Harmful Algal Blooms (HABs) on Cayuga Lake: 6 Years of Local Volunteer Monitoring

Grascen Shidemantle, PhD
Executive Director
Community Science Institute

Cayuga Lake Watershed Network
Community Conference
6/20/2024

Agenda

- Community Science Institute
- Brief overview of HABs
- Cayuga Lake HAB Monitoring Program
  - Program structure
  - 2023 HAB Monitoring Season
  - HAB patterns on Cayuga Lake (2018-2023)
  - Looking ahead to the 2024 Season
- Get Involved!
- Acknowledgements and Q&A

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Community Science Institute

Community Science Institute
Partnering with Communities to Protect Water

CSI is a 501(c)3 non-profit and NYSDOH-ELAP certified water testing lab

CSI offers three types of programming:

- **Fee-for-Service Water Testing**
- **Volunteer Water Monitoring Partnerships**
- **Outreach and Education**

CSI's Mission

To foster and support environmental monitoring in partnership with community-based volunteer groups in order to better understand our shared natural resources and how to manage them for long-term sustainability and protection.

CSI's Water Monitoring Partnerships

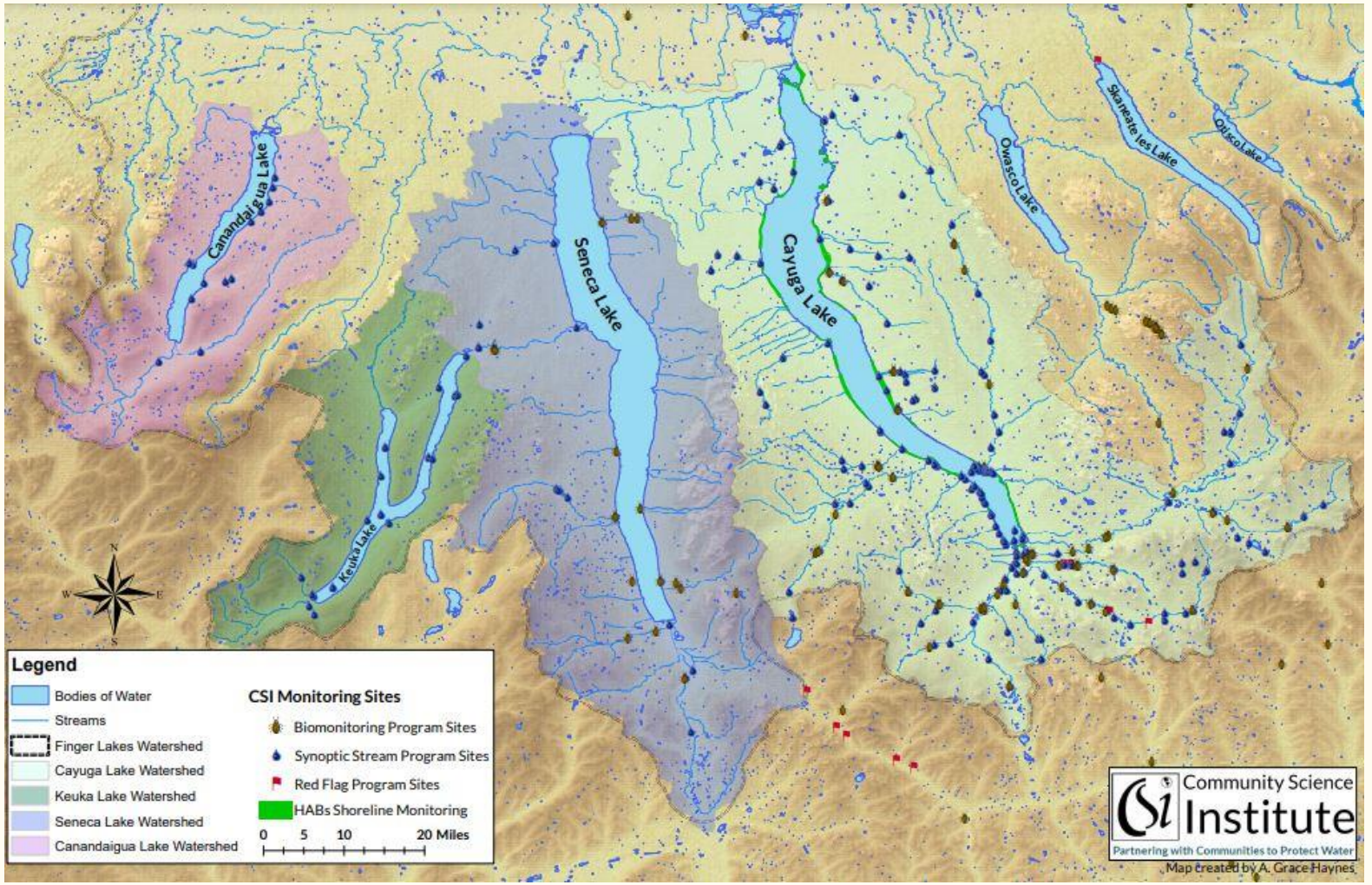
1. Synoptic Stream and Lake Monitoring

2. Red Flag Monitoring

3. Biomonitoring

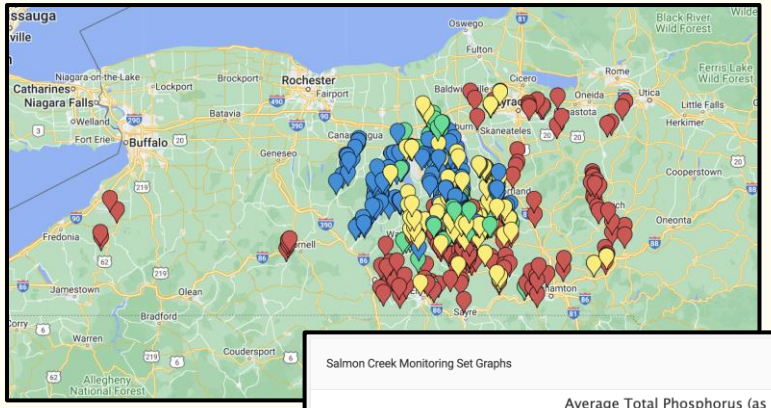
4. Harmful Algal Bloom (HAB) Monitoring

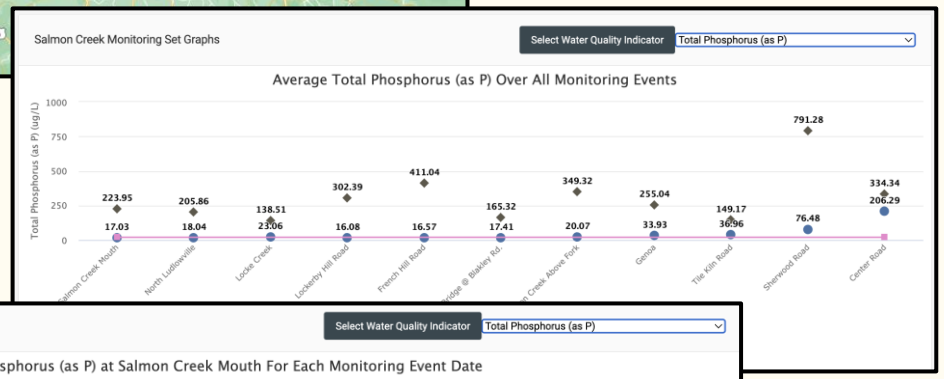
CSI recruits, trains, and coordinates over 250 volunteers!

