Great Lakes HABs Collaborative
NEWSLETTER
LINKING SCIENCE AND MANAGEMENT TO REDUCE HARMFUL ALGAL BLOOMS WINTER 2023

What's happening with the HABs Collaborative?

Science by icebreaker

R. Michael McKay, Director and Professor,
Great Lakes Institute for Environmental Research, University of Windsor

Beyond their role in support of commerce, icebreaking capabilities of the joint U.S. and Canadian Coast Guards (USCGC) render their vessels **safe and reliable platforms for monitoring and research on ice-covered coastal seas.** For over 15 years, I have collaborated with the command and members of USCGC NEAH BAY (WTGB 105) and Canadian Coast Guard Ship (CCGS) GRIFFON to investigate lower food web dynamics during winter in Lake Erie.

CCGS SAMUEL RISLEY transiting Detroit River during the 2022 Winter Grab.

Ice cover on the Great Lakes has declined precipitously over the past half-century consistent with a warming climate. On Lake Erie, the shallowest of the Great Lakes, this has resulted in a higher frequency of low ice winters thus compromising any seasonal resets that may occur. While winter presents a logistical barrier to better understanding the lake ecosystem, **combined U.S. and Canadian Coast Guard winter operations in the Great Lakes provide an opportunity to advance our knowledge.**

These recent sampling campaigns partnering with the joint Coast Guards have demonstrated the tremendous value of this relationship. Winter 2019-20 was uncommonly mild in the region thus offering a window to a future low-ice state of Lake Erie predicted in climate models. With no federal, state, or provincial agencies having the capability to monitor the lake between December-March, this unique event may have passed without investigation save for the partnership with NEAH BAY facilitating monthly sampling along transects between Cleveland and Detroit. Beyond the unique state of the lake that winter and spring, the onset of the COVID-19 pandemic in late winter 2020 meant that data acquired from NEAH BAY may be some of the only early season in-lake observations that year as agency spring monitoring efforts were paused.

While COVID-19 paused winter science operations in 2020-21, our partnership resumed the following winter in time for the Great Lakes basin-wide Winter Grab event held in February 2022. Modeled after the successful 2019 HABs Grab, the Winter Grab comprised over a dozen research teams from the U.S. and Canada working together to offer a snapshot of the winter condition across the Great Lakes. While most teams were confined to sampling at nearshore sites, partnering with the joint Coast Guards facilitated sampling of offshore areas. All told, CGC NEAH BAY, CCGS GRIFFON and CCGS SAMUEL RISLEY collected samples from 22 locations in southern Lake Huron and Lake Erie. Combined, these samples accounted for 50% of all samples contributed to the Winter Grab and are providing valuable insights into the lower food web during winter. With another mild winter upon us reinforcing thoughts of a future ice-free Lake Erie, our Coast Guard partners continue to support science to unravel the mysteries of the Great Lakes winter ecosystem. Bravo Zulu.

Editor's Note: At the October 2021 meeting of the Great Lakes Commission, commissioners adopted a policy resolution encouraging **improved capacity for winter icebreaking,** with specific support for equipping future icebreaking tugs for winter ecology research.

HABs Calendar

IAGLR's 66th Annual Conference

Join the Great Lakes HABs Collaborative at **IAGLR's 66th annual conference** on Great Lakes research in Toronto from May 8-12, 2023. The collaborative will be hosting Session 38 (Threats to the Great Lakes). You can find more conference details **here.**

IAGLR 2023

St. Louis River Summit

The Lake Superior National Estuarine Research Reserve is hosting the **13th annual St. Louis River Summit** in Superior, Wisconsin March 8-10, 2023. You can find more details and **register for the summit here.**

ITRC Trainings

ITRC is offering live online training for their **Strategies for Preventing and Managing Harmful Cyanobacterial Blooms guidance documents.** Planktonic cyanobacteria will be covered March 2 and benthic cyanobacteria will be covered March 9, 2023. You can find more details and **register for the trainings here.**

Great Lakes Science for Parks Symposium

Northland College in Ashland, Wisconsin, is hosting the **Great Lakes Science for Parks Symposium** March 21-23, 2023. This symposium focuses on addressing emerging issues in Great Lakes National Parks. You can find more details and **register for the symposium here.**

