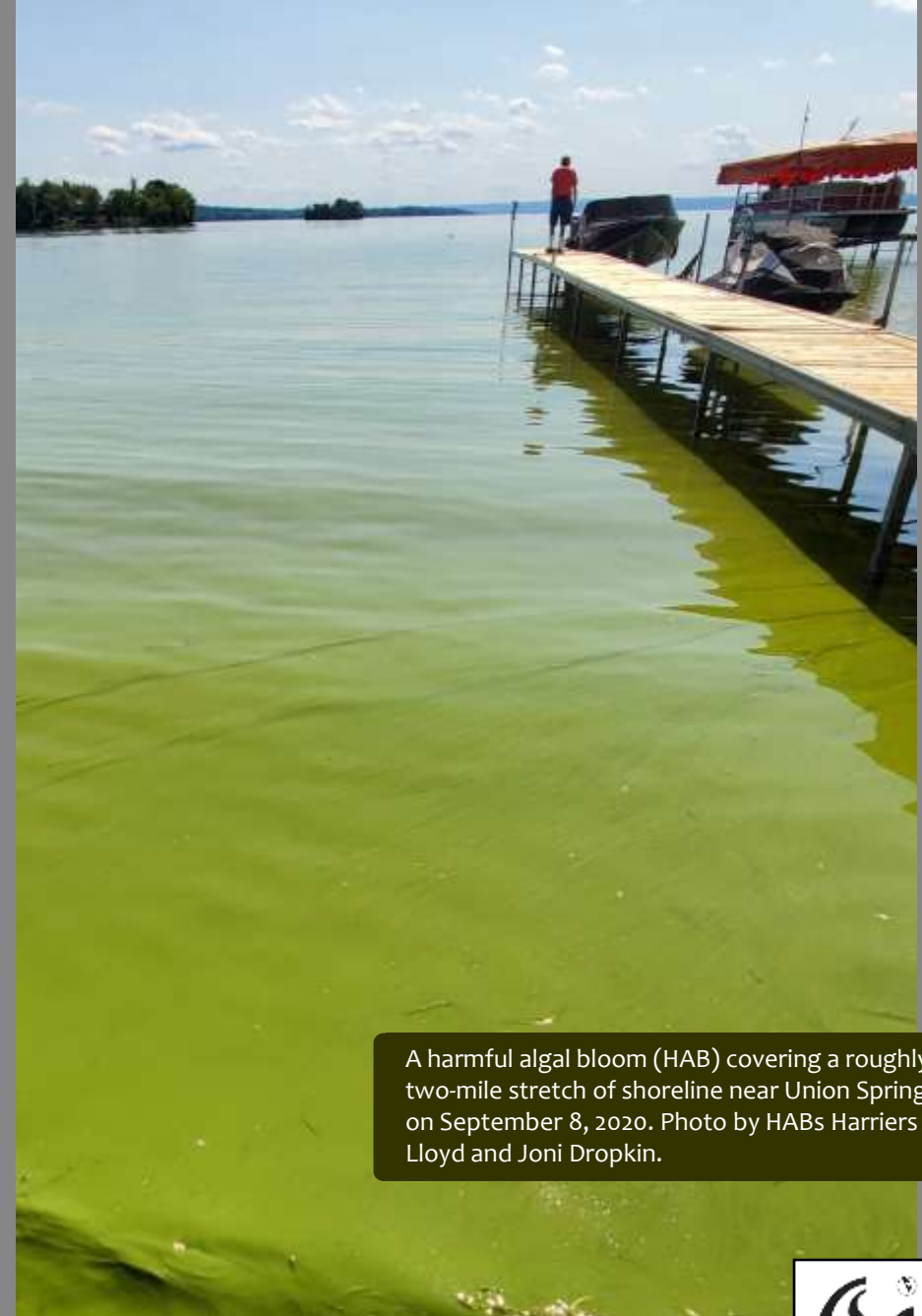
Dr. Stephen Penningroth, *CSI Executive Director*

Rules and Reminders

All participants will be muted upon entry. Please remain muted until called upon by the moderator

Please use the chat function to ask questions throughout the webinar. A moderator will collect the questions and then call upon participants to unmute and ask their question, in-turn, during the discussion.

If your internet connection is poor, please consider turning your video off.



A harmful algal bloom (HAB) covering a roughly two-mile stretch of shoreline near Union Springs on September 8, 2020. Photo by HABs Harriers Lloyd and Joni Dropkin.

