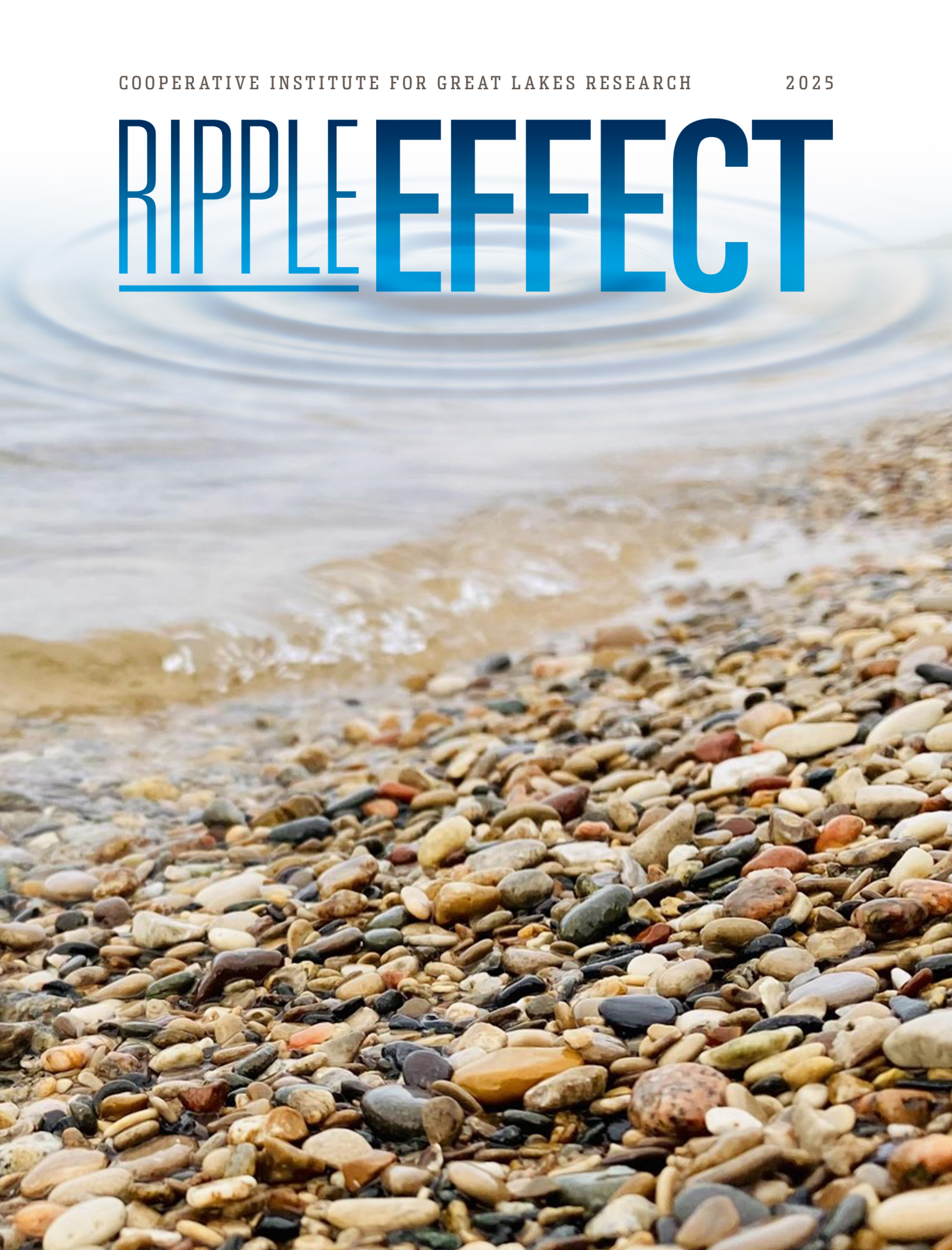
COOPERATIVE INSTITUTE FOR GREAT LAKES RESEARCH 2025

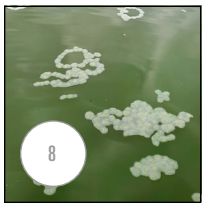
RIPPLE EFFECT



What's Inside

Mission Statement

As a NOAA Cooperative Institute, CIGLR helps NOAA accomplish its goals for research and management of the Laurentian Great Lakes by leading exciting new research efforts, training the next generation of Great Lakes scientists, expanding NOAA research in the Great Lakes through our Consortium, and translating research into actionable science to meet societal needs. The Great Lakes Environmental Research Laboratory (GLERL) is our primary NOAA sponsor and home of CIGLR research personnel.



UNLOCKING THE
Potent Saxitoxin Threat
IN LAKE ERIE

Little Mussels, Big Impact
UNRAVELING THEIR SECRET TO SUCCESS

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Connect with CIGLR

Glenn Carter (left) and Mary Ogdahl (right) helped celebrate the inaugural World Lake Day by engaging visitors at the University of Michigan Matthaei Botanical Gardens with insights on Great Lakes research and stewardship. Photo: Aubrey Lashaway.

Dear Friends and Colleagues,

CIGLR Director, Dr. Gregory Dick

It was a challenging year. In February, many of our dear NOAA colleagues were laid off. These were "probationary employees", meaning they had been recently hired or promoted. Several of them were CIGLR employees for years and had just landed NOAA jobs. Seeing valued, hard-working, and high-performing colleagues terminated, effective immediately, with notices that falsely cited poor performance, was hard to stomach. The GLERL work force is down ~40% from the beginning of the year due to layoffs and early retirements, leaving gaping holes in key roles like communications and dissemination of critical data to stakeholders. Later in the year the President's 2026 budget called for the elimination of NOAA's Office of Oceanic and Atmospheric Research, a scenario in which GLERL and CIGLR would likely cease to exist. While congressional budgets call for funding closer to that of previous years, next year remains uncertain. As I write this letter in late October, the budget dispute and lengthy government shutdown is keeping us away from our labs and vessels, disrupting critical research and end-of-season field work. We also grappled with long delays in delivery of funding, taking us to the brink of massive layoffs of CIGLR staff in Ann Arbor and interrupting support of students and science at consortium institutions across the Great Lakes Basin. Thanks to steadfast support from the University of Michigan, we were able to avoid large-scale layoffs until the funds arrived but unfortunately we did lose several highly-valued staff members as a direct result of the funding delays.

Such events can shake even the strongest conviction and dedication, but CIGLR staff and scientists have shown remarkable resiliency in the face of this adversity. From supporting each other in community gatherings (e.g., lunchtime euchre!), to explaining how **NOAA protects our water, our communities, and our way of life in the Great Lakes**, to simply carrying on with important work, we have pushed forward.

This issue of *Ripple Effect* is packed with examples of how CIGLR has carried on with critical research and training and redoubled efforts to communicate the importance of this work to the public and to policymakers. I joined together with scientists from across the Great Lakes basin to explain the critical value of Great Lakes research and how investing in it improves human health, prosperity, and well-being (pages 6-7). One of our most powerful assets in communicating the importance of Great Lakes research has been CIGLR Associate Director Mike Shriberg. Bringing his many years of experience in the Great Lakes advocacy community, Mike took CIGLR's engagement enterprise to a new level. He has worked tirelessly on our behalf, advocating for science-based Great Lakes policy to congressional staffers, writing op-eds, and engaging with numerous media outlets. Mike recently moved on from CIGLR to take the helm at the U-M Water Center. While we are sad to lose him, we are delighted that he is moving on to a role that suits his talents and interests so perfectly. We will continue to work closely with him to advocate for sound Great Lakes science and policy. You can read more about Mike's many contributions to CIGLR and the Great Lakes community in our piece on Celebrating Mike Shriberg (pages 4-5).

We hosted another cohort of outstanding Great Lakes Summer Fellows (pages 22-23), who worked with mentors from CIGLR and GLERL to learn what Great Lakes research is all about. I hope you are inspired as I am by these enthusiastic young scientists. I am also proud of our dedicated staff, and delighted that we could recognize some of them with awards for their exceptional

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efforts to build community, conduct outstanding research, and translate that research into societal benefits (page 27).

This issue spotlights some of those research successes that illustrate the impacts of our work. Paul Den Uyl used cutting-edge environmental genomic approaches to reveal the source of a dangerous algal toxin in the Great Lakes for the first time (pages 8-9). This study provides a foundation for understanding what conditions promote the occurrence of this emerging threat. His work builds on CIGLR's growing strength in "omics" technologies, which offer faster, cheaper, and better avenues for monitoring, understanding, and forecasting ecosystems. Research by Postdoc Hazem Abdelhady and colleagues showed that extreme weather events are on the rise in the Great Lakes (pages 12-13), emphasizing that the Great Lakes have entered a new thermal regime and we are now in a highly volatile era that will likely have consequences for ecosystems, economies, and communities.

Two of our research advances focused on invasive mussels that have transformed Great Lakes ecosystems. Anna Boegehold and colleagues published a new paper that used lab experiments to deepen our understanding of how invasive mussels promote harmful cyanobacterial blooms by selectively feeding on the "good algae", tilting the competitive landscape towards toxic cyanobacteria (pages 10-11). This dramatic removal of algae has decimated the base of the food web, causing catastrophic crashes of beloved fisheries. Tongyao Pu and colleagues have developed a new model that will help us predict how mussels grow and respond to environmental change (pages 16-17), a major advance that brings us one step closer to understanding, predicting, and mitigating the impacts of these Great Lakes invaders. The complementarity of these two studies highlights the power of CIGLR's integrated field measurements-experiments-modeling approach.

A major accomplishment from one of our biggest projects was the development of the Great Lakes Net Basin Supply Predictor, which leverages advanced machine learning and interdisciplinary science to improve forecasts of Great Lakes water levels (pages 14-15). This new tool, produced in collaboration with the US Army Corps of Engineers and co-designed with end-users, will help to prepare communities and industries for water level changes and protect the long-term health of Great Lakes ecosystems.

Amidst the chaos and progress, we welcomed eight new members to the CIGLR team (page 30) and said goodbye to several others this year. Whatever the future holds, the enthusiasm and commitment of these CIGLR colleagues, new and old, inspires me and gives confidence that we will weather whatever challenges the next year brings.