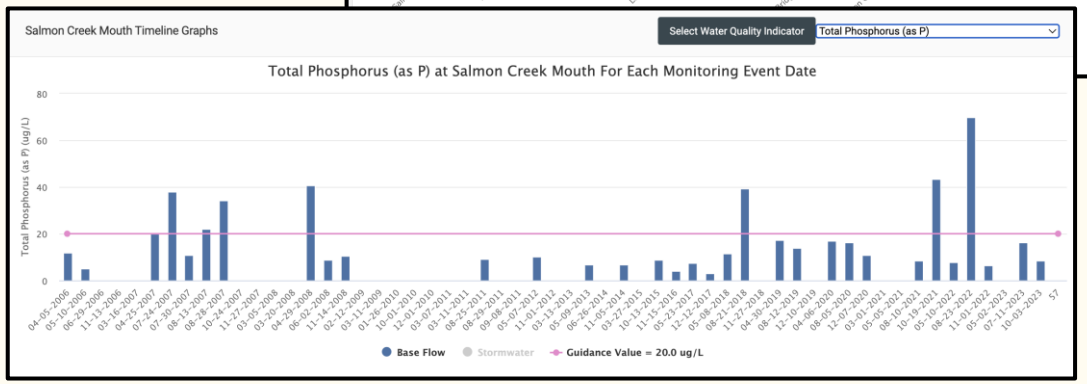


CSI's Water Quality Database

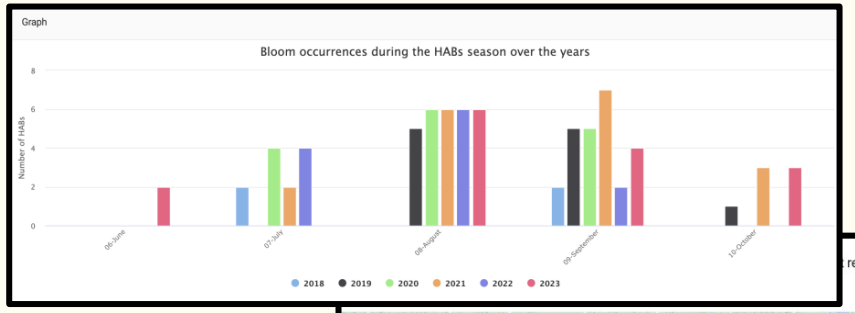
Stream and Lake Chemistry

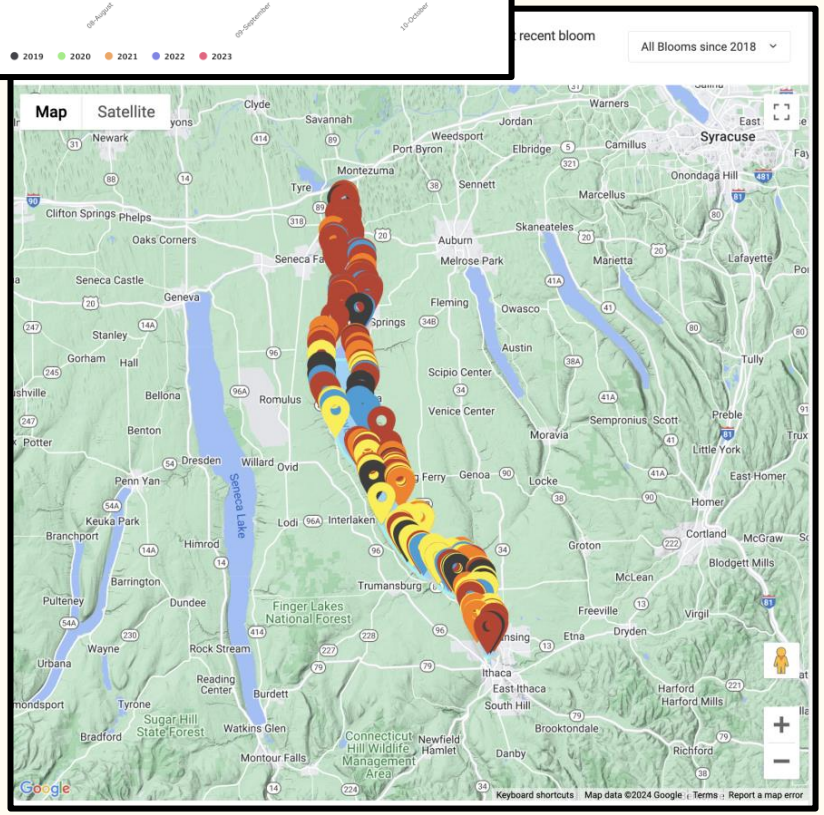






Harmful Algal Blooms





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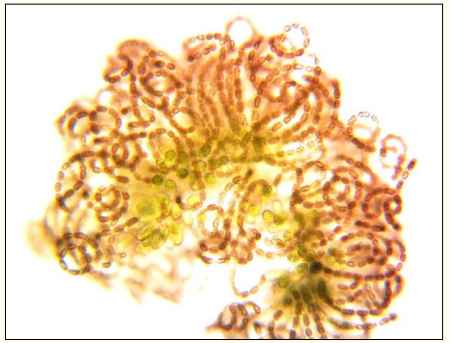
Harmful Algal Blooms (HABs)

H = Harmful → Produce cyanotoxins (e.g. microcystin, guanitoxin, saxitoxin, cylindrospermopsin, etc.)

A = Algal → Actually cyanobacteria, not algae!

B = Bloom → Explosive growth

Microcystis sp.

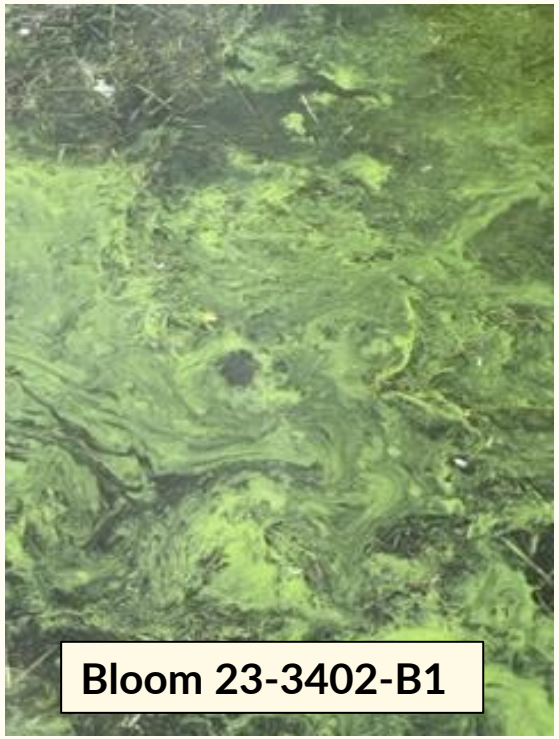


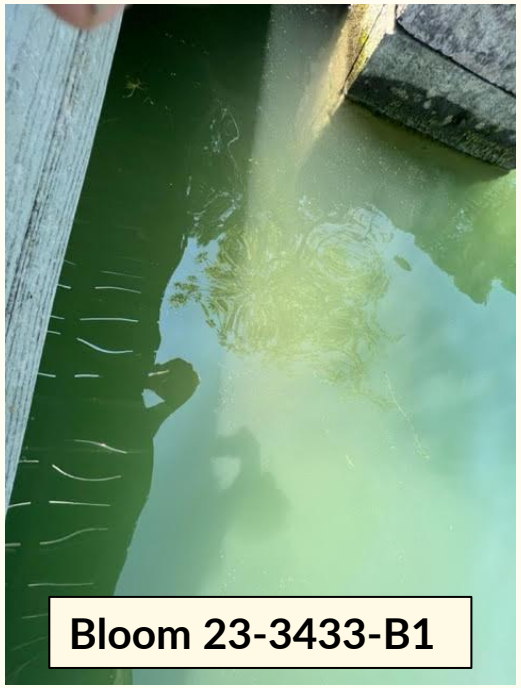
Dolichospermum sp.

Harmful Algal Blooms (HABs)

Know it!

Avoid it!





Report it!

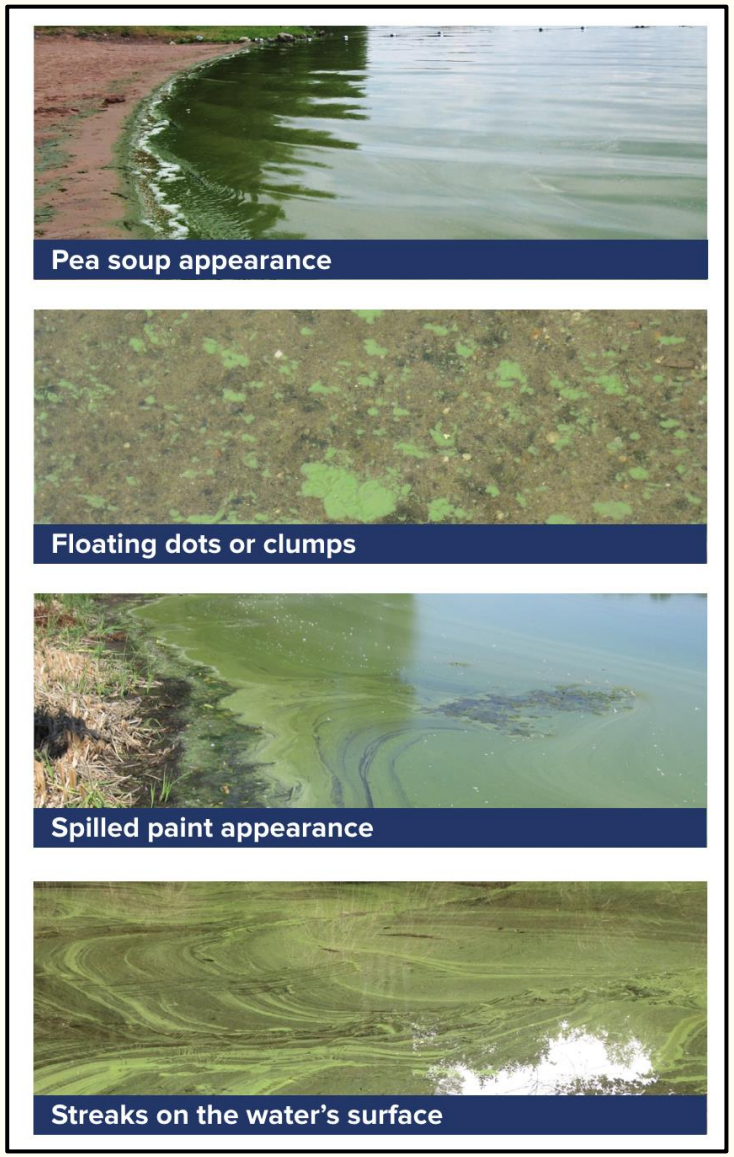
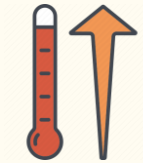


