



Updates

Last week, our 2019 HABs Monitoring Program Quadrant Leaders got together to finalize preparations for the upcoming HABs season (pictured below!). In this week's newsletter, we would like to highlight those four Harriers that are truly going above and beyond for the monitoring program. Additionally, we will answer all of your HABs-related questions this week, just in time for the start of the monitoring season! As always, if you see a suspicious bloom, report it to habshotline@gmail.com with the *location* of the bloom, the *date and time*, and *pictures*.



2019 HABs Monitoring Program Quadrant Leaders

Welcome Quadrant Leader Glenn Ratajczak!



Glenn Ratajczak is the Quadrant Leader for the Southeast Quadrant of Cayuga Lake. As Production Manager at Bolton Point Water System, Glenn was already monitoring the shoreline near their intake. So, when he heard about our HABs monitoring program, he said he knew he needed to be a part of this important project!

Glenn has also been a longtime advocate for citizen science. He was one of the founding board members of the Clean Air Coalition of Western New York, which battled a processing plant that was emitting benzene into a nearby neighborhood. He has also worked on bringing participatory budgeting to the City of Buffalo, where community members would have a say in where discretionary funding is spent.

When asked what Cayuga Lake meant to him, Glenn responded, “What Cayuga Lake means to me goes beyond the recreational use and tourism it attracts. It is a lifeline to the community by acting as an almost unlimited source of fresh drinking water, which is becoming more rare around the world due to changing weather patterns. Therefore it is very important that we protect it from natural or anthropogenic sources of contamination.”

When Glenn monitoring Cayuga Lake, he said he acts as a roadie for his daughter, who happens to be an amazing drummer!

Welcome to the team, Glenn! We are so thankful for your passion and expertise!

Welcome Quadrant Leader Andy Yale!



Andy Yale is the Quadrant Leader for the Southwest Quadrant of Cayuga Lake. Andy has been enjoying Cayuga Lake since he was a boy. He likes to sail, motor, fish, and swim, but his favorite lake activity is drifting in a boat on the lake, taking in the wonderful environment. Aside from lake activities, Andy enjoys biking on the Black Diamond Trail.

Cayuga Lake was an important part of Andy's childhood and his present; he and his family live "just above her shores." When asked what Cayuga Lake meant to him, Andy responded, "I love the perspective it gives on where we are, placed among the hills."

Welcome to the team, Andy! We are so thankful to you and your fun-loving spirit!

Welcome Quadrant Leader Bill Ebert!



Bill Ebert is the Quadrant Leader for the Northwest Quadrant of Cayuga Lake. Bill Ebert and his wife Jane have been living on the northwest shore of Cayuga Lake for 30 years. His relationship with the Cayuga Lake Watershed Network began five years ago when Bill and two of his granddaughters attended an evening workshop held by CLWN Steward, Hilary Lambert, on invasive species. Bill had brought with him a bucket of unidentified slime, hoping to find someone at the workshop who knew what it was. The slime turned out to be cladophora, a non-toxic green algae

commonly found in lakes. A few emails later, Bill was elected to the CLWN's Board of Directors.

As a board member, Bill has initiated many water monitoring campaigns. Due to concern about the quality of the water coming out of Canoga Creek, Bill and the CLWN started a water quality monitoring program on both Canoga and Burroughs Creeks. This program has been going strong for four years now, gathering and publicizing eye-popping data about the sources of pollution on Cayuga Lake. After the success of this program, Bill is collaborating again with the CLWN and the Finger Lakes Institute to develop a proposal for a pilot restoration project for either Canoga or Burroughs creek with the Citizen Science Institute. Additionally, Bill was enlisted along with his friend, Tom Casella, by the DEC to participate in the Citizens Statewide Lake Assessment Program (CSLAP), and monitor water quality at the north end of Cayuga Lake. Last summer, Bill and Tom did weekly monitoring on a stretch of lakefront to create a census of all plant species found there.

It's easy to notice Bill's experience in water quality monitoring and passion for Cayuga Lake. He has been an amazing asset to the CLWN organization due to his stick-to-itiveness, his ambition and his readiness to take action.

Welcome to the team, Bill! Thank you for donating your time, energy and expertise to this program!

Welcome Quadrant Leader Christy Gunderson VanArnum!

Christy Gunderson VanArnum is the Quadrant Leader for the Northeast Quadrant of Cayuga Lake. She grew up and currently resides right on Cayuga Lake in Aurora. After growing up on the lake and falling in love with the water, Christy went back to college for fisheries and aquaculture and received a Masters Degree in Aquatic Science/Aquaculture. Christy has been working in the field of aquatic sciences for 10 years, and is now a teacher in the area. She still spends her summers on the lake.