An Overview of Monitoring Harmful Algal Blooms (HABs) on Cayuga Lake

By Nathaniel Launer Outreach Coordinator, Community Science Institute



What are Harmful Algal Blooms (HABs)?

Blooms are the **rapid growth of cyanobacteria populations**, or accumulation of cyanobacteria, concentrated to a local area.

This is different than the modest population growth that occurs as a natural seasonal cycle.

The factors that promote **bloom formation** are still under study. There is general scientific consensus that...

- Cyanobacteria population growth increases at higher water temperatures.
- Nutrients such phosphorus and nitrogen have been shown to promote cyanobacteria growth.
- Still, calm, and stratified waters facilitate the formation of dense surface blooms.
- On the flip side, prevailing winds may lead to blooms through the accumulation of cyanobacteria on specific shorelines

H: Harmful

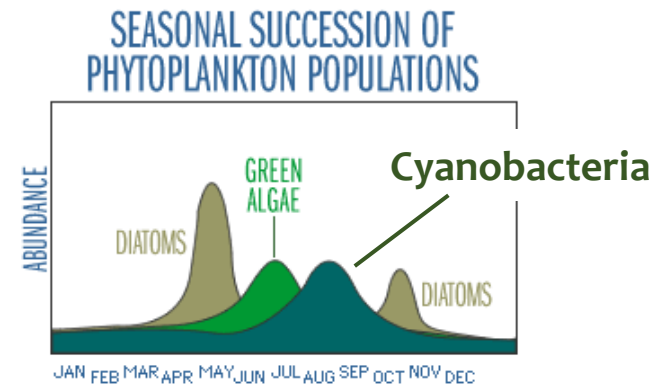
- Toxins, economic, aesthetic, and ecological damage/disruption

A: Algal

- Freshwater HABs refer to cyanobacteria. Not true algae.

B: Bloom

- Proliferations of cells, dense concentrations



The Cayuga Lake HABs Monitoring Program

The Cayuga Lake HABs Monitoring Program was designed and implemented by the Community Science Institute (CSI), the Cayuga Lake Watershed Network (CLWN), and Discover Cayuga Lake (DCL) in 2018.

The purpose of the program is to:

1. Provide timely information and hazard warnings to the users of Cayuga Lake
2. Develop information about the occurrence of HABs, which may be useful in future responses and long-term mitigation of cyanobacteria blooms on Cayuga Lake.

The program is a partnership of these organizations and a network of dedicated volunteers who monitor sections of shoreline around the lake and report their observations.

- If no bloom is observed during their survey, the volunteer(s) file a No Bloom Report
- If a bloom is observed, volunteers report the bloom, collect a sample, and transport it to the CSI lab in Ithaca for analysis.



A screenshot of a web-based form titled "Cayuga Lake No-Bloom Report". The form includes fields for "Name of Child/Youth", "Home/Work Address", "Date of Survey", and "How the Date Survey was Completed?". There is a "Submit" button at the bottom.



A screenshot of a web-based form titled "Cayuga Lake Cyanobacteria Survey". The form includes fields for "Name of Child/Youth", "Home/Work Address", "Date of Survey", and "How the Date Survey was Completed?". It also has a "Submit" button.



Testing Bloom Samples at CSI's Certified Lab

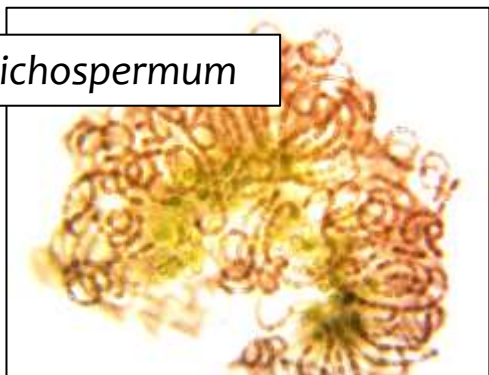
The ability to test bloom samples at a local certified lab is a **unique** strength of Cayuga Lake's program.

Volunteers bring samples directly to the lab which ensures for a fast turnaround of results – within 24 to 72 hours!

At CSI's lab, bloom samples are analyzed to...

1. Determine which cyanobacteria are present in the bloom sample

Dolichospermum



Microcystis



2. Determine the concentration of microcystin toxin

CSI lab is certified in EPA Method 546 to test for microcystin toxin.