Sincerely,

Gregory J. Dick

Gregory J. Dick, PhD
Director
Cooperative Institute for Great Lakes Research

Cooperative Institute for Great Lakes Research
CIGLR
Great Lakes Science for Society

Thank You, Mike Shriberg:

A CHAMPION FOR CIGLR AND GREAT LAKES SCIENCE

We are proud to celebrate and extend our heartfelt gratitude to Mike Shriberg, PhD, whose exceptional leadership and visionary engagement at the Cooperative Institute for Great Lakes Research (CIGLR) have profoundly enriched our community. Appointed Director of the U-M Water Center on July 1, 2025, Mike started a new chapter perfectly aligned with his deep commitment to water research, policy, and community engagement.

While also serving as a faculty member in U-M's School for Environment and Sustainability (UM-SEAS) and Interim Director at Michigan Sea Grant, Mike joined CIGLR in 2023 as Director for Engagement and then Associate Director with a clear mission: to expand the institute's Engagement, Career Training, and Outreach (ECO) program and strengthen the connection between science and policy. Drawing from his experience as Great Lakes Regional Executive Director for the National Wildlife Federation, Education Director at the U-M Graham Sustainability Institute, and leadership roles in the Healing Our Waters-Great Lakes Coalition, Mike brought deep expertise in water quality, environmental leadership, climate resiliency, and youth education.

"Mike Shriberg is a master collaborator and Great Lakes visionary," said Laura Rubin, Director of the Healing Our Waters-Great Lakes Coalition. "Mike reaches out to partners throughout the region to strategize and implement high-level tactics. Mike is successful because of his ability to listen, make space for everyone, and articulate compelling stories and rationale."

"Michigan Sea Grant is excited to continue working with Mike in his new role," added Silvia Newell, Director of Michigan Sea Grant. "He's been a strong advocate for our Great Lakes for the past two decades, and will add substantially to the great work and partnerships of the Water Center."

As Associate Director of CIGLR, Mike also played a critical role in aligning research priorities with pressing policy needs and fostering partnerships that amplified the institute's reach and influence. CIGLR Director Gregory Dick praised Mike's leadership for opening "new doors for collaboration, engagement, and impact across U-M's water community and beyond. Mike's extensive connections with Great Lakes partners and policymakers have been essential to taking CIGLR's engagement, collaborations, and impact to another level."

"One of the many impacts Mike has had on the Great Lakes is developing the next generation of sustainability leaders," said Mary Ogdahl, Managing Director of CIGLR. "He has a passion for mentoring and building talent through engaged learning experiences that empower students to solve real-world problems. Mike's students graduate with the skills, confidence, and compassion to become the Great Lakes leaders we need."

Under Mike's mentorship, the ECO program awarded supplemental funding to UM-SEAS master's projects that wove engagement, career training, or outreach into their research. One recent collaboration paired students

with Great Lakes Now to design a media model that engages frontline communities, promotes inclusive coverage, and equips newsrooms with tools for accountability and impact tracking, just one example of Mike's dedication to ensuring Great Lakes science communication is equitable, clear, and accessible. "Having Mike's mentorship and guidance on this project was invaluable to our team both personally and professionally," said Hira Ahmad, Kausthubh Sumanth, Francesca Levethan, Hannah and Madeline Rieders. "As master's students, an opportunity to lead a consulting project was daunting but working with Mike was anything but. He was kind, patient, and encouraging during the process and despite his depth of knowledge in the environmental field he always gave us room to explore our own questions, sparking greater curiosity and passion in us as emerging professionals. The U-M Water Center and the School of Environment and Sustainability are better because of his leadership."

"Mike is a master communicator," said Carole Love, UM-SEAS Executive Director of Communications, Marketing, and Outreach. "It's been incredible to watch him in action. He combines deep expertise in Great Lakes policy, advocacy, and community engagement with a true gift for crafting compelling messages, whether it's the perfect soundbite or a powerful op-ed. The Great Lakes are better protected because of his voice, and it's been an absolute joy to collaborate with him on the UM-SEAS communications team. Not only that, but he has played a crucial role with students, inspiring them to amplify their impact. I look forward to working with him as he tackles his new role leading the Water Center."

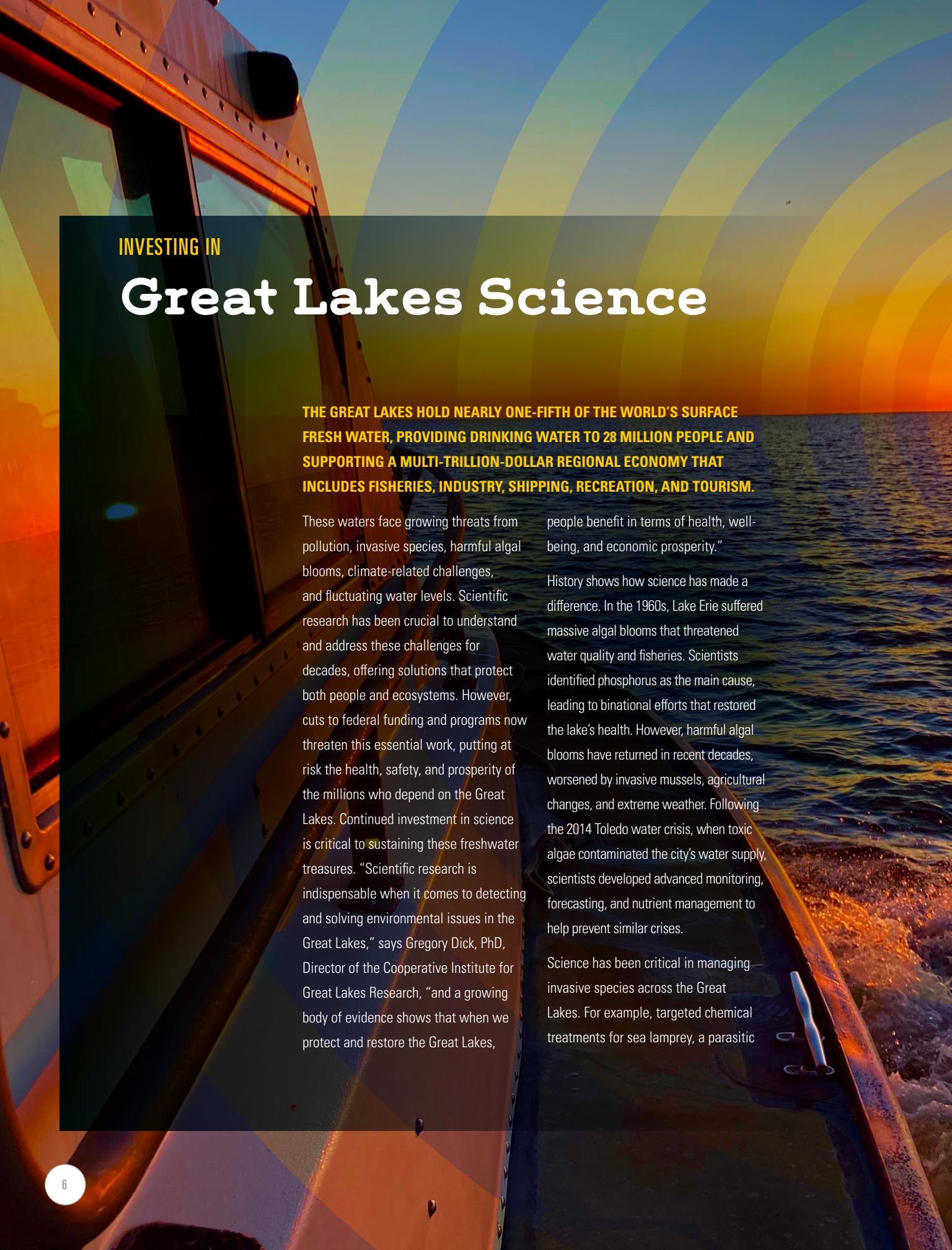
Mike's influence extends well beyond campus. He has worked directly with congressional staffers on Capitol Hill to advocate for science-based Great Lakes policy, given countless interviews to media outlets, and brought together diverse stakeholders including government partners, tribal leaders, community groups, and researchers, to co-create solutions with lasting impact. His leadership in launching and co-chairing the Water@Michigan Collaborative has strengthened collaboration across disciplines and expanded the reach of U-M's water community.

As Mike steps into his role at the U-M Water Center, launched with support from the Erb Family Foundation, he carries forward a wealth of experience, vision, and relationship-development. Building on the legacy of outgoing director Jennifer Read, PhD, he is poised to lead the Water Center into its next era, advancing collaborative approaches to water policy, science, and management.

"I'm confident that with Mike Shriberg's leadership, the Water Center is well positioned for its next chapter," said John Erb, Chair of the Fred and Barbara Erb Family Foundation. "In its efforts to address harmful algal blooms, advance microplastics research, and take on other critical water issues, the Water Center has made a clear impact, and I believe it will only grow stronger under Mike's direction. As a former "Erber," Mike brings both a deep connection to U-M and lifelong commitment to environmental stewardship that will help expand the Water Center's leadership across the Great Lakes region."

Mike will continue to interact with CIGLR in his new position. "I'm delighted to see Mike take the helm at the Water Center and excited to continue to work with Mike in this new role", says Dick. "We will continue to work together closely, and I look forward to finding new ways of advancing Great Lakes science and its impacts on campus and beyond."

The Great Lakes region and U-M's water community are stronger, more connected, and more hopeful because of Mike's leadership. We wish him boundless success as he continues shaping the future of collaborative water science.



INVESTING IN

Great Lakes Science

THE GREAT LAKES HOLD NEARLY ONE-FIFTH OF THE WORLD'S SURFACE FRESH WATER, PROVIDING DRINKING WATER TO 28 MILLION PEOPLE AND SUPPORTING A MULTI-TRILLION-DOLLAR REGIONAL ECONOMY THAT INCLUDES FISHERIES, INDUSTRY, SHIPPING, RECREATION, AND TOURISM.