Image from Cayuga Lake HABs Action Plan

Harmful Algal Blooms (HABs)

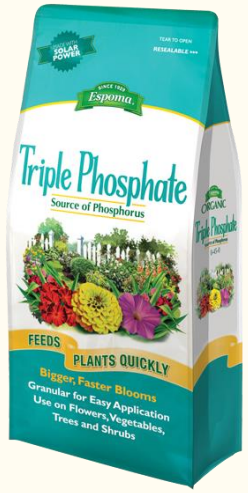
Contributing factors to HAB formation:

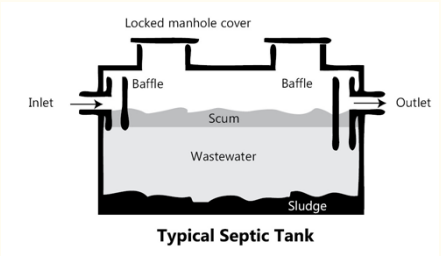


Weather

Randy Westbrooks, U.S. Geological Survey

Invasive Species





Nutrients

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Cayuga Lake HAB Monitoring Program

Alyssa Johnson
Cayuga Lake HABs Monitoring Program Coordinator

Purpose: Collect actionable data on cyanobacteria blooms, protect public health, and relay bloom information and testing results quickly and efficiently.

HABs Harriers perform weekly shoreline surveys for HABs → **Blooms are reported to CSI via HABs Hotline** → **Samples are analyzed in CSI's state certified lab** → **Alerts public to HABs**

The Cayuga Lake HABs Monitoring Program is led by CSI in collaboration with CLWN and DCL

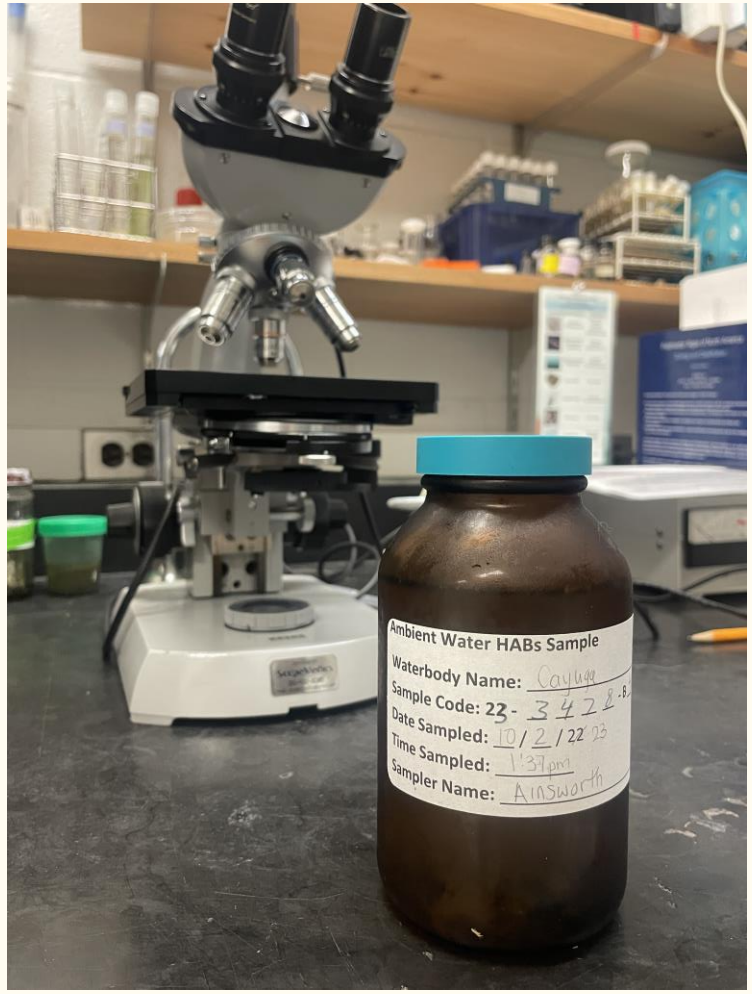
Cayuga Lake HAB Monitoring Program

HAB samples are analyzed to:

- Identify cyanobacteria genera
- Measure chlorophyll a (EPA 446.0 Rev. 1.2)
- Measure microcystin (EPA 546)

Bloom information is uploaded to CSI's NEW
HABs Database

CSI reports all blooms to county health department officials and NYSDEC



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2023 Monitoring Season Fast Facts

- Number of volunteers: 85 HAB Harriers; 8 HAB Carriers
- Number of monitoring zones: 73
- Shoreline coverage: 50%
- HABs Reported: 80
- CSI received HABs reports from

June 22, 2023 – October 26, 2023

2023 Monitoring Season

Concentration of microcystin toxin

- Greater than 4.0 µg/L
- Between 0.3 µg/L and 4.0 µg/L
- Less than 0.3 µg/L
- Not Tested for Microcystin

[----------Official DEC HABs Monitoring Season----------]