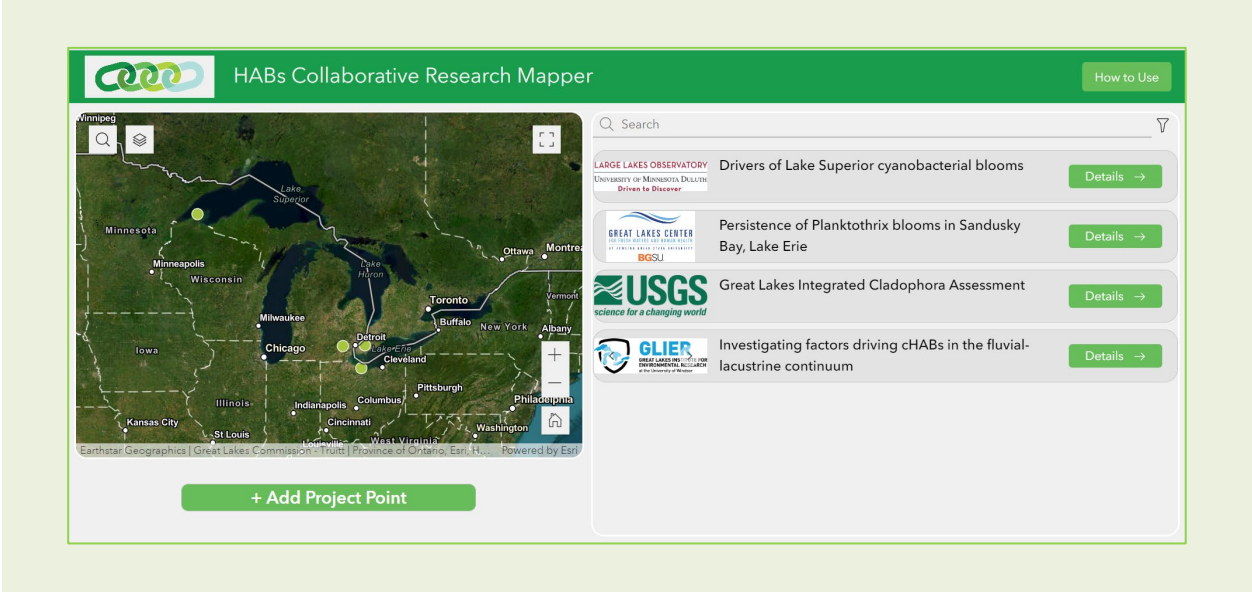
Wisconsin Lakes and Rivers Convention

HABs Collaborative Co-chair, Gina LaLiberte is presenting a workshop, **Introduction to Lake Algae and Cyanobacteria: Identification, Ecology, Health Effects, and Management,** at the Wisconsin Lakes and Rivers Convention on April 19, 2023, in Stevens Point, Wisconsin. You can find more details and **register for the convention here.**

HABs Research Mapper

The HABs Research Mapper continues its beta-testing!

HABs Collaborative Steering Committee members have worked with the Great Lakes Commission to develop an app to increase collaboration among researchers and water managers working to investigate and address HABs in the Great Lakes basin. **Visit www.glc.org/work/habs to learn more.** Please reach out to Connor Roessler at croessler@glc.org if you have a research project to add to the mapper.



Member Spotlight

We know a lot of good work is happening around the Great Lakes basin thanks to many of our collaborative members. **Help us share that work by suggesting content for the "Member Spotlight" section of this periodic newsletter.** Please share your ideas with Connor Roessler at croessler@glc.org.

Spotlight: Jordan Murray

Jordan Murray was born and raised in Toledo, Ohio, where she witnessed the impact harmful algal blooms had on her community during the 2014 drinking water crisis. Now, as a University of Wisconsin Water Resources Science-Policy Fellow, Jordan helps address this problem in Wisconsin by leading the state's public health response to HABs. She manages the **Harmful Algal Blooms Program** at the **Wisconsin Department of Health Services** where she leads prevention and control of HAB-related illnesses through research, illness investigation, and outreach.