These waters face growing threats from pollution, invasive species, harmful algal blooms, climate-related challenges, and fluctuating water levels. Scientific research has been crucial to understand and address these challenges for decades, offering solutions that protect both people and ecosystems. However, cuts to federal funding and programs now threaten this essential work, putting at risk the health, safety, and prosperity of the millions who depend on the Great Lakes. Continued investment in science is critical to sustaining these freshwater treasures. "Scientific research is indispensable when it comes to detecting and solving environmental issues in the Great Lakes," says Gregory Dick, PhD, Director of the Cooperative Institute for Great Lakes Research, "and a growing body of evidence shows that when we protect and restore the Great Lakes, people benefit in terms of health, well-being, and economic prosperity."

History shows how science has made a difference. In the 1960s, Lake Erie suffered massive algal blooms that threatened water quality and fisheries. Scientists identified phosphorus as the main cause, leading to binational efforts that restored the lake's health. However, harmful algal blooms have returned in recent decades, worsened by invasive mussels, agricultural changes, and extreme weather. Following the 2014 Toledo water crisis, when toxic algae contaminated the city's water supply, scientists developed advanced monitoring, forecasting, and nutrient management to help prevent similar crises.

Science has been critical in managing invasive species across the Great Lakes. For example, targeted chemical treatments for sea lamprey, a parasitic

fish that once devastated native fish populations, saved billions of dollars in fisheries and allowed species like lake trout to recover. Research on invasive mussels has revealed their sweeping impacts on food webs and lake productivity, helping managers adapt fisheries and conservation strategies. In addition, studies on ballast water treatment for ships have slowed the arrival of new invaders.

Research into contaminants such as mercury, PCBs, DDT, PFAS, and microplastics has revealed serious risks to fish, birds, and humans by showing how these pollutants move through food webs. This work led to regulatory bans, cleaner water, and the recovery of species like the bald eagle, while ongoing monitoring continues to detect new threats before they cause widespread damage. At the same time, the Great Lakes are among the fastest-warming large lakes in the world, with shrinking winter ice, shifting temperature layers, and unpredictable water levels that threaten ecosystems and communities alike. Long-term data and advanced models now forecast flooding and erosion, helping cities and resource managers prepare and reduce future impacts.

Great Lakes science thrives on collaboration across universities, federal and state agencies, nonprofit organizations, businesses, and citizen scientists, often spanning the US-Canada border. Federal funding supports observation networks, research vessels, labs, and training the next generation of scientists. Programs like the Great Lakes Restoration Initiative generate over three dollars in local economic activity for every dollar spent, revitalizing communities with cleaner water.

"Without continued investment, critical data and research capacity will be lost, weakening the region's ability to respond to threats," said Dick. "History proves that investing in Great Lakes science safeguards water, wildlife, and prosperity, ensuring these freshwater treasures endure for generations."

Journal Article

Hear more from across the Great Lakes region

Continued investment in Great Lakes science is essential to safeguard water, wildlife, and prosperity across the region, making continued support essential for protecting these freshwater treasures for generations to come.

— Gregory Dick, PhD

UNLOCKING THE

Potent Saxitoxin Threat

IN LAKE ERIE

SAXITOXINS ARE NATURALLY OCCURRING CHEMICALS MADE BY CERTAIN ALGAE AND CYANOBACTERIA THAT CAN DISRUPT NERVE FUNCTION AND CAUSE SERIOUS ILLNESS.

While these toxins are well known in ocean environments for causing paralytic shellfish poisoning, their presence in the Great Lakes has been less understood, and the exact organisms producing them remain unknown. A recent study led by CIGLR Bioinformatics Specialist Paul Den Uyl, along with collaborators from the University of Michigan, NOAA GLERL, and Ohio State University, has made a major breakthrough in western Lake Erie by identifying the first planktonic cyanobacterium in the region that has the full genetic capability to produce saxitoxin.

Harmful algal blooms, or HABs, have long threatened Lake Erie's ecosystem, water quality, and public health. While much research has focused on microcystins, another type of toxin produced by cyanobacteria, saxitoxins have received far less attention. This discovery fills an important gap in our understanding of toxin risks in the lake.

"Microcystins have gotten most of the attention, but they're not the only concern," said Den Uyl. "HABs have been a major challenge in Lake Erie, especially since the 2014 microcystin bloom that led to a 'do not drink' advisory for nearly half a million people in Toledo, Ohio. Our study shows that saxitoxins may also be present and deserve closer monitoring."

By analyzing nearly a decade of water samples from the Great Lakes Atlas of Multiomics Research (GLAMR) database, the team found that a cyanobacterium called *Dolichospermum* carries the complete set of genes needed to produce saxitoxin. They also discovered a second set of saxitoxin genes likely from another cyanobacterium, *Cuspidothrix issatschenkoi*, suggesting there could be multiple toxin producers in the lake.

To better understand when saxitoxin is produced, the researchers examined DNA, gene activity, and environmental conditions in the lake. "We confirmed that saxitoxin genes were not only present but actively expressed under certain conditions," said Den Uyl. "By analyzing five years of data, we found genetic markers for the potential of saxitoxin production in one-third of samples. They were more common in warmer water with higher ratios of particulate nitrogen to phosphorus and less common when ammonium levels were high. This connection to temperature suggests that warmer waters may encourage the growth of saxitoxin-producing strains, which are genetic variants within a species."

The findings also reveal more about the ecology of *Dolichospermum* in Lake Erie. Many strains can utilize nitrogen in the air, which may help them survive later in the bloom season when other species, like *Microcystis*, have used up dissolved nitrogen in the water. "The saxitoxin-producing strain appeared across multiple years and locations, sometimes alongside similar non-toxic strains. This suggests that the ability to produce saxitoxin can be gained or lost through evolutionary processes such as gene transfer, where genetic material is exchanged between organisms," Den Uyl explained.

"Although saxitoxin levels in Lake Erie are generally low and below Ohio EPA safety thresholds for drinking water, the

presence of these genes in public water sources is important to note," said Den Uyl. "Finding multiple potential toxin producers highlights why monitoring for a wider range of cyanotoxins beyond microcystins is crucial."

This study marks a significant advance in understanding saxitoxin risks in the Great Lakes. "By identifying the organisms involved, showing their genetic potential, and linking their presence to environmental factors, this work lays the foundation for better monitoring, risk assessment, and prediction," Den Uyl said. "As nutrient levels and other conditions in Lake Erie continue to change, closely watching these newly identified toxin producers will be key to protecting both ecosystem health and human safety."

Journal Article

Research Highlight

GLAMR Database

"Saxitoxins have been an overlooked threat in Lake Erie, but our study identifies cyanobacteria with the full genetic capacity to produce these toxins, highlighting the need to expand monitoring beyond microcystins. Understanding when and where saxitoxin-producing strains thrive is essential to protecting both ecosystem and public health."

— Paul Den Uyl

WHAT'S ON THE MENU?

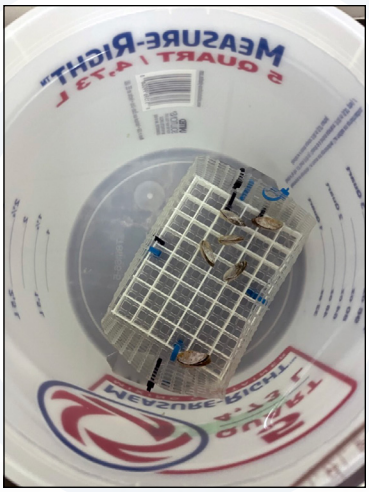
Not *Microcystis*, Say Mussels

IN WESTERN LAKE ERIE'S DYNAMIC AND EVER-CHANGING ECOSYSTEM, AN UNDER-THE-SURFACE RELATIONSHIP MAY HELP EXPLAIN WHY TOXIC BLOOMS OF *MICROCYSTIS* HAVE BECOME INCREASINGLY COMMON IN RECENT YEARS.

A recent study led by former CIGLR Algal Toxin and Ecology Research Specialist Anna Boegehold, PhD, alongside NOAA GLERL colleagues Paul Glyshaw, Reagan Errera, PhD, and Scientist Emeritus Hank Vanderploeg, PhD, explores the complex interactions between invasive quagga mussels and genetically distinct strains of *Microcystis aeruginosa*. Their findings shed new light on how these relationships may promote cyanobacterial dominance and highlight the many stressors shaping freshwater ecosystems.

Invasive dreissenid mussels, like the quagga mussel, have long been known as powerful ecosystem engineers. Introduced to the Laurentian Great Lakes in the late 1980s alongside the more familiar zebra mussel, they have significantly reshaped phytoplankton communities. By filtering out preferred food sources such as diatoms and green algae, while often rejecting cyanobacteria like the toxic *Microcystis aeruginosa*, these mussels have shifted the balance of the western Lake Erie ecosystem. As quagga mussels have become the dominant dreissenid species in much of Lake Erie, they play a key role in influencing phytoplankton dynamics. Until now, it remained unclear whether quagga mussels would eventually begin consuming *Microcystis* when other food became scarce.

To investigate this, the research team collected quagga mussels from Lake Erie and used seven genetically distinct strains of *Microcystis* aeruginosa from the Western Lake Erie Culture Collection at the University of Michigan. In carefully controlled lab experiments, they paired these strains with the green alga *Chlamydomonas oblonga* to observe feeding behavior. The mussels quickly consumed the green algae but did not switch to eating *Microcystis*, even when the green algae were depleted. Notably, strains of *Microcystis* that produced microcystins, the toxins characteristic of harmful blooms, also suppressed mussel feeding on the green algae, suggesting that the toxins or another metabolite act as a deterrent.



In the laboratory, quagga mussels were gently cleaned and stored in a stock tank for use in carefully controlled lab experiments. Photo: Anna Boegehold.

"This lack of prey switching is significant," said Boegehold. "It shows that the mussels remain selective even during food scarcity. Instead of becoming opportunistic, quagga mussels continue to avoid cyanobacteria, a behavior that could allow *Microcystis* to thrive once other

phytoplankton have been removed from the system." This consistent selectivity may help explain the recurring dominance of *Microcystis aeruginosa* in shallow, nutrient-rich systems like western Lake Erie and Saginaw Bay in Lake Huron.