The EPA and New York State Department of Health have set safe limits for microcystin in water:

Finishing drinking water limit: **0.3 µg/ L**

Surface water used for recreation: **4.0 µg/ L**

Always avoid contact with any suspicious bloom!

Cyanobacteria may produce a variety of other toxic compounds for which labs do not have a certified test method for yet.

3. Determine the concentration of Total Chlorophyll a

Understanding the concentration of Total Chlorophyll a provides us with a better understanding of bloom density.

Reporting HABs on Cayuga Lake

The Cayuga Lake HABs Reporting Page

All bloom reports and results of bloom analysis are reported on CSI's website in **near to real-time** to provide quick hazard warnings and alerts to all who use Cayuga's waters.

The Cayuga Lake HABs Reporting Page

Cayuga Lake HABs Reporting Page Locations of Cyanobacteria Blooms and Results of Lab Analyses

Our work to monitor and report harmful algal blooms on Cayuga Lake is supported by Tompkins County and by a grant from the Fred L. Emerson Foundation.

Cayuga Lake Cyanobacteria (HABs) Reporting Map

The Cayuga Lake Cyanobacteria Reporting Map serves as an interactive resource for all cyanobacteria blooms on Cayuga Lake. Click on an icon to view a description of the bloom including photos as well as test results from the CSI lab.

We recommend viewing the map in full screen mode in order to see all the information provided. Click on the broken box in the upper right hand corner of the map. This will open the full screen map in a new tab.

Important Note: HABs are usually transient, often lasting no more than a couple of days. This map is retrospective, meaning that it reports blooms since the beginning of the 2020 HABs season on June 25. If you are concerned about a particular part of the lake, check the date of the bloom on the map and in the table. Blooms reported more than a couple of days ago could well have dissipated. Regardless of where you choose to swim or boat on our beautiful lake, learn to recognize the appearance of HABs on CSI's [HABs Monitoring Information page](#), and avoid all suspicious blooms. Call local state parks for current information regarding beach closures.

Guide to Map Icons

Colored icons indicate the microcystin toxin status of the cyanobacteria bloom. The dates of the bloom can be found by clicking on the bloom icon, or on the side menu when viewing the map full screen.

Cyanobacteria Bloom (HAB) Microcystin Toxin Status

Black - Cyanobacteria are present in bloom (HAB) sample. Microscopic examination indicates the presence of cyanobacteria and therefore the potential for the bloom to be harmful.

Blue - Cyanobacteria are present in bloom (HAB) sample. Microscopic examination indicates the presence of cyanobacteria and therefore the potential for the bloom to be harmful. Analyses of microcystin toxin and total chlorophyll a have not been performed because the cyanobacteria identified in the bloom sample was too sparse to be considered bloom conditions, or the bloom is



Interactive reporting map



Complete table of bloom results to date

Cayuga Lake HABs Information and Master Results Table

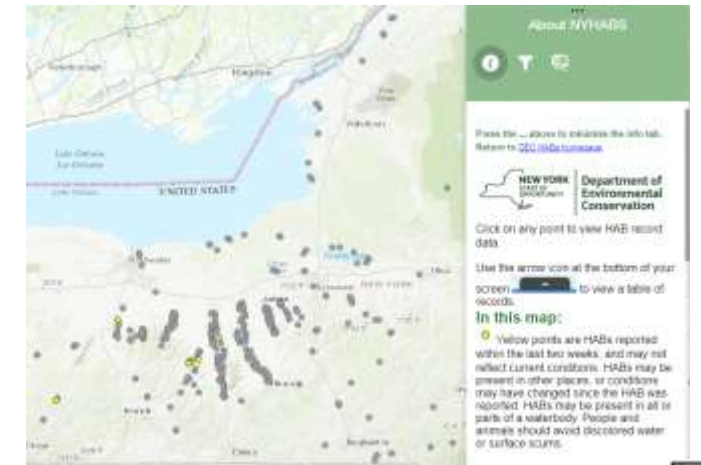
2020 Cayuga Lake HABs Information and Results Table - Cayuga Lake 2020 HABs Results

-16 7081		Bloom Location Information						
Microcystin Toxin Status	Date Reported	Time Reported	Date Sample Received	Microcystin Toxin Status	Location Description	Bloom Status	Latitude	Longitude
Black	7/15/20	10:00 AM	7/15/20 10:00 AM	Detected	Offshore of Lakeland Dr. in Cayuga Lake	Small Localized	42.7152	-76.7587
Black	7/15/20	10:00 AM	7/15/20 10:00 AM	Detected	Off the shore of Road 26 extending to 50' water along with the shore grounds.	Large Localized	42.7632	-76.7687
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CLWN Weekly Updates to the Public



Report to NYHABs State-wide Reporting System



View on CSI's website at www.communityscience.org



The 2020 Monitoring Season

Over **90 HABs Harrier** volunteers participated in the program this year!