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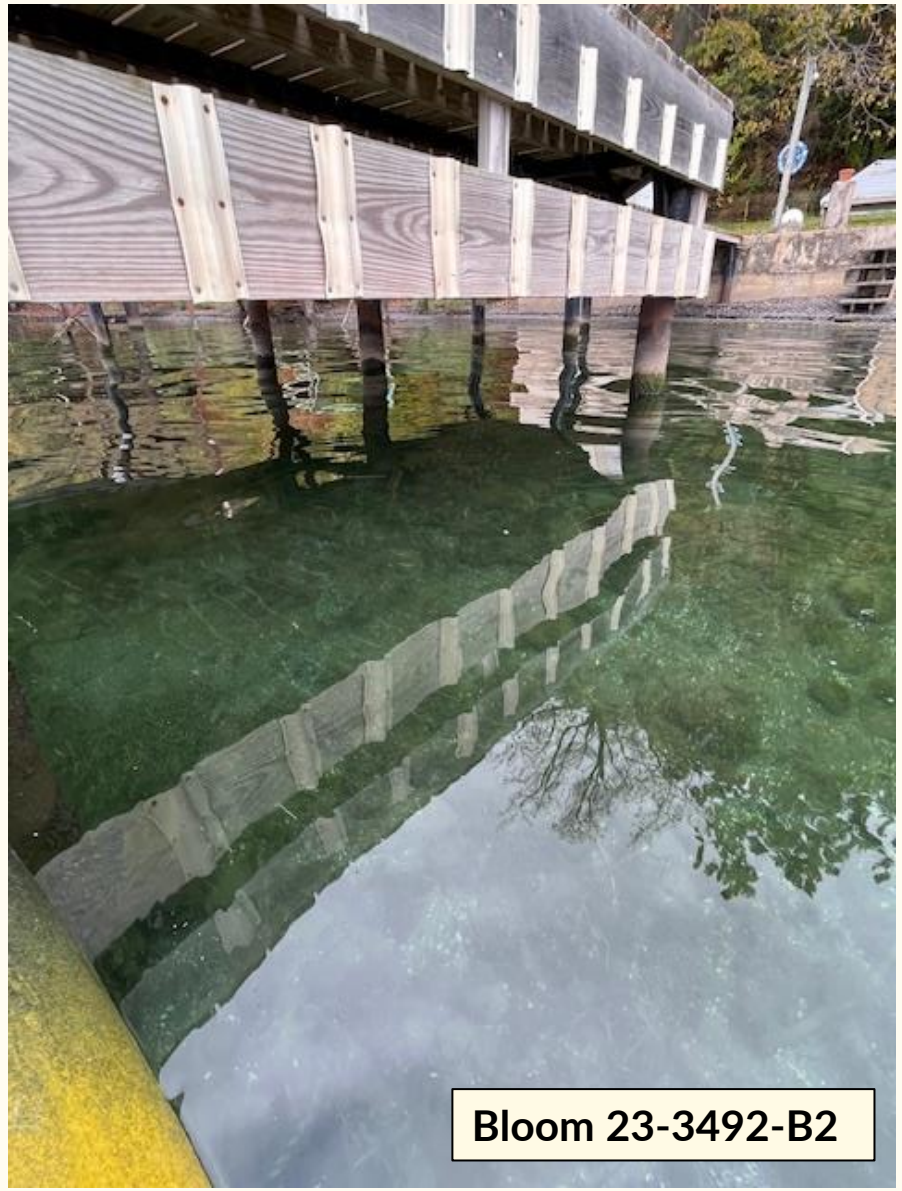
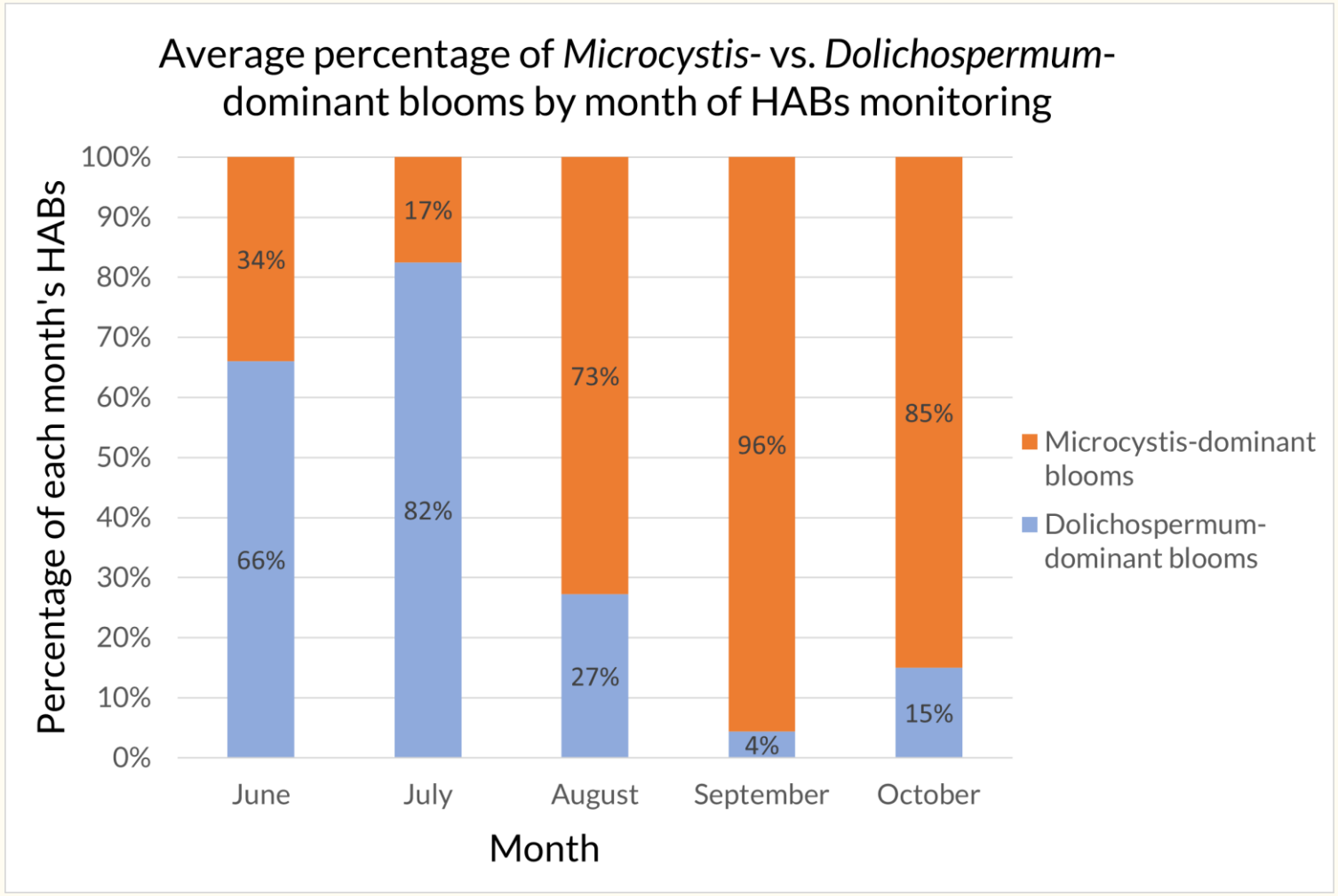
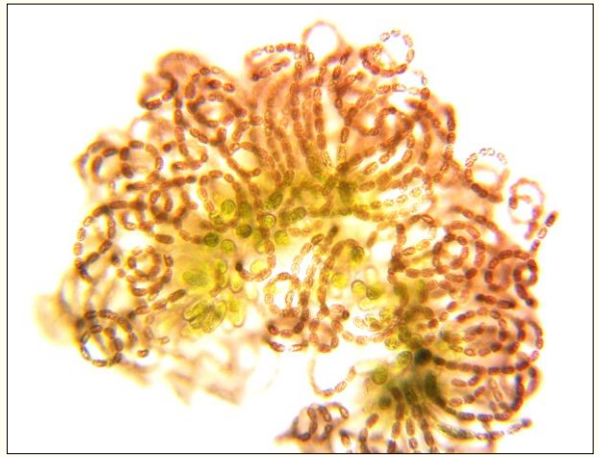


HAB Monitoring 2018-2023

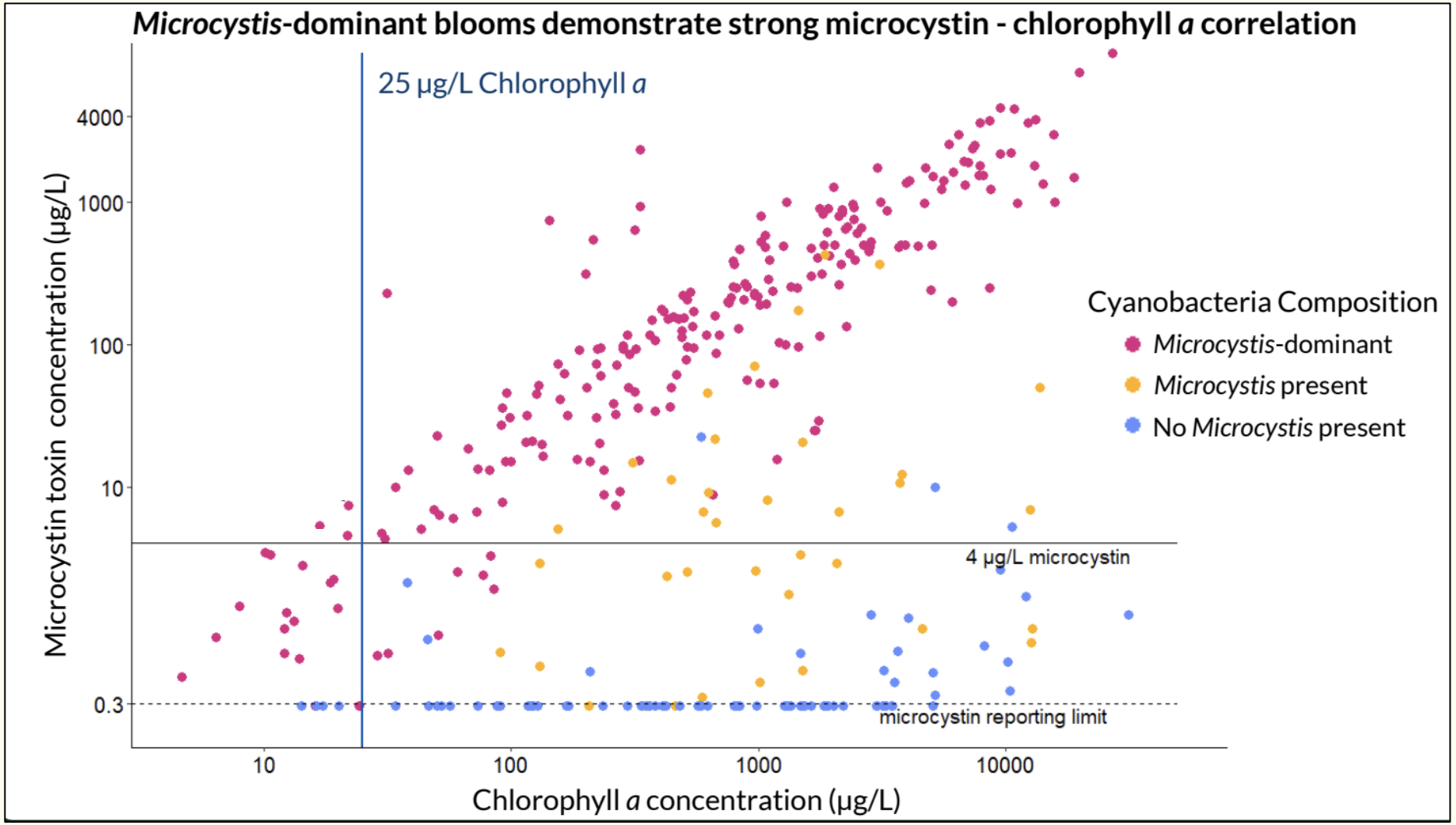


Microcystis sp.