By depleting green algae and diatoms, mussels disrupt the natural competition among phytoplankton species. This opens up a niche that *Microcystis* is well-positioned to fill. The ongoing avoidance of toxin-producing strains, even when preferred food is unavailable, suggests that compounds such as microcystins not only deter consumption but may also play a role in shifting community dynamics, indirectly promoting blooms through altered mussel feeding behavior.

"While reducing phosphorus and nitrogen inputs remains critical, we also need to consider the influence of invasive mussels, and potentially find ways to manage their effects. Understanding which *Microcystis* strains are present could help too, since mussel feeding responses vary by strain."

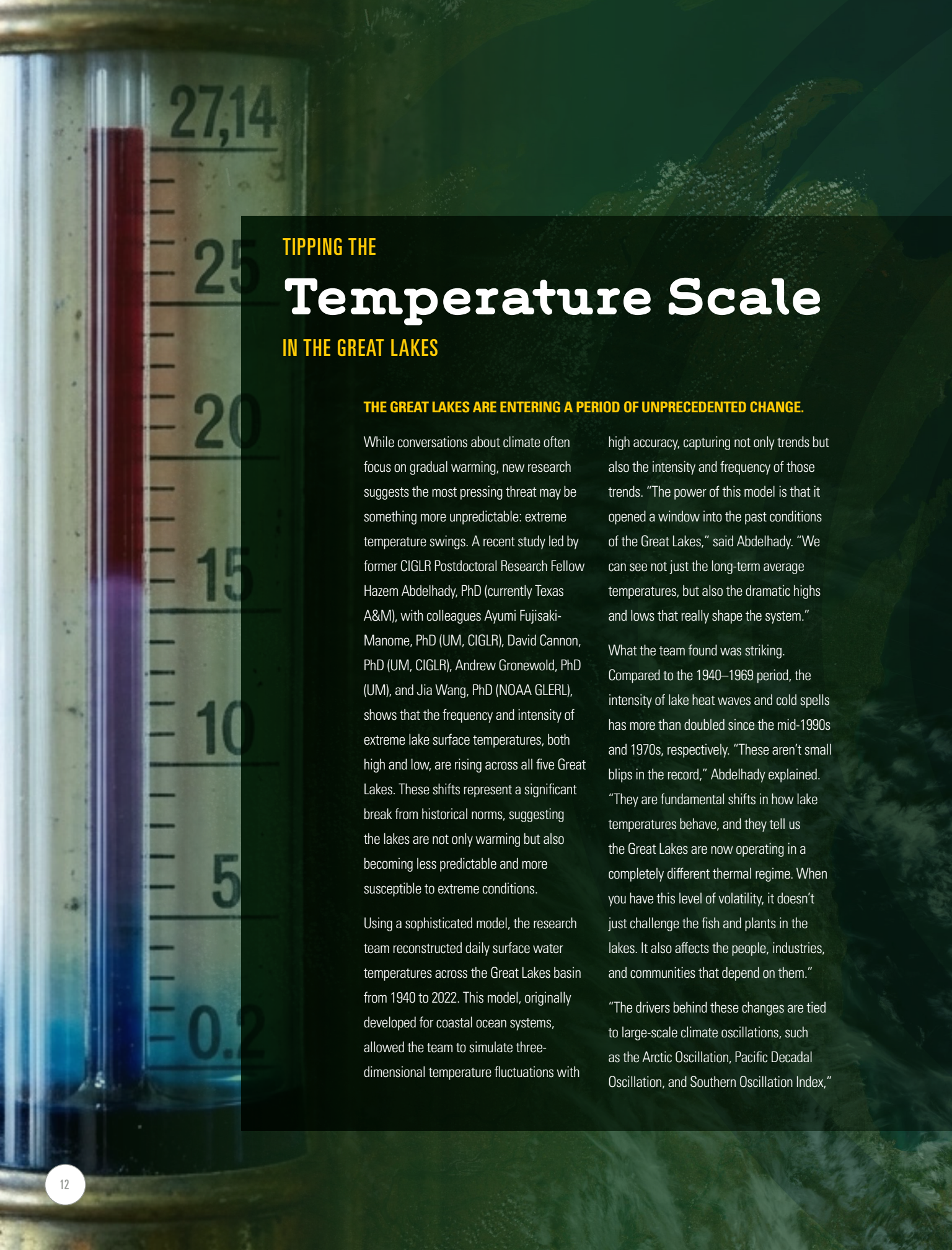
"Moving forward, our team sees a need to explore the chemical ecology of western Lake Erie blooms by determining what is causing the changes in quagga mussel feeding behavior, whether it's microcystin or another metabolite produced by *Microcystis aeruginosa*," said Boegehold. "We also see a need for broader lab trials with a more diverse range of phytoplankton to better understand whether mussels might begin feeding on cyanobacteria under more extreme or prolonged food scarcity."

As invasive species and harmful algal blooms continue to challenge the health of the Great Lakes, understanding and addressing these layered interactions will be essential to protecting water quality, ecosystem function, and public safety

Journal Article

"Our research shows that quagga mussels selectively avoid feeding on toxic *Microcystis* even when preferred algae are scarce, highlighting how multiple stressors combine to shape harmful algal blooms and ecosystem health in Lake Erie."

— Anna Boegehold, PhD



TIPPING THE

Temperature Scale

IN THE GREAT LAKES

THE GREAT LAKES ARE ENTERING A PERIOD OF UNPRECEDENTED CHANGE.

While conversations about climate often focus on gradual warming, new research suggests the most pressing threat may be something more unpredictable: extreme temperature swings. A recent study led by former CIGLR Postdoctoral Research Fellow Hazem Abdelhady, PhD (currently Texas A&M), with colleagues Ayumi Fujisaki-Manome, PhD (UM, CIGLR), David Cannon, PhD (UM, CIGLR), Andrew Gronewold, PhD (UM), and Jia Wang, PhD (NOAA GLERL), shows that the frequency and intensity of extreme lake surface temperatures, both high and low, are rising across all five Great Lakes. These shifts represent a significant break from historical norms, suggesting the lakes are not only warming but also becoming less predictable and more susceptible to extreme conditions.

Using a sophisticated model, the research team reconstructed daily surface water temperatures across the Great Lakes basin from 1940 to 2022. This model, originally developed for coastal ocean systems, allowed the team to simulate three-dimensional temperature fluctuations with high accuracy, capturing not only trends but also the intensity and frequency of those trends. "The power of this model is that it opened a window into the past conditions of the Great Lakes," said Abdelhady. "We can see not just the long-term average temperatures, but also the dramatic highs and lows that really shape the system."

What the team found was striking. Compared to the 1940–1969 period, the intensity of lake heat waves and cold spells has more than doubled since the mid-1990s and 1970s, respectively. "These aren't small blips in the record," Abdelhady explained. "They are fundamental shifts in how lake temperatures behave, and they tell us the Great Lakes are now operating in a completely different thermal regime. When you have this level of volatility, it doesn't just challenge the fish and plants in the lakes. It also affects the people, industries, and communities that depend on them."

"The drivers behind these changes are tied to large-scale climate oscillations, such as the Arctic Oscillation, Pacific Decadal Oscillation, and Southern Oscillation Index,"

said Abdelhady. "These atmospheric circulation patterns can trigger shifts in lake temperature over periods of several years." For aquatic ecosystems, rapid temperature shifts can disrupt life cycles, spawning periods, and migration patterns of native fish. "Cold-loving species may struggle to survive sudden warm spells, while invasive species can find new opportunities," said Abdelhady. "For humans, the stakes are equally high. Intense heat waves can reduce water quality, increase evaporation, and strain drinking water and energy infrastructure, while severe cold spells can damage nearshore structures and ice-sensitive systems."

"Perhaps most concerning," Abdelhady said, "is the potential for these extremes to grow both in frequency and in intensity." As global atmospheric patterns continue to shift, the Great Lakes may face even more dramatic fluctuations. "It's not just about warmer lakes, it's about more extreme lakes," said Abdelhady. These extremes set off cascading consequences for ecosystems, economies, and communities and show that stability on the lakes is increasingly uncertain.

Journal Article

"The Great Lakes are no longer just warming, they're experiencing more intense and unpredictable temperature extremes that threaten both ecosystems and communities."

— Hazem Abdelhady, PhD

ADVANCING

Water Supply Predictions

FOR THE GREAT LAKES

THE GREAT LAKES ARE A VITAL RESOURCE, SUPPORTING ECOSYSTEMS, COMMUNITIES, AND ECONOMIES ACROSS NORTH AMERICA.

Understanding and predicting how water moves through this system is critical, especially as changing climate conditions affect precipitation, evaporation, and runoff. Net Basin Supply (NBS) is a key measure in this process, representing the balance of water entering and leaving a lake through *precipitation, runoff*, and *evaporation*. To better monitor and forecast these dynamics, researchers have developed the **Great Lakes NBS Predictor**, an advanced machine learning tool that leverages NOAA operational models to provide monthly forecasts of NBS and its components for each of the Great Lakes, up to 12 months into the future.

Funded by the Bipartisan Infrastructure Law and designed in collaboration with the U.S. Army Corps of Engineers, NOAA's Great Lakes Environmental Research Laboratory, and the University of Michigan, the Great Lakes NBS Predictor is intended to improve long-range water level forecasting and support better resource management.

Its key features include ensemble-based machine learning methods with built-in uncertainty quantification, a framework for subseasonal to seasonal predictions, and a modular design that allows flexibility for experimenting with different approaches. These innovations are helping to advance water forecasting beyond traditional methods, giving managers and stakeholders better tools to anticipate and respond to changes in the Great Lakes.

The research team is actively seeking contributors to help test, refine, and enhance the model. By participating, collaborators will have the opportunity to shape a forecasting system that is not only cutting-edge but also vital for protecting the future of the lakes. To learn more about how to get involved, visit the project's GitHub page using the QR code.