In her role, Jordan assists local health officials with investigating HAB-related health complaints and develops signage, press releases, social media messaging, and other tools for communicating vital information about HABs to the public. During illness investigations, she works closely with the Wisconsin Department of Natural Resources to coordinate water sample collection and testing for cyanobacteria and cyanotoxins. Jordan presents frequently at conferences and outreach events. This year, she helped lead a collaborative HAB-related pilot study with the U.S. Centers for Disease Control and Prevention, U.S. EPA, and other federal agencies. This research uses existing data sources to assess the relationship between respiratory-related hospital visits and cyanobacteria bloom occurrence over time.

Jordan holds a BA in neuroscience from the College of Wooster and a master's in Public Health-Epidemiology from the University of Toledo. During grad school, she interned with the University of Toledo's Kennedy-Haller Lab where she led a team to develop **research-based infographics** related to harmful algal blooms in partnership with the Great Lakes Commission and HABs Collaborative. Jordan hopes to continue studying and advocating for HABs and health while growing in her role as a public health leader.

Jordan Murray

Spotlight: Dr. Benjamin Kramer

Benjamin Kramer joined the **Cooperative Institute for Great Lakes Research (CIGLR)** as a postdoctoral fellow in the summer of 2022. He is dedicated to **studying how elevated carbon dioxide (CO2) levels influence bloom-forming, toxin-producing cyanobacteria.** Ben obtained his Ph.D. in marine sciences from the State University of New York at Stony Brook as well as an MS and a BS, respectively, from UNC Wilmington and Georgia Tech. His work was recently funded by NOAA's Ocean Acidification Research program in order to understand how CO_2 enrichment affects the microbial communities of the Great Lakes. Three weeks after beginning his postdoctoral

Dr. Benjamin Kramer on the EPA R/V Lake Guardian collecting samples from a CTD

fellowship, Ben participated in the EPA's annual survey of the Great Lakes on the R/V Lake Guardian. From the samples collected on this research cruise, he has measured alkalinity, dissolved inorganic carbon, and dinitrogen (N_2) levels in dozens of locations throughout the Great Lakes. This work will determine whether inorganic carbon levels significantly correlate to the degree of N_2 fixation, which is a major ecosystem function in freshwater systems. Ben is also collaborating with several principal investigators from other academic institutions to refine and revise the phylogeny of N_2-fixing organisms in dozens of ecosystems (lake, hydrothermal vents, oceanic, rhizosphere, etc). Upcoming projects of his include characterizing microbial communities within the Great Lakes, and studying the effects of CO_2, temperature, nitrogen, and alkalinity on the growth, toxin production, community composition, and gene expression of bloom-forming cyanobacteria from the Great Lakes. If you are interested in learning more about his work and the research tools/techniques he's familiar with, please contact Ben at **bjkramer@umn.edu.**

News from our HABs Collaborative Co-chairs

Co-chairs participate in HAB Communication Preparedness Workshop

Co-chairs Ruth Briland and Gina LaLiberte participated in a virtual workshop on **Great Lakes HAB Communication Preparedness** in January 2023. This event was hosted by **NOAA's Disaster Preparedness Program** and the University of New Hampshire's Coastal Response Research Center. The planning committee included representatives from several NOAA programs, Ohio Sea Grant, and Ruth Briland. The goal of the workshop was to better understand the roles and responsibilities of HAB response agencies, explore the science and tools that help drive decision-making and their ability to assist states, and to highlight the importance of interagency coordination. 70 participants from local response, state and federal agencies attended the workshop and actively contributed to facilitated, small-group discussions. To help everyone come to the table, pre-workshop recorded presentations served as case studies on HAB events in the region. Gina LaLiberte presented the case study from a 2021 Lake Superior HAB event which impacted recreation. The other case study from Ohio EPA addressed the HAB impacts on drinking water of the Toledo Water Crisis event in 2014.