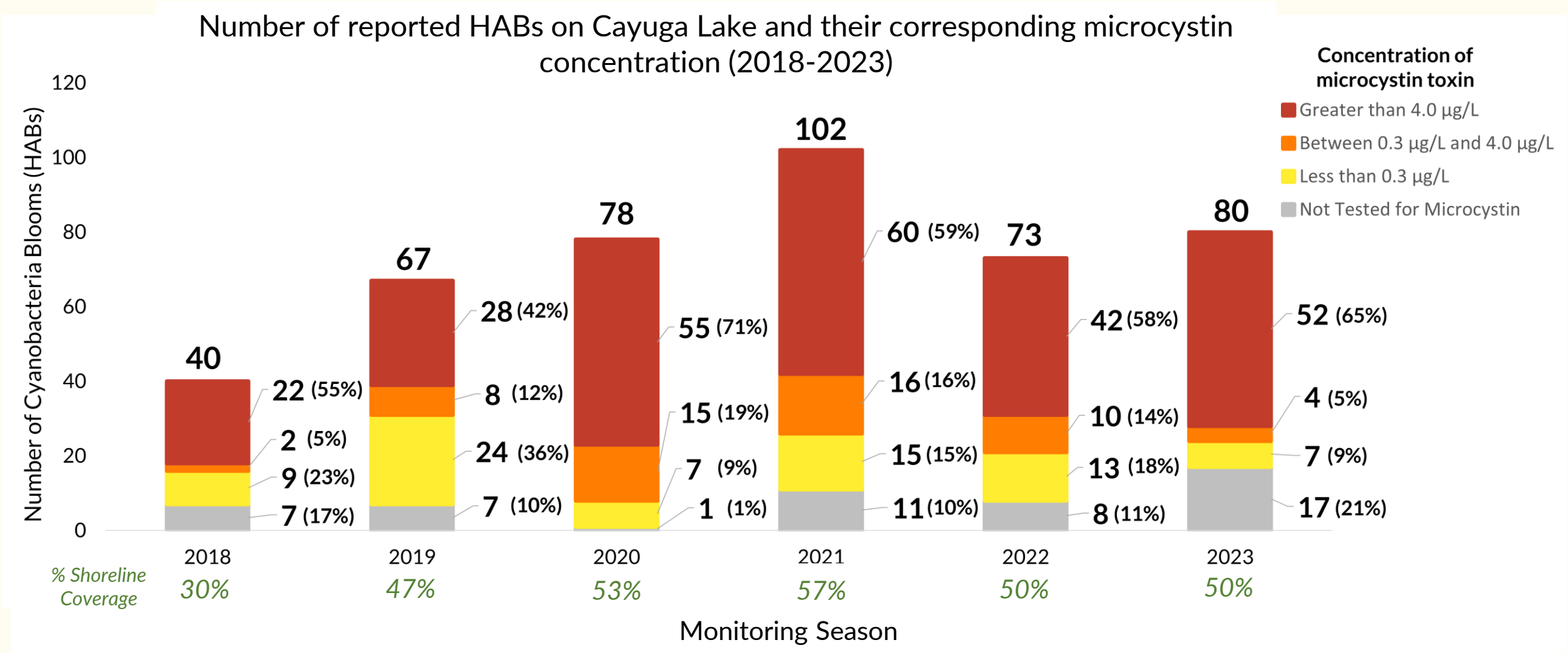


Dolichospermum sp.

HAB Monitoring 2018-2023

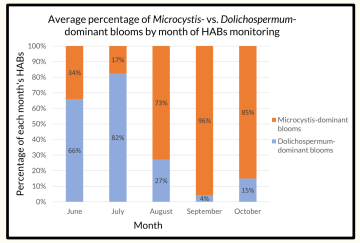


HAB Monitoring 2018-2023

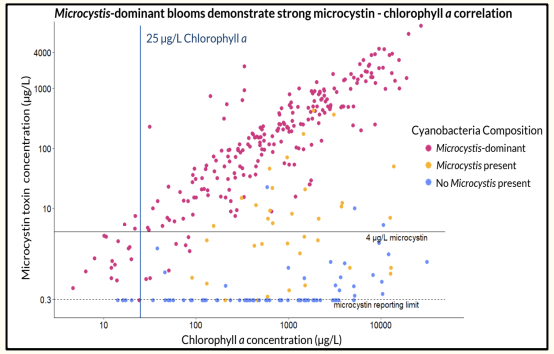


HABs Monitoring 2018-2023: Takeaways

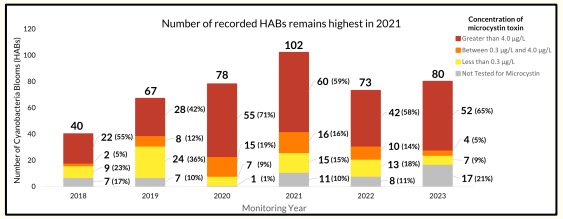
- From June – July, Cayuga Lake HABs tend to be dominated by *Dolichospermum sp.*. From August to October, blooms tend to be dominated by *Microcystis sp.*



- Blooms that are *Microcystis*-dominant usually have higher levels of microcystin toxin than blooms that are **not** *Microcystis*-dominant
- There is a strong positive relationship between chlorophyll a and microcystin concentration in HABs that are *Microcystis*-dominant.



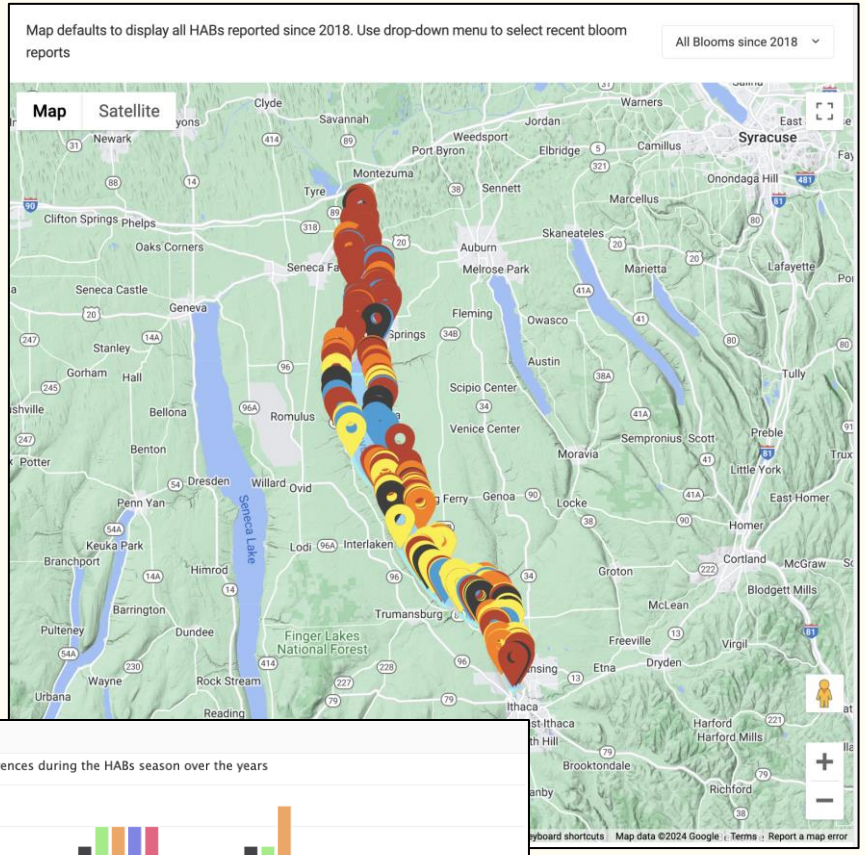
- Typically more than half of the HAB samples collected each year have microcystin concentrations greater than the contact recreation limit (4 ug/L)
- The number of HAB reports increased from 2018-2021, then plateaued in 2022-2023

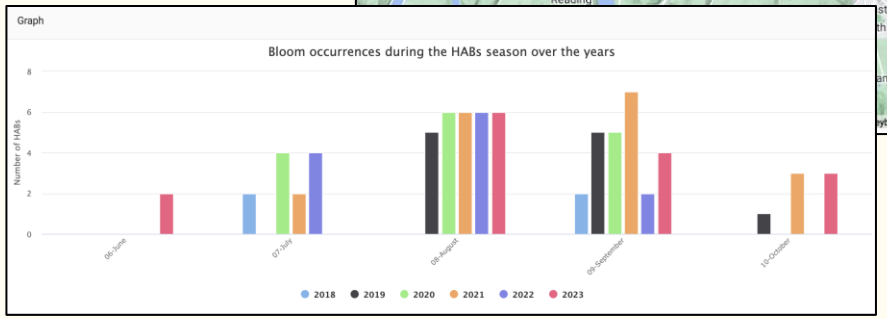


Want to see even more HAB data?

Visit CSI's HAB Database!