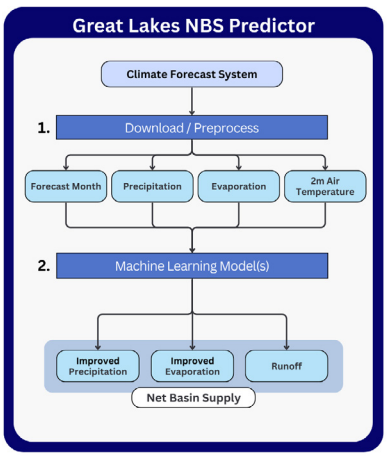
By working together, scientists, engineers, and community partners can help ensure the continued advancement of the Great Lakes NBS Predictor, strengthening its role as a vital tool for understanding water balance dynamics, preparing communities for water level changes, protecting the long-term health of our shared Great Lakes ecosystem.

GitHub Product Page

Great Lakes Net Basin Supply Predictor Factsheet

Great Lakes
Net Basin Supply Predictor

An advanced prediction tool that uses operational NOAA models to predict monthly mean values of **Net Basin Supply (NBS)** and its components - **precipitation, evaporation, and runoff** - for each of the Great Lakes. Designed for use by the U.S. Army Corps of Engineers.



The tool provides:

- Support for operational water level forecasting
- A framework for subseasonal to seasonal predictions
- Ensemble-based machine learning with uncertainty quantification
- Modular design allows for flexible experimentation with different methods

We are looking for contributors to test and improve our model. Learn more about how to get involved on GitHub.

Powered by institutional collaboration from:

GREAT LAKES AI LAB

Cooperative Institute for Great Lakes Research CIGLR Great Lakes Science for Society

UNIVERSITY OF MICHIGAN

GREAT LAKES ENVIRONMENTAL RESEARCH LABORATORY

US Army Corps of Engineers

"Check out our new factsheet! The Great Lakes Net Basin Supply Predictor uses NOAA models and machine learning to support water level forecasting and water resource planning. The research team is actively seeking contributors to help test, refine, and enhance the model."

— Lindsay Fitzpatrick

Little Mussels, Big Impact

UNRAVELING THEIR SECRET TO SUCCESS

QUAGGA MUSSELS *(DREISSENA ROSTRIFORMIS BUGENSIS)* HAVE TRANSFORMED THE GREAT LAKES SINCE THEIR ARRIVAL IN THE EARLY 1990S.

These small, bottom-dwelling invaders filter vast quantities of water, removing plankton that native species depend on, clearing the water column, and reshaping entire food webs. Their ability to thrive in cold, deep waters has made them even more successful than their close relative, the zebra mussel, but scientists have struggled to predict how these organisms grow and respond to environmental change. A recent study led by CIGLR Ecological Modeling Data Analyst Tongyao Pu, together with collaborators from the University of Michigan, NOAA GLERL, and Central Michigan University, creates a detailed energy-based model of quagga mussel biology.

Using a framework known as the Dynamic Energy Budget (DEB) theory, the research team compiled two decades of experimental and field data to estimate how quagga mussels acquire, store, and use energy for feeding, growth, and reproduction. "Quagga mussels are now the dominant species across the Great Lakes, yet their basic physiology has remained poorly characterized," said Pu. "Our work brings together years of data to describe how these mussels function and what drives their ecological success."

The model focuses on five key parameters that describe mussel metabolism: the relationship between shell size and body mass, the maximum amount of energy that can be stored in tissues, how temperature affects biological activity, and the rates at which mussels filter and ingest food. The estimated values show subtle differences from other bivalves that help explain why quagga mussels outcompete zebra mussels. Compared with their relatives, quagga mussels can feed more efficiently and continue to grow in colder conditions, allowing them to spread into deep, offshore regions of the Great Lakes where food is scarce and temperatures remain low.

Laboratory feeding experiments also revealed that quagga mussels are highly selective eaters. They prefer medium-sized algae such as cryptophytes and diatoms, organisms that are nutritious and form the foundation of the aquatic food web, while largely avoiding cyanobacteria, some of which produce harmful toxins. By consuming preferred algae and leaving behind less desirable or toxic species, quagga mussels can promote the dominance of cyanobacteria in the water, which could contribute to harmful algal blooms in nearshore areas. This selective feeding behavior was quantified through new "selectivity coefficients," which measure how strongly mussels favor certain food types, providing a more realistic understanding of what food is effectively available to them in the wild.

The team's DEB model simulating mussel growth under varying temperatures and food levels, showed that quagga mussels can maintain activity even in cold water, a key advantage that explains their deep-water success. Their energy use changes predictably with temperature, following patterns similar to other aquatic invertebrates, but their efficiency in converting filtered food into body mass stands out. The study also provided new estimates of the mussels' elemental

composition, specifically the ratios of carbon, nitrogen, and phosphorus in their tissue, which will help scientists understand how mussel metabolism affects nutrient cycling in lakes.

The researchers emphasize that this model is an important first step rather than a finished product. Because much of the available data came from experiments not originally designed for energy-budget modeling, some uncertainty remains in the estimates. "These results give us a strong foundation to build from," said Pu. "The model is still evolving. Many of the data we used were not collected specifically for this purpose, so we need more controlled laboratory studies to refine the parameters and improve accuracy. Future work will help us better connect mussel physiology to ecosystem change."

By connecting the biology of an individual mussel to its ecosystem impacts, the new model offers a powerful tool for predicting how quagga mussels will respond to future environmental shifts such as warming waters, changing nutrient inputs, or shifts in plankton communities. The findings not only improve understanding of one of the Great Lakes' most influential invaders but also provide a framework that can be integrated into larger lake models used for ecosystem forecasting and management. "The DEB framework can now be used to link mussel physiology to ecosystem-scale models of nutrient and energy flow, providing researchers with a powerful tool to explore how these invaders influence the broader lake environment," said Pu. "This approach helps us see how a single species' energy use can ripple through an entire lake system, influencing water quality, nutrient cycles, and the health of the Great Lakes for years to come."

Journal Article

"By understanding the energy dynamics of quagga mussels, scientists gain a powerful tool to predict their spread, manage their impacts on freshwater ecosystems, and develop a framework applicable to other invasive species."

— Tongyao Pu

Alumni Highlight

2019 GREAT LAKES SUMMER FELLOW
2020 - 2021 FOOD WEB LABORATORY ANALYST

ANNA SCHMIDT FIRST JOINED CIGLR IN 2019 AS A GREAT LAKES SUMMER FELLOW, WHERE SHE ADVANCED RESEARCH ON *MYSIS* IN LAKE MICHIGAN.

Mysis, also known as opossum shrimp, are small, shrimp-like crustaceans that play a vital role in the Great Lakes food web by transferring energy from plankton to fish. Using the Multiple Opening and Closing Net and Environmental Sensing System (MOCNESS), she helped measure the fine-scale vertical distribution, size structure, and biomass of *Mysis*. Her project addressed important research questions about seasonal and depth-related changes in *Mysis* populations, their daytime behavior in the water column, and the performance of new sampling technologies. It also contributed valuable insights to broader efforts linking *Mysis* dynamics to fisheries acoustics and food web modeling. Building on this experience, Anna returned to CIGLR as a Food Web Laboratory Analyst from 2020 to 2021, collaborating with Drs. Michael Fraker (formerly CIGLR), Ed Rutherford (formerly NOAA GLERL), and Doran Mason (formerly NOAA GLERL). In this role, she organized and conducted field sampling and laboratory analyses focused on zooplankton, larval fish, and *Mysis* ecology, further supporting efforts to understand and sustain Great Lakes ecosystems.

Anna left CIGLR in 2021 to begin a Ph.D. program in the Department of Biology at the University of Vermont (UVM) in Burlington, supported by the National Science Foundation Graduate Research Fellowship Program (NSF-GRFP). She is advised by Dr. Jason Stockwell and conducts her research at the **Rubenstein Ecosystem Science Laboratory** on the shore of Lake Champlain (a great lake in its own right, though not one of the Laurentian Great Lakes). Anna's graduate research explores the drivers and ecosystem impacts of zooplankton's daily synchronized movements in the water column, known as diel vertical migration, in freshwater ecosystems.

Her research brought her to France in the fall of 2021, where she sampled experimental ponds at the National Experimental Platform in Aquatic Ecology (PLANAQUA) to study how hypoxia (critically low oxygen) and planktivory (plankton predation) affect the daily zooplankton migrations. In 2023, she spent

five months in Germany at the Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB), conducting experiments on diel vertical migration and zooplankton-mediated carbon fluxes.

Outside her graduate research, Anna has been deeply involved in the **Global Lake Ecological Observatory Network (GLEON)** throughout her Ph.D. She currently serves as co-chair of the GLEON Student Association, coordinating training and leadership opportunities for students across the network. In February 2025, she traveled to Lake Toba, Indonesia, for the annual GLEON All-Hands Meeting, where she organized and co-led a working group of international participants developing collaborative research ideas on freshwater plankton.

Bold blue words indicate link

Q & A with Anna Schmidt

Q: Which is your favorite Great Lake and why?

That's a hard choice, but I'd have to pick Lake Superior as my favorite Great Lake! Growing up in southeastern Minnesota, I have wonderful memories of traveling with my family to Duluth and along the North Shore. There's nothing quite like a crisp fall hike by the lake followed by a visit to Betty's Pies in Two Harbors for a well-earned treat!

Q: Where did you attend college and what did you study?

I earned my bachelor's degree in Biology and Environmental Sciences from the University of Wisconsin–Madison. As an undergraduate, I spent several years working in Dr. Trina McMahon's laboratory, studying microbial community ecology in Lake Mendota. I collaborated with a Ph.D. student on research investigating how microbes transform mercury in lake ecosystems and conducted an independent project examining the gut microbiome of native and invasive zooplankton in Lake Mendota. That experience sparked my lasting interest in aquatic science research!

Q: Why were you interested in working at CIGLR?

While earning my bachelor's degree at UW–Madison, I explored career paths in ecological research and gained hands-on experience in aquatic fieldwork and lab work through a CIGLR Great Lakes Summer Fellowship. During my final semester, I applied for a Food Web Laboratory Analyst position at CIGLR, allowing me to continue my fellowship work and develop new skills with the fantastic team I had worked with.