Christy's favorite lake activity is swimming! With a lifetime of experience on the lake, she was able to swim across Cayuga Lake at its widest point to Aurora several years ago. When asked what Cayuga Lake meant to her, Christy responded, "Cayuga Lake is my entire family's favorite place. It is critical to all who live here."

Welcome to the team, Christy! We so appreciate your passion and support for the lake!

Q&A

Thank you to everyone who sent in questions for this week's newsletter! Below are our answers to them.

Why do cyanobacteria produce toxins?

Toxins produced by cyanobacteria are considered to be secondary metabolites. This means that these molecules are not essential to the organism's growth, development, or reproduction (Waters, 2015).

An increased production of these toxins have been observed as a result of zooplankton grazing. Interestingly though, spikes in toxin production have also been observed from cyanobacteria that are simply in the presence of zooplankton. This suggests that zooplankton may emit an infochemical that, when sensed by cyanobacteria, triggers an increase in toxin production. Ecologically, this all suggests that toxin production is an induced defense in cyanobacteria in order to deter grazing (Jang et al., 2003). Not all cyanobacteria are capable of producing toxins, but there is evidence that some copepods have the ability to select non-toxic bacteria to feed on within mixtures of both toxic and

non-toxic bacteria, thus contributing to the ecological success of toxin producing cyanobacteria (Jang et al., 2003).

While there is evidence that toxins are produced as a defense mechanism, some also hypothesize that toxin production may be a stress response to several abiotic factors including, but not limited to, salinity, temperature, light intensity, and nutrients (Jang et al., 2003). As with most things involving cyanobacteria it seems, more research is necessary to fully understand these creatures!

What are the causes of HABs?

According to a study conducted by the DEC, four factors were found to be correlated with HABs occurrences: phosphorus levels, presence of dreissenid mussels, maximum lake fetch length, and the lake compass orientation of its maximum length. For every 0.01mg/L increase in Phosphorus levels, the probability that a body of water will produce a HAB increases by roughly 10-18%. However, the other three factors have a much greater range of uncertainty. The presence of dreissenid mussels are estimated to increase the probability of HABs by 18-66%, a northwest orientation of the longest fetch length is estimated to increase HABs probability by 10-56%, and finally, every mile of increased fetch lake is estimated to increase the probability of HABs by 20%. More information on this can be found in the Cayuga Lake HABs Action Plan here:

https://www.dec.ny.gov/docs/water_pdf/cayugahabplan.pdf.

While these four factors were identified by the DEC, they are likely not the only four that exist. According to Rollwagen-Bollens et al. (2018), "Many different biotic and abiotic factors influence the dynamics of cyanobacterial blooms, often acting synergistically." This likely contributes to the difficulty in predicting cyanobacteria bloom occurrences. As noted in the Cayuga Lake HABs Action Plan, some lakes that seem to have all of the factors that contribute to HABs development will not experience HABs, while there have been harmful blooms in lakes that have lower nutrient levels and likewise would not have been predicted to have HABs.

Though we are certainly on the path to understanding these mysterious cyanobacteria, I think it is safe to say that we are not quite there yet. With further research and detailed datasets (like those produced from lake monitoring!), we can hopefully grow to better understand the factors that influence HABs in the near future.

Do cyanobacteria generate any positive impacts, or are they all bad?

Though aggregations of cyanobacteria can prove to be harmful, these microorganisms are important primary producers. In fact, they are responsible for about 30% of the annual oxygen production on Earth (DeRuyter & Fromme, 2008). In addition, cyanobacteria are a very diverse and relatively unexplored group of organisms, presenting a great opportunity for scientific discovery (Sharma et al., 2010). For example, though

microcystin, a toxin produced by cyanobacteria, is toxic to humans, it has been found to contain some anti-cancer properties, making it an excellent prospect for the development of pharmaceuticals (Dixit & Suseela, 2013). A few species of cyanobacteria have also shown some promise as potential candidates for biofuel production (Sharma et al., 2010). So, even though HABs are a growing nuisance in the lake, cyanobacteria themselves are not inherently bad. They even seem to have the potential to produce some really wonderful discoveries!

I don't have time to become a HABs Harrier, but is there anything else that I can do to prevent HABs?

Yes! Watershed residents can do their part by taking action to reduce nutrient pollution in Cayuga Lake. This can be done through the following:

- Limiting lawn fertilization
- Maintaining septic tanks
- Installing and maintaining shoreline buffers
- Reducing erosion and stormwater runoff
- Improving water movement

More detailed information on these strategies can be found on the DEC website here:

<https://www.dec.ny.gov/chemical/82123.html>

Jessica Biggott, Cayuga Lake Watershed Network 2019 HABs Communication Intern
habsintern@gmail.com

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).

Cayuga Lake Watershed Network
programs@cayugalake.org 607-319-0475
Community Science Institute
info@communityscience.org 607-257-6606