Day One focused on general workshop goals, logistics, and the two case studies. It included two breakout sessions to allow participants to share and discuss HAB responses plans that they have experienced with response to recreation and drinking water impacts in small groups of eight to 10 individuals. Day Two focused on tools for risk communication and examples of HAB response plans and communication tools. Often, this information is tailored to different audiences, from immediate technical details on water quality and bloom conditions targeted to key stakeholders, to public audiences interested in visiting a beach or other recreational area. Additional small-group discussions on the second day gave participants the chance to share their experiences and gather thoughts from others on how to prepare for and improve communication about HABs. The workshop's recorded case studies, presentation slides, and other shared resources are **available online.**

Canadian Corner

Monitoring phosphorus loss at small scales to understand big issues

Katie Stammler, ERCA; Colin Little, LTVCA; Mari Veliz, ABCA;
Tatiana Lozier, UTRCA; Chris Van Esbroeck, MVCA

The **On-Farm Applied Research and Monitoring (ONFARM) program** is a four-year, applied research initiative that began in 2019 which supports soil health and water quality research on farms across Ontario. ONFARM is funded by the Canadian Agricultural Partnership, a federal-provincial-territorial initiative. The program was developed by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), and is delivered by the Ontario Soil and Crop Improvement Association (OSCIA) with the support from various organizations including Agriculture and Agri-Food Canada, five Conservation Authorities and The Soil Resource Group. ONFARM is also supported by a network of farmer cooperators, who are essential to the success of this program. ONFARM builds on work completed under the Great Lakes Agricultural Stewardship Initiative's (GLASI) Priority Sub-watershed Project, supports Ontario's Soil Health and Conservation Strategy, and helps the industry meet commitments under the Great Lakes Water Quality Agreement.

The role of the Conservation Authorities (CA) is to monitor water quality at the sub-watershed and edge of field scale to evaluate the effects of best management practices (BMPs) on nutrient reduction. We have learned some important lessons along the way. We monitor six sub-watersheds – Wigle Creek in the Essex Region CA, Jeanette's Creek in the Lower Thames Valley CA, Upper Medway and Kettle Creek in the Upper Thames River CA, Garvey Glen in the Maitland Valley CA, and Gully Creek in the Ausable Bayfield CA. Each of these sub-watersheds is under 20km^2. They were selected to be representative of the unique physical characteristics and farming activities of each area, from the flat clay plains of Essex County to the rolling hills of the Maitland Valley. Farmers in our watersheds grow corn, soy, and winter wheat in various rotations, with cover crops planted after wheat when possible and desired. In the northern watersheds, there is more livestock and manure use, while the southern watersheds are mostly cash crop with commercial fertilizer.

In each of these watersheds, we can tell a story of a specific event that led to high runoff at the edge of a field, often contributing nearly an entire year's worth of nutrient load in a matter of days. In one example, the highest phosphorus losses were observed during the nongrowing season, in the rainy months following surface application of manure, and subsequent conventional tillage. On a strict no-till farm in the clay plains, rain following broadcast fertilizer with no incorporation led to high nutrient concentrations in runoff. In another example, we saw high loss (10x normal phosphorus concentrations) after surface broadcast of fertilizer with no incorporation followed by a large rain event. In each of these events, the amount of elemental phosphorus lost compared to what was applied was as little as 0.05% and up to 8%, meaning that loss at a small scale is negligible, and these individual events are rarely noticeable at the watershed scale. However, when these same practices occur throughout the watershed, the cumulative loss can lead to high nutrient loads.

We have also observed many successes. Applying nutrients in dry periods, incorporating nutrients, and maintaining crop residue over the winter appears to have minimized losses. Cover crops help to keep soil and nutrients in place, while improving soil health. Importantly, none of these farm practices are new and the participating farmers in our studies are all conservation minded. There are more BMPs implemented on the landscape than ever before – with significant increases in the uptake of cover crops, soil erosion control and 4R nutrient management (right source, rate, time, and place for nutrient application). Monitoring at both the sub-watershed and field-scale has increased our understanding of key drivers and opportunities to reduce losses. It is essential that we continue monitoring at these scales to better understand nutrient losses from the landscape and the challenges of capturing or reducing <8% loss from each field to mitigate this dynamic nonpoint sources runoff issue with no single, simple solution. To achieve Lake Erie phosphorus reduction targets, land management changes and BMP adoption will need to be adopted on a large scale across a significant number of hectares. We need to continue to work with farmers regionally to determine how these practices can feasibly be incorporated into a variety of farming systems from a logistical and economic perspective, while maximizing their potential to reduce nutrient loads.

Get involved and stay in touch!

Find us on Twitter

The Collaborative is active on Twitter! Follow us to get up-to-date information about our work and other HABs-related content. @GLHABsCollab

Join our Listserv

To join our Listserv and receive announcements about the Collaborative, please email Connor Roessler at croessler@glc.org