Q: What is your current position and what led you to pursue this career path?

I am currently a Ph.D. candidate in the Department of Biology at the Rubenstein Ecosystem Science Laboratory, University of Vermont. My research explores what drives zooplankton to migrate up and down in the water column each day and how these movements affect freshwater ecosystems. Understanding these patterns helps us better predict energy flow and nutrient cycling in lakes, which is important for managing fisheries and maintaining healthy aquatic ecosystems. I chose to pursue a Ph.D. because I love doing research and wanted the chance to dive deeply into a topic that fascinates me.

Anna with a plankton imaging instrument at the Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB) LakeLab experimental platform.

Journal Article

News Article

Q: What advice would you give to someone interested in an environmental science career?

My advice for anyone interested in this type of career is to remember that you never know where an experience might take you. During a trip to the Cornell Biological Field Station with Dr. Doran Mason, one of my Summer Fellowship mentors, I met a visiting student named Rosie Chapina. She was a Ph.D. student working with Dr. Jason Stockwell at UVM and suggested I check out UVM if I was thinking about grad school. That casual conversation ended up guiding me to apply to and eventually join Dr. Stockwell's lab a few years later! The lesson I learned is that some of the best opportunities come from simply talking to people—those connections can open doors you never expected. In a way, I have my CIGLR Summer Fellowship to thank for leading me to my Ph.D. lab.

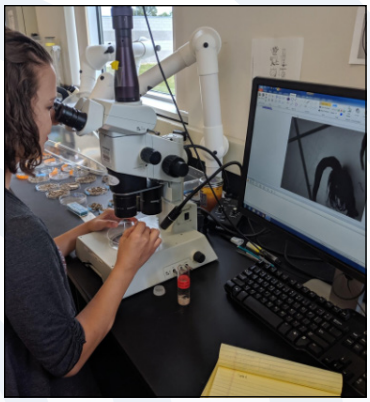
Q: What was your favorite part about working at CIGLR?

My favorite part about working at CIGLR was definitely the people! I have so many fond memories from my first summer, getting to know the other Summer Fellows, and later building connections with staff and scientists while working as a Food Web Laboratory Analyst. Fieldwork on Lake Michigan aboard the *R/V Laurentian* was unforgettable—not just learning the sampling techniques, but also enjoying the moments between shifts: playing cards, sharing stories, and laughing together. I even learned to play Euchre on the boat with a deck of Great Lakes-themed cards, which feels perfectly fitting for my time there!

Q: Is there anything else you would like to say?

As I mentioned, I have so many reasons to be grateful to CIGLR for helping guide my career to where I am today. Wishing everyone all the best, and I hope to catch up with some of you at the May 2026 Association for the Sciences of Limnology and Oceanography and the International Society of Limnology (ASLO-SIL) Joint Meeting in Montreal!

Anna enjoying a sunrise hike at Lake Toba, Indonesia, while attending an international aquatic research conference.



Anna examining *Mysis* under the microscope during her CIGLR Great Lakes Summer Fellowship.

Anna heading out to do fieldwork on Lake Champlain.

Anna at Temperance River State Park on the North Shore of Lake Superior.

GREAT LAKES SUMMER FELLOWS

In partnership with NOAA GLERL, the **Great Lakes Summer Fellows Program** is the cornerstone of CIGLR's efforts to train the next generation of scientists. Each year, CIGLR has the pleasure of hosting a group of bright, upcoming scientists to participate in a 12-week fellowship through which they conduct an in-depth research project, attend career development seminars and science discussions, receive skills training, and bond as a cohort. We applaud the fellows, mentors, and CIGLR ECO (Engagement, Career Training, and Outreach) team for their dedication, creativity, and positivity that shaped such a meaningful career-building experience.

We offer an enthusiastic thank you and congratulations to the 2025 Great Lakes Summer Fellows:

Noah Bernot

Noah, a senior at Indiana University majoring in computer science and mathematics, worked with CIGLR's Dani Jones and Russ Miller, along with the Great Lakes Observing System's Joe Smith and Shelby Brunner, on the Data-Driven Buoy Deployment Project. He developed a deep learning model to evaluate current buoy placement across the Great Lakes and suggest future deployment opportunities, while also pioneering applications of the DeepSensor Python library to environmental research.

Ronnie Geiger

Ronnie, a senior studying Atmospheric Science at Cornell University, worked with CIGLR's Abby Hutson and Rachel Kelly from GLISA to evaluate the performance of the GFDL-CM4 climate model over the Great Lakes region. His project analyzed model output against observations to better understand precipitation patterns, temperature trends, and lake-atmosphere interactions, culminating in a Climate Model Report Card.

Elias Hanson

Elias, a senior studying Environmental Science at St. Olaf College in Minnesota, worked with Michigan Sea Grant's Rochelle Sturtevant and NOAA GLERL's Ashley Elgin to investigate how climate change is influencing the likelihood of aquatic species invading the Great Lakes ecosystem. The project highlighted how shifting environmental conditions may alter future invasion risks while providing valuable insight for Great Lakes management.

Stacey Naeemullah

Stacey, who recently completed a M.S. in Physical Oceanography at the University of Hawaii at Mānoa, worked with CIGLR's Yang Song and Ayumi Fujisaki-Manome and NOAA GLERL's David Wright to apply ensemble machine learning methods to predict contaminant spread in the Straits of Mackinac. Using extreme gradient boosting and random forest models, the project demonstrated new ways to better understand and prepare for potential environmental risks in this unique waterway.

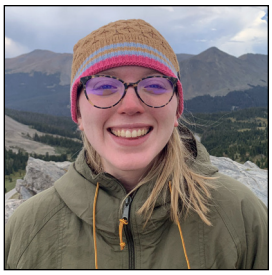
Bold blue words indicate link

Jondall Norris

Jondall recently graduated with a bachelor's degree in physics from Bowdoin College. Working with CIGLR's Hazem Abdelhady, Ayumi Fujisaki-Manome, David Cannon, and Dani Jones, along with NOAA GLERL's James Kessler, he developed a deep learning model to reconstruct the spatial distribution of Great Lakes ice cover dating back to the early 20th century. By combining historical air temperature records with ice chart data, his project is helping scientists better understand long-term climate patterns and past lake conditions.

Matthew Parent

Matthew, who recently earned a Master of Applied Data Science degree from the University of Michigan, worked with CIGLR's Yi Hong and Dani Jones and NOAA GLERL's Lauren Fry to apply deep learning methods for predicting water runoff across Great Lakes basins. His project aimed to improve hydrologic models and provide insights to support regional and global water resource management.



Brooke Tillotson

Brooke recently graduated from the Colorado School of Mines with a M.S. in Hydrological Sciences and Engineering. She worked with CIGLR's Meena Raju and David Cannon and NOAA GLERL's Mark Rowe and Peter Alsip to study Lake Erie wind and wave patterns and predict the onset of harmful algal blooms using computer simulations of how wind and waves stir the lakebed. Brooke's project contributes to a better understanding of the physical factors that influence bloom development and lake dynamics.

Fellows profile videos

2025 CIGLR Great Lakes Summer Fellows. Photo: Margaret Throckmorton.

A working group of scientists from the University of Wisconsin–Milwaukee, the University of Toledo, and NOAA GLERL convened the aeDNA Working Group at the University of Michigan to share expertise across microbial ecology, carbon cycling, remote sensing, sediment characterization, and related fields.

CIGLR Summit:

The Use of Archival Environmental DNA (aeDNA) in the Laurentian Great Lakes

Long-term time series data are critical for understanding how stressors affect aquatic ecosystems and their resilience. Traditional paleoecological approaches use fossils left behind in lake beds to help extend records of biodiversity far into the past, but these methods are limited to organisms that leave distinct fossils. Archival environmental DNA (aeDNA), or DNA shed from organisms and preserved in sediments, provides a richer record of past biodiversity, including microorganisms that play key roles in ecosystem function. In the Great Lakes, this method allows scientists to link historical ecological changes to present-day conditions and better anticipate future responses to human and climate-driven pressures. Low-oxygen environments, such as the Lake Huron sinkholes and the central basin of Lake Erie, are particularly valuable for aeDNA studies, because DNA is well-preserved and because these areas have been heavily impacted by anthropogenic stressors like eutrophication.

A working group of scientists from the University of Wisconsin–Milwaukee, University of Toledo, and NOAA GLERL convened June 10–13, 2024, at U-M to explore the application of aeDNA in Great Lakes sediments. The group brought together researchers, managers, and social scientists to share expertise in microbial ecology, carbon cycling, remote sensing, sediment characterization, and other disciplines. Presentations highlighted ongoing research, emerging tools, and opportunities for integrating aeDNA with existing monitoring programs. Breakout discussions identified research questions addressing ecological and management challenges, such as tracking invasive species, understanding hypoxia, and linking historical changes to current ecosystem dynamics.

Participants developed a list of more than 100 research questions, which were refined to 72 questions organized into five major themes: external drivers of ecosystem change, human drivers, management implications, opportunities for aeDNA research, and potential for synthesizing existing data. These questions guided the development of a perspectives manuscript submitted to a peer-reviewed journal in October 2025 and are also informing a proposal for submission to the National Science Foundation.

The working group fostered a new interdisciplinary network of researchers focused on aeDNA applications in the Great Lakes, many of whom had not collaborated previously. This network provides a foundation for future collaboration, including sediment coring campaigns and additional aeDNA analyses. The outcomes from this working group will leverage ongoing aeDNA research and sediment sampling to provide critical insights into the past and present dynamics of the Great Lakes and support science-based management of these vulnerable ecosystems.

aeDNA in the Laurentian Great Lakes Working Group

The University of Michigan hosted the AI Horizons summit, July 22-23, 2024.

CIGLR Summit:

AI Horizons: How Machine Learning and Artificial Intelligence Will Shape Great Lakes Observations, Modeling, and Forecasting in the Coming Decade

In July 2024, the AI Horizons summit was led by scientists from U-M, NOAA GLERL, Michigan Sea Grant, and Cornell University, and brought together experts from across the region to explore how machine learning and AI can transform Great Lakes research, monitoring, and management.