database.communityscience.org/hab





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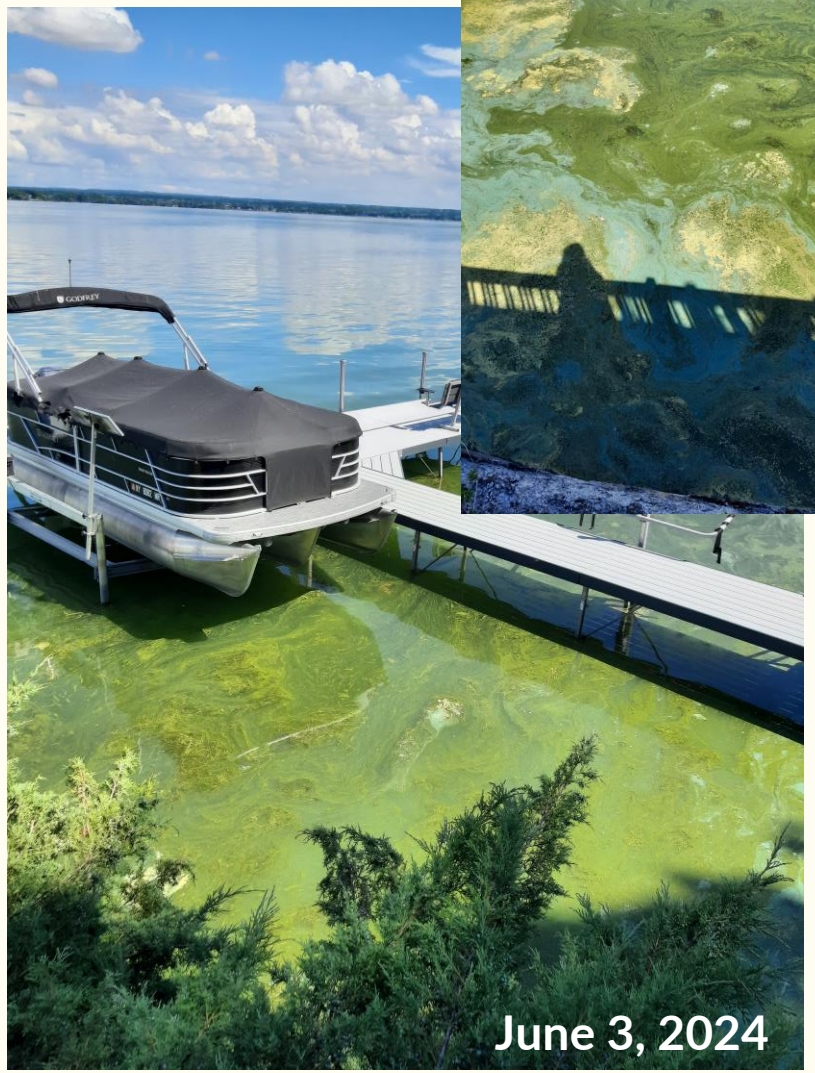
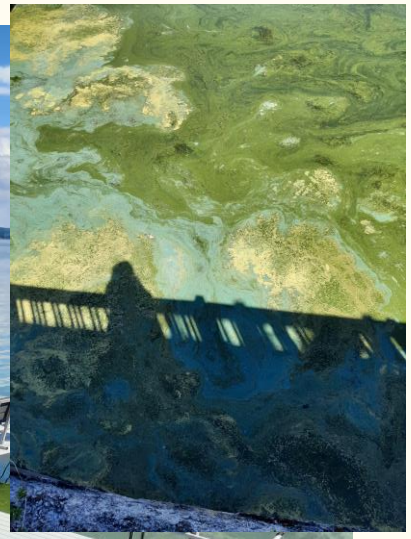
2024 Monitoring Season

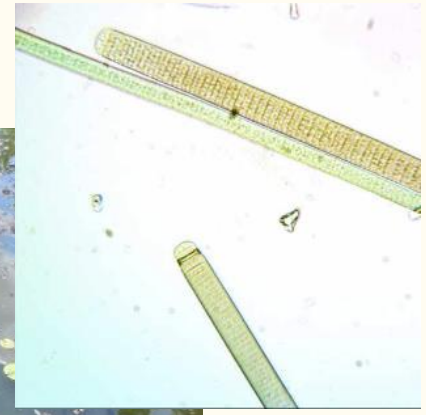




2024 Monitoring Season – Investigate HAB “Clumps”

- Found in Cayuga Inlet and Southern end of Cayuga Lake in 2022 and 2023
- The appearance of these clumps contradicts traditional HAB ID guidance
- One sample was collected in 2023 and tested for a suite of toxins by Greg Boyer’s lab at SUNY ESF. No toxins were detected.
- This summer, CSI is inviting volunteers to help report and sample these clumps

Order Oscillatoriales



2024 Monitoring Season – Trial new technology

In collaboration with the US Army Engineer Research & Development Center, CSI's lab will trial a rapid screening tool for microcystin toxin.

ELISA: 5-6 hours

VS.

Graphene-Based Sensor: 5-20 minutes

This goal is to make this tool commercially available in the future.

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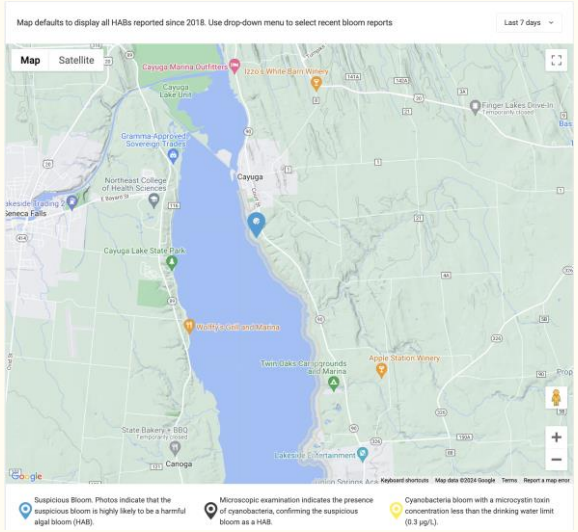
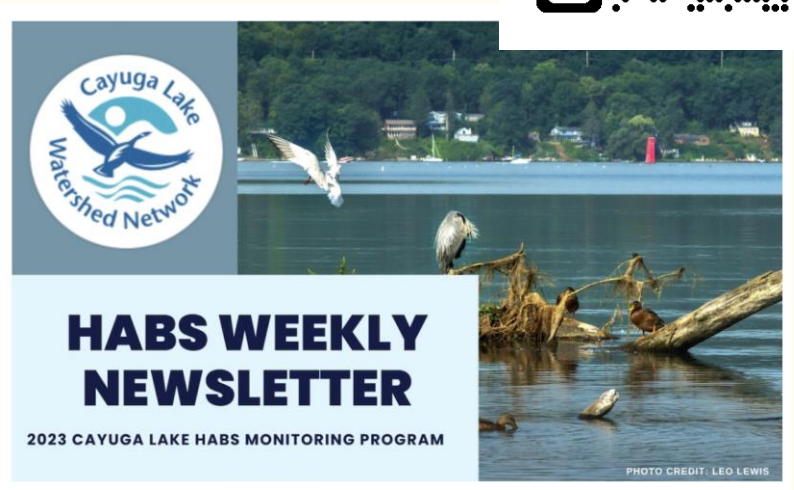
Get Involved!

Volunteer



Explore CSI's HABs Database



Subscribe to CLWN's HABs Weekly Newsletter

Get Involved!

Engage with the organizations that make this work happen!

Become a member

Join email list

Follow on social media

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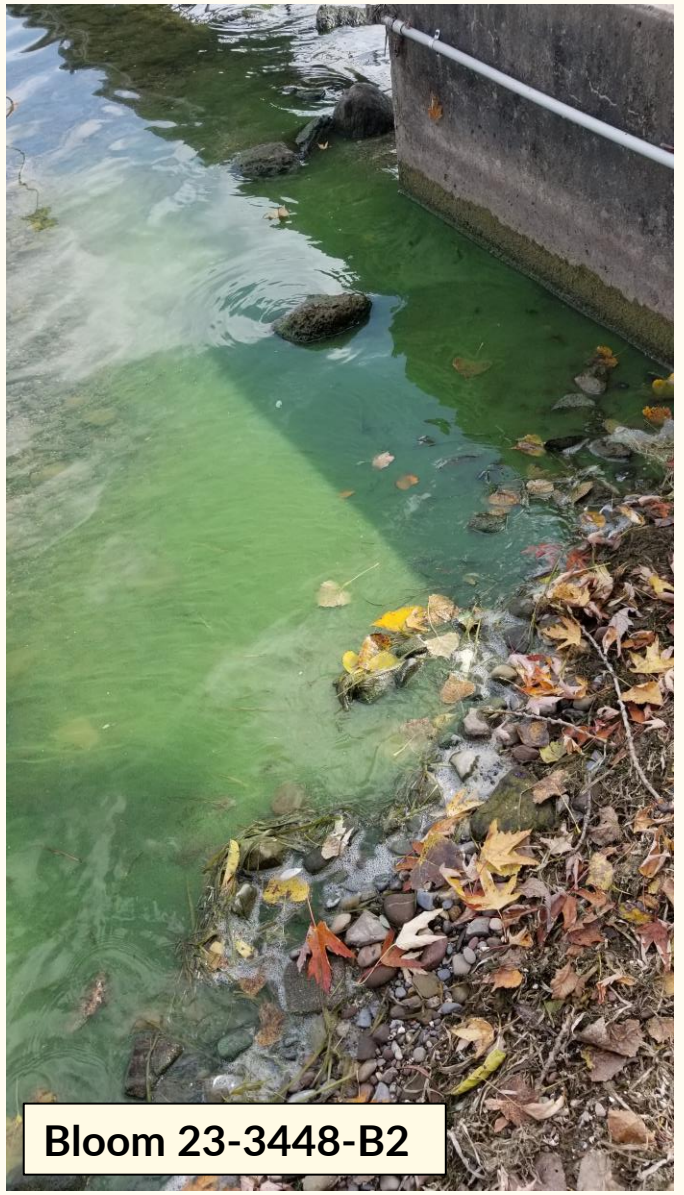

Acknowledgements

CSI Staff Past and Present

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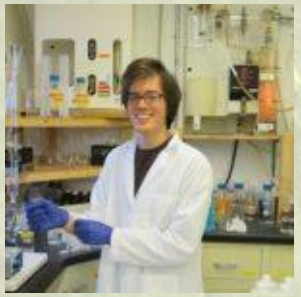
Cayuga Lake HABs Monitoring Program Coordinator



Noah Mark
Laboratory Director

Adrianna Hirtler
Biomonitoring Program Coordinator

Dedicated volunteers!