With **83 monitoring zones**, over **53%** of lake shoreline was monitored weekly, including State Parks, municipal lakefront parks, natural areas, and other public shoreline.

HAB Information and Reporting Guide brochures installed at **six** lakefront parks. More to be installed ahead of the 2021 season.

Over **40,000 views** of our Cayuga Lake HABs Reporting Page.



Bill Ebert collecting a late summer bloom sample



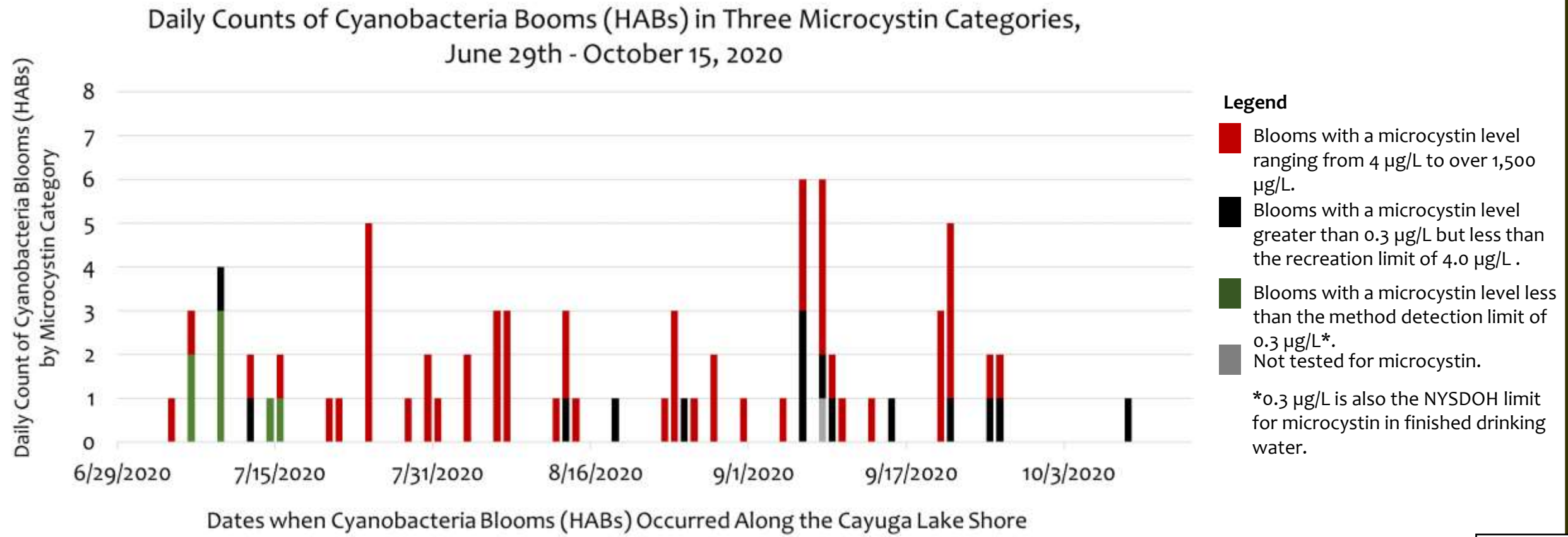
HABs Information and Reporting Guide installed at Harris Park in the Village of Cayuga



Widespread bloom near Union Springs

When did HABs Occur in 2020?

Blooms occurred continuously throughout the summer of 2020 and there was a great number of blooms with “high” levels of microcystin toxin, ranging from just above 4.0 µg/L to over 1,500 µg/L.



Where did HABs Occur in 2020?

Blooms occurred most frequently in the northern end of Cayuga Lake, and blooms in the northern end had the highest levels of microcystin toxin. However, blooms also occurred at many other shoreline locations such as Taughannock Falls State Park, Stewart Park, and near Myers Point.

While high microcystin blooms occurred most frequently at the northern end, they occurred at many other shoreline locations around the lake as well.