With the lakes facing challenges like harmful algal blooms and fluctuating water levels, participants showcased how AI is already being used to predict wave heights, ice cover, and water levels, as well as to improve autonomous sampling. Discussions also highlighted the importance of making AI tools transparent, trustworthy, and accessible to both decision-makers and the public.

To guide discussions, the participants organized into working teams focused on predictive modeling, real-world applications, generative AI, and data pipelines for observing networks. These teams explored how AI can help fill data gaps, improve forecast accuracy, and better integrate physical, biological, and chemical data across the lakes. They emphasized the need for data systems that are open, well-documented, and easy to use. A key outcome was a draft framework for the Great Lakes AI Laboratory, an open, collaborative hub to advance AI applications in Great Lakes science. The lab will promote shared data resources, training opportunities, and interdisciplinary projects that connect environmental scientists with AI experts. Participants began drafting a perspectives paper on how AI can best support Great Lakes research and management, which has now been submitted to the American Meteorological Society journal of *Artificial Intelligence for the Earth Systems*.

The group plans to expand this community of practice through workshops, hackathons, and shared online platforms, including a GitHub space for code and data. The initiative aims to ensure that AI tools are developed responsibly and with broad input, while accelerating solutions to pressing Great Lakes challenges. The AI Horizons summit marked an important step toward reimagining how science is done in the region, building new partnerships and shared goals, and positioning AI as a valuable tool in protecting and restoring the world's largest freshwater ecosystem.

Great Lakes AI GitHub

AI Horizons Summit

Meeting Summary in Bulletin of the American Meteorological Society

GREAT LAKES AI LAB

2025 PROGRAM WINNERS

CIGLR AWARDS $431,000 IN 2025 PARTNER PROGRAMS

Each year, CIGLR offers competitive programmatic funding for Consortium partners to build collaborations with NOAA. Through these partnerships, recipients provide early career training to graduate students and postdocs, delve into big Great Lakes issues in multidisciplinary summits, translate research to the public, research emerging issues, and respond to emergencies and other time-sensitive needs in the Great Lakes. The recipients of the 2025 awards will advance important areas of Great Lakes research and strengthen connections between our partners and NOAA. Thank you to all who applied, and congratulations to the winners!

POSTDOCTORAL FELLOWSHIP AWARDS

- **Karen Alofs, PhD, University of Michigan:** Incorporating Bioenergetics to Investigate Effects of Dreissenid Mussel Invasions in the Great Lakes on Growth and Diet of Native Larval Fishes, Year 2
- **Lars Rudstam and James Watkins, PhD, Cornell University:** Using Linear Inverse Models to Understand the Ecosystem Impacts of Coregonine Restoration in the Great Lakes

GRADUATE RESEARCH FELLOWSHIP AWARDS

- **Harvey Bootsma, PhD, University of Wisconsin-Milwaukee:** Dreissenid Influences on Nutrient Cycling in Lake Michigan: The Role of Profundal Sediment
- **Sergey Kravtsov, PhD, University of Wisconsin-Milwaukee:** Nonlinear Perspectives on Lacustrine Amplification of Global Climate Change in the Great Lakes Region
- **Scott Steinschneider, PhD, Cornell University:** Advancing Adaptive Reservoir Operations to Support Resilient Transboundary Water Systems

SUMMIT AND WORKING GROUP (SWG) AWARDS

- **Elena Litchman, PhD, Michigan State University:** Thinking Outside the Box: How to Increase Synergy Across Observational, Experimental and Modeling Approaches to Understand and Predict HABs
- **Mike Shriberg, PhD, University of Michigan:** Integrating Human Dimension Indicators into Great Lakes Monitoring and Management
- **Ed Verhamme, LimnoTech:** Great Lakes Marine Science and Technology Users Group (GLTUG): Strategy Development and First Meeting

ECO AWARDS

- **Lisa Dinon, National Wildlife Federation:** Preventing and Remediating Microplastics Pollution: Engaging Business Leaders

SEED AWARDS

- **Aaron Fisk, PhD, University of Windsor:** Investigating the Future of Winter Stratification in Lake Ontario Using an Autonomous Underwater Vehicle

CONGRATULATIONS TO CIGLR'S 2025 AWARD RECIPIENTS AND FINALISTS

The CIGLR Staff Awards program recognizes the outstanding work done by our staff and postdoctoral research fellows. This year, awards were given to CIGLR personnel who exemplify excellence in research, support science and public service, and make exceptional contributions to the CIGLR community. Please join us in congratulating Lindsay Fitzpatrick, Teige O'Brien, and Magaret Throckmorton!

Find out more

The **Science for Society Award** was given to **Lindsay Fitzpatrick** (Environmental Data Specialist) and recognizes exceptional activities or accomplishments that support the link between science and public service. "Lindsay's dedication to making science more inclusive and impactful is a model for how scientific expertise can be used to create real-world impact." **Maddie Tomczak** (Food Web Laboratory Analyst) was runner-up.

The **Research Excellence Award** was given to **Teige O'Brien** (Biogeochemical Laboratory Analyst) for his outstanding performance in laboratory research, fieldwork, computer modeling, data analysis, scientific achievements, and innovative work. "Teige's commitment to getting it right and delivering outstanding science exemplifies how CIGLR's staff contribute to excellence in research." **Yang Song** (Hydrodynamic Modeler) was runner-up.

The **Community Award** was given to **Margaret Throckmorton** (Administrative Project Coordinator) in recognition of her exceptional contributions to building the CIGLR community, encouraging teamwork, and excellence in mentoring. "What stands out most about Margaret is her incredible responsiveness and her ability to think ahead with people in mind. She's always quick to offer help, answer questions, and ensure that events and programs run smoothly. Her patience and calm presence create a welcoming environment for fellows, colleagues, and visitors alike. She quietly takes care of countless details that help others feel supported and included."

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*Indicates personnel transitions

Bold names indicate profile links

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Andrea Vander Woude
IPEMF Branch Chief, NOAA GLERL

Chris Winslow
Director, Stone Laboratory, Ohio Sea Grant, Ohio State University

CIGLR Organization

CIGLR research staff

*Indicates personnel transitions

Bold names indicate profile links

CIGLR welcomes new team members!

Tait Algayer is an Aquatic Genomics Specialist who advances the use of genomic methods, particularly environmental DNA and molecular genetics tools, to study ecosystem dynamics and monitor aquatic invasive species in the Great Lakes.

Aldo Arellano is a Postdoctoral Research Fellow in molecular ecology, focusing on the roles of microbial community members in food web dynamics associated with harmful algal blooms and Great Lakes ecology.

Aaron Bartlett is an Atmospheric Science Research Specialist working with Dr. Abby Hutson (CIGLR) to advance lake-atmosphere modeling in the Great Lakes region.

Kristen Behrens is a Postdoctoral Research Fellow working closely with USGS, using genomic techniques to study sex determination and hybridization in ciscoes, an important Great Lakes prey fish, helping support conservation and species reintroduction efforts.

Spencer Gardner is a Biophysical Modeling Analyst working with Dr. Casey Godwin (CIGLR) and the NOAA GLERL Ecosystem Dynamics team to implement the European Regional Seas Ecosystem Model (ERSEM) in Lake Erie.

Riley Peterson is a Biogeochemistry Laboratory Analyst working with CIGLR's Dr. Casey Godwin, Teige O'Brien, and Rima Upchurch to conduct nutrient analyses for various CIGLR projects.

Staff profiles

Nayethzi Hernandez is a Research Engagement Specialist with the CIGLR ECO Program, working to foster connections between CIGLR scientists and communities across the Great Lakes region.

Rima Upchurch is a Biogeochemistry Laboratory Analyst collaborating with CIGLR's Dr. Casey Godwin, Teige O'Brien, and Riley Peterson to analyze nutrient turnover in the Great Lakes and support the monitoring of harmful algal blooms (HABs).

Bold names indicate profile links

IN THE MEDIA

GREAT LAKES RESEARCH AND POLICY

The state of the Great Lakes: U-M experts available to comment, Michigan News

Peters renews push for Great Lakes restoration funds, WCMU

NOAA layoffs endanger Great Lakes, experts say: 'The drivers behind keeping us safe', Planet Detroit

Opinion | Great Lakes champions needed in Congress, Bridge Michigan

Ann Arbor's sustainable energy utility aims to build the electric power grid of the future – alongside the old one, The Conversation

The US and Canada have long managed the Great Lakes together. That era could be ending, Grist

Great Lakes research at risk as Trump administration proposes major cuts to NOAA, Michigan Public

Trump's 100 days in office: U-M experts available, Michigan News

Budget cuts threaten Great Lakes weather forecasting, Capital News Service and Spartan NewsRoom

'Gutted.' Michigan losing $200M in fed research funding, with more in limbo, Bridge Michigan

Millions of people depend on the Great Lakes' water supply. Trump decimated the lab protecting it, ProPublica

Mike Shriberg named director of the U-M Water Center, The University Record

Great Lakes scientists 'couldn't stay quiet' about cuts to research, federal agencies, The Detroit News

Experts available to discuss how federal funds protect lives and livelihoods in the Great Lakes region, Michigan News

5 things Great Lakes research dœs for Michiganders, UM-SEAS News

HARMFUL ALGAL BLOOMS

Bacterial villain behind Lake Erie's 'potent toxin' unveiled by U-M study, Michigan News

U-M scientists link dangerous toxin to a certain bacteria in Lake Erie, The Detroit News

NOAA develops new method to forecast toxin risk from harmful algal blooms on Lake Erie, NOAA Research

Toxic algæ blooms are lasting longer in Lake Erie – why that's a worry for people and pets, Michigan Advance

Michigan Sea Grant-funded research fuels development of ground-breaking Lake Erie algæ database, Michigan Sea Grant News

ICE, WEATHER, & CLIMATE

Great Lakes continuing to lose ice coverage, experts warn, Bridge Michigan

Scientists learn Great Lakes storms may be trending further north, warming faster due to climate change, MPR News

Looking back on Michigan, climate and the environment in 2024, News from the States

Great Lakes temperature extremes intensifying due to climate change, Michigan Public

Landmark study finds Great Lakes have entered a new era with climate change, extreme events, Milwaukee Journal Sentinel

The Great Lakes are in an extreme new era, Michigan News

In the Great Lakes, heat waves and cold spells are on the rise, Physics Today

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Fujisaki-Manome, A.; G. Seroka; J. Kelley; S. Pe'eri; J. Sienkiewicz; J. Feyen; O. Doty; K. Ide; B. Gramp; F. Ogden; T. Fanara; E. Myers; S. Moghimi; T. Cockerill; W. Wu; E. Anderson; K. Huelse; S. Memari; C. Forbes; Y. Liu; S. John; E.D. Lorenzo; K. Park; S. Wipperfurth; N. Sannikova; V. Titov; Y. Wei; C. Akan; S. Mani; C. Lindley; I. Rivin. 2025. UFS coastal applications team report: Round 2 summary of a Unified Forecast System model evaluation for marine navigation. NOAA Technical Memorandum NOS 37. NOAA Technical Memorandum NWS 05. NOAA Technical Memorandum OAR 05. (DOI:**10.25923/7mfb-7852**).