Financial Supporters

Program Partners

CSI Members

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Cayuga Lake Watershed Network

Discover CAYUGA LAKE

Cayuga County Health Department

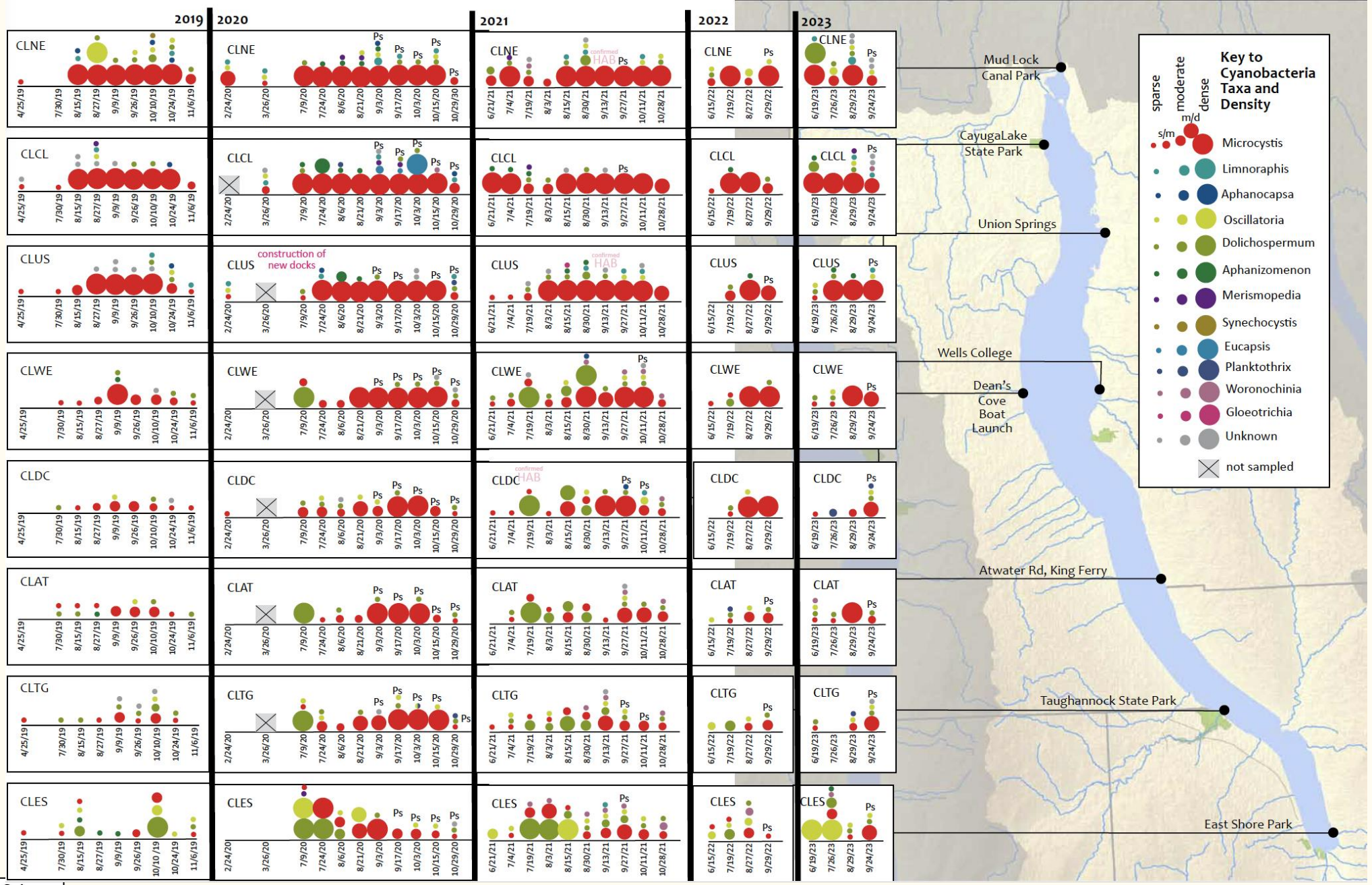
Public Health Prevent. Promote. Protect. Seneca County, NY

TOMPKINS COUNTY Whole Health

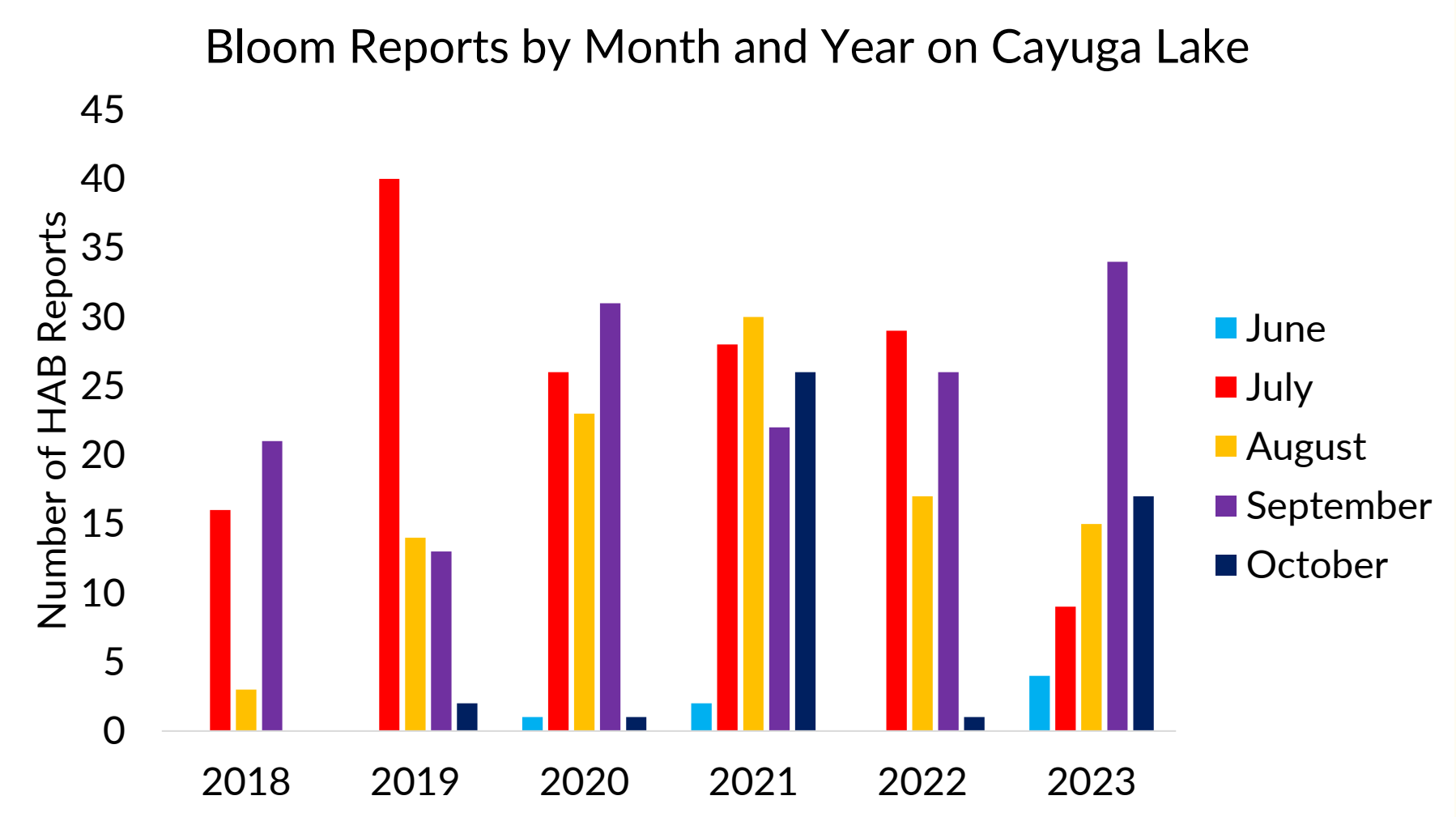
Questions

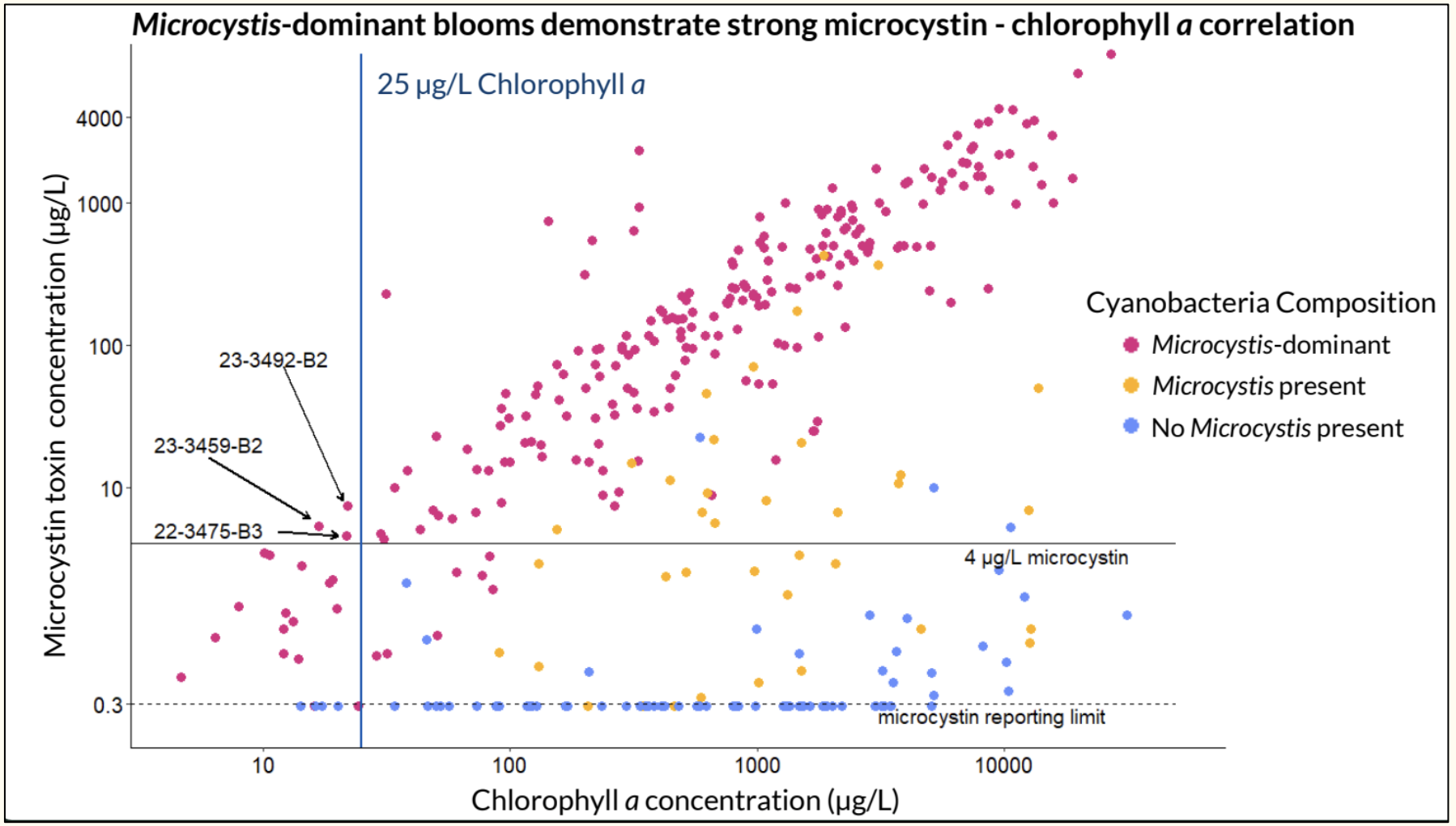
If you see a HAB on Cayuga Lake, report it here or to habshotline@gmail.com!

Extra Slides


2019
2020
2021
2022
2023
CLNE
CLCL
CLUS
CLWE
CLDC
CLAT
CLTG
CLES
construction of new docks
confirmed HAB
Ps
Mud Lock Canal Park
CayugaLake State Park
Union Springs
Wells College
Dean's Cove Boat Launch
Atwater Rd, King Ferry
Taughannock State Park
East Shore Park
Key to Cyanobacteria Taxa and Density
sparse
moderate
dense
s/m
m/d
Microcystis
Limnoraphis
Aphanocapsa
Oscillatoria
Dolichospermum
Aphanizomenon
Merismopedia
Synechocystis
Eucapsis
Planktothrix
Woronochinia
Gloeotrichia
Unknown
not sampled

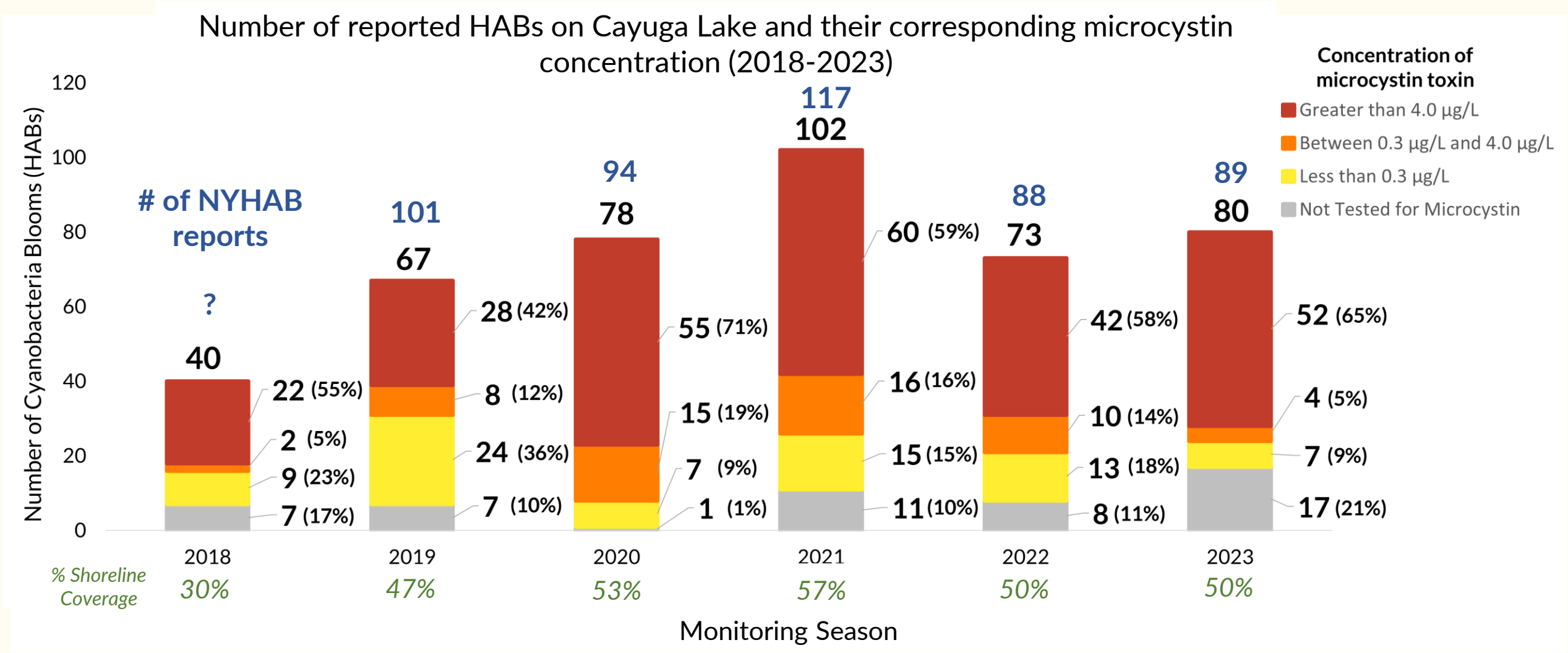
HABs Monitoring 2018-2023





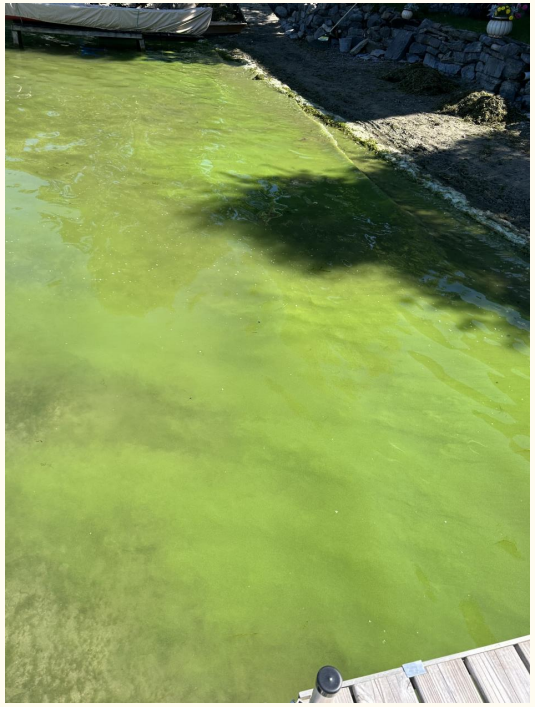
- DEC defines a bloom as having 25 ug/L chlorophyll a or greater
- In 2023, two blooms (one pictured above) had chlorophyll a concentrations less than 25 ug/L but exceeded contact recreation limit for microcystin. The same was true for one bloom in 2022. Just because a bloom appears sparse, does not necessarily mean the toxin levels are low.

HABs Monitoring 2018-2023



Cayuga Lake HAB Monitoring Program

2018 - Present



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 and composition of HABs, which may be useful in future responses and long-term mitigation of cyanobacteria blooms on Cayuga Lake.

3. Empower and educate community members to identify and respond to HABs

Led by CSI in collaboration with Cayuga Lake Watershed Network and Discover Cayuga Lake