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Sandborn, D.; 2024. **Inorganic carbon cycling in Lake Superior and responses to anthropogenic carbon dioxide**. University of Minnesota Twin Cities, PhD Dissertation.

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Publications

Rain is visible falling off in the distance as the scientists and crew are stationed at Lake Erie site WE12 on the *R/V Laurentian*. Photo: Paris Schofield.

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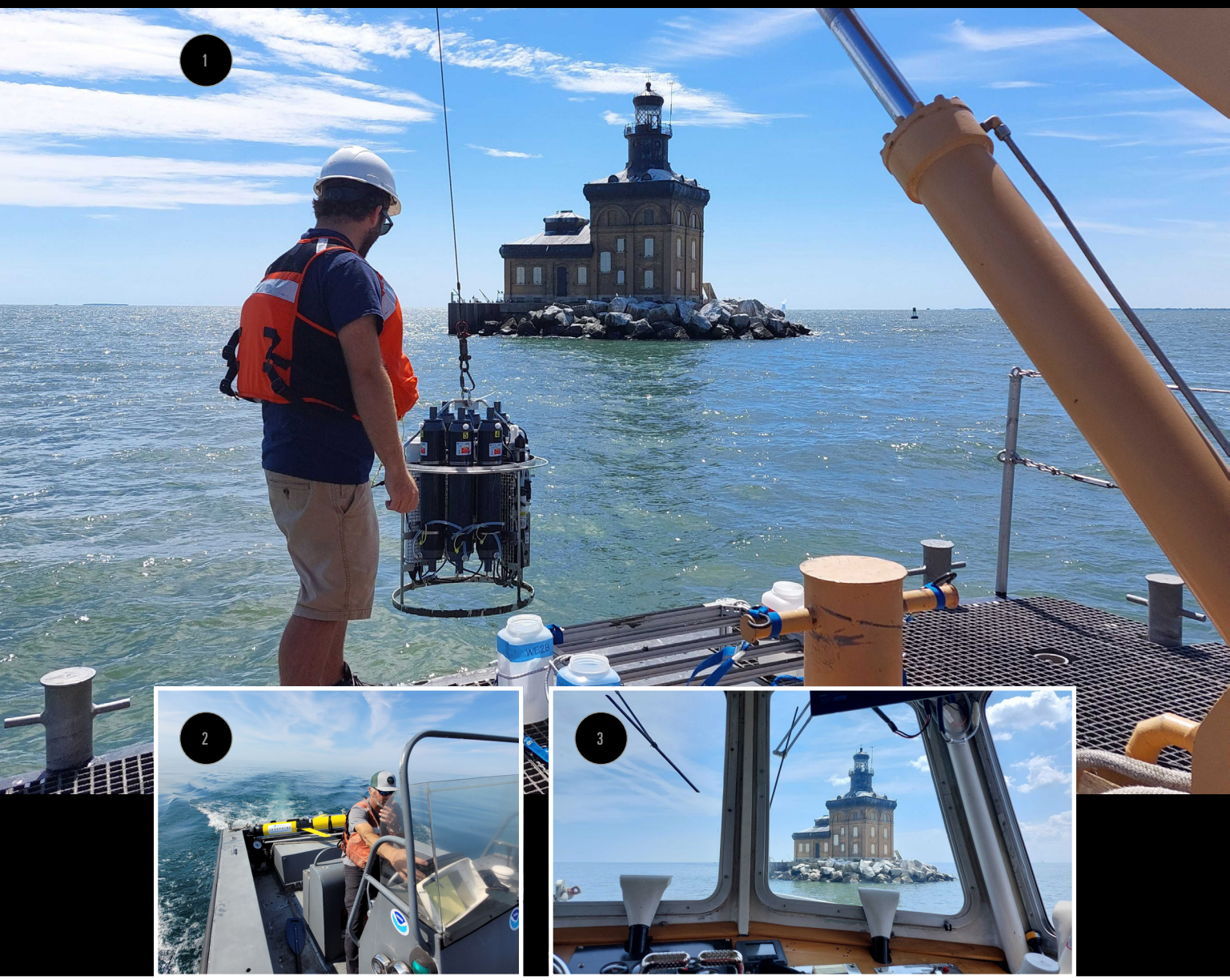
2024 Photo Contest Winners

With a shared passion for water, the Great Lakes, and science, photographers from the Cooperative Institute for Great Lakes Research seek to tell their stories through the lens. For the eighth year in a row, the CIGLR Photo Contest entries feature images that inform, inspire, and amaze.



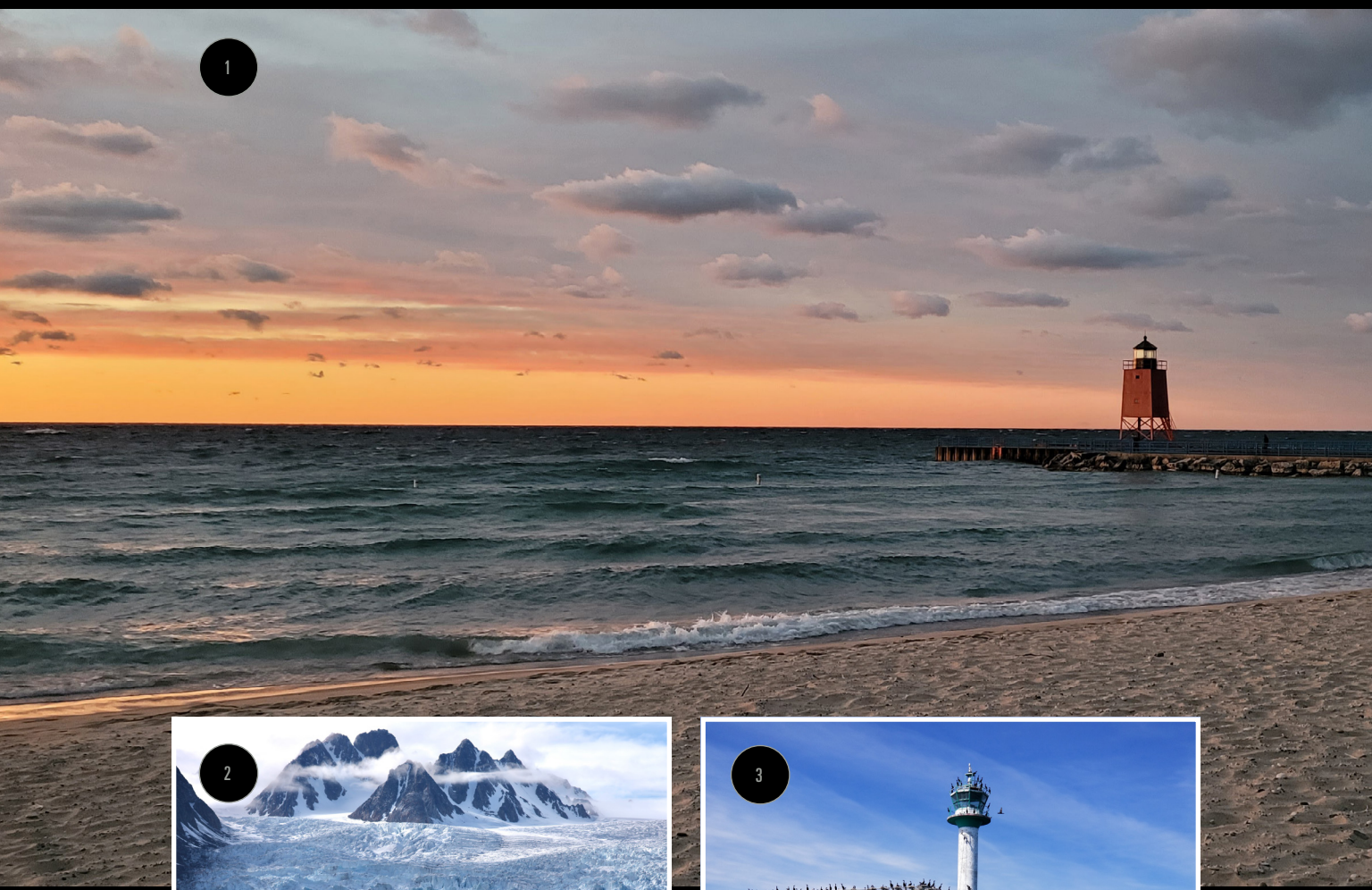
CIGLR IN ACTION CIGLR scientists at work reveal the creativity and dedication behind efforts to understand and protect the Great Lakes.

1st place: *Andrew with the Rosette,* Paige Williams

2nd place: *GLOS Glider Recovery,* Russ Miller

3rd place: *Lighthouse Through the Window,* Paige Williams

Explore more photos



CIGLR SCENERY

Viewing scenery through CIGLR lenses is always an inspiration. The creative stories that emerge offer shared experiences and adventure through our Great Lakes research.

1st place: *Charlevoix Lighthouse at Sunset,* Russ Miller

2nd place: *Changing Climate of Svalbard,* Mike Shriberg

3rd place: *Cormorants Startle,* Russ Miller

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