IAGLR

LAKES Letter

Large lakes of the world

Winter 2026, No. 28

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IISD Experimental Lakes Area

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Lake Winnipeg Foundation

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LAKES *Letter*

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Investigating the "round spots" on Great Salt Lake's exposed lakebed. *Photo by William Johnson.*

Features

A volunteer with the Lake Winnipeg Community-Based Monitoring Network. *Photo by Paul Mutch.*

On the Cover. Lake Balaton. *Photo by Frank Wagner*. See story on p. 12.

LAKES ***Letter***
Winter 2026, No. 28
iaglr.org/lakesletter

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EXECUTIVE DIRECTOR'S NOTE

Dear IAGLR members and friends,

Welcome to the first issue of *Lakes Letter* in 2026, where we explore lessons learned from large lakes worldwide. We are pleased to share that a new website for our magazine is currently in development. Soon, readers will be able to easily access past issues online, and individual contributions will be assigned unique identifiers to provide a reliable way to track and cite content. This transformation of *Lakes Letter* has been made possible by the Fred & Barbara Erb Family Foundation through a grant announced last fall as part of their investment in Legacy, Great Lakes, and Democracy Partners.

This month, IAGLR also received funding from the Erb Family Foundation to assist the University of Michigan in assessing the loss of Great Lakes science capacity in the United States and Canada in 2025. These efforts will lead to a report detailing what's known and what's unknown about these significant losses.

IAGLR continues to contribute to a range of policy discussions and media inquiries. In November, IAGLR was featured in a news story in *Nature* examining the implications of U.S. cuts to science funding on Canadian research. In December, IAGLR joined 15 other Great Lakes organizations for Great Lakes Day on the Hill in Ottawa (see story on page 5). More recently, we responded to the U.S. EPA's request for comments on proposed changes to the definition of "Waters of the United States." Several IAGLR board members are also involved in drafting the proposed *Science Plan for the Great Lakes*, with a report expected to be released in the coming weeks through the International Joint Commission.

At this time of year, preparations for our annual conference are ramping up. We are working in partnership with the Society of Canadian Aquatic Sciences on our joint conference, scheduled for May 25–29 at the RBC Convention Centre in Winnipeg, Manitoba. We are delighted to report that nearly 700 abstracts were submitted across 64 sessions. We encourage attendees to book accommodations soon using the preferred conference rates, and we invite organizations to become exhibitors and/or sponsors. Visit the conference website for details.

We also encourage you to join or renew your membership to receive a full year of benefits, including discounted conference registration.

Best regards,

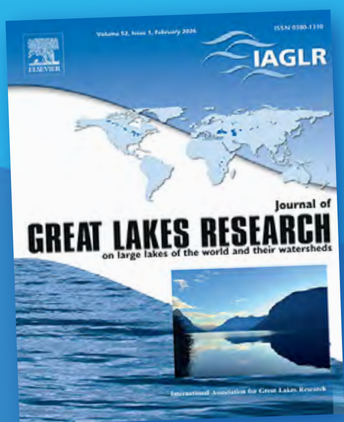
Jérôme Marty

Left to right: IAGLR Treasurer Mike McKay, Terry DeGuid, Member of Parliament for Winnipeg South, and IAGLR Executive Director Jérôme Marty at Great Lakes Day in Ottawa (see story, page 5).

Connecting researchers across continents

IAGLR's international activities in focus

JOURNAL OF GREAT LAKES RESEARCH



iaglr.org/journal

The *Journal of Great Lakes Research* actively seeks manuscripts from outside of Canada and the United States. In the most recent issue, you'll find articles on the following lakes around the world:

- Caspian Sea (Europe/Asia) & Anzali Lagoon (Iran)
- Fuxian Lake (China)
- Hulun Lake (China)
- Lake Lugano (Switzerland & Italy)
- Poyang Lake (China)
- Lakes Vänern and Vättern (Sweden)

Also in press are articles about the following lakes:

- Lake Baikal (Russia)
- Lake Titicaca (Peru & Bolivia)

Contact: JGLR Editor Margaret Docker at editor@iaglr.org

INTERNATIONAL COMMITTEE PRIORITIES

IAGLR's International Committee is pursuing several objectives to strengthen the association's internationalization efforts. Central to this work is the promotion of an integrated, global approach to the study of large lakes and the development of partnerships with international associations and individual researchers.

- The committee seeks to enhance the *Journal of Great Lakes Research* by encouraging manuscript submissions from outside the United States and Canada, recruiting associate editors from underrepresented regions, and developing special issues focused on international large lake systems.
- In support of conferences and collaboration, the committee aims to organize regional meetings outside the United States and Canada, host IAGLR conference sessions dedicated to global large lakes, and co-host a "State of the African Great Lakes" conference in partnership with ACARE.
- Additional priorities include advocating for international student scholarships, simplifying registration processes for non–U.S./Canada participants, and promoting transAtlantic collaboration and enhanced use of the IAGLR job board.

Contact: Co-chair Ronald Semyalo at internationalchair@iaglr.org. Also see our Member Spotlight on Semyalo on page 11.

ASSOCIATION NEWS

IAGLR joins Great Lakes Day in Ottawa

For the first time, IAGLR participated as an official partner—alongside 15 other organizations—in Great Lakes Day on Parliament Hill in Ottawa on December 6, 2025. Led by the Great Lakes Fishery Commission, the event gave participants the chance to meet with senators and members of each House of Commons caucus. An evening reception offered networking with 127 elected officials and members of the Senate. The shared priorities presented during these discussions were well received. Across party lines, there was clear agreement that science plays a critical role in providing the data needed to protect the Great Lakes and support the regional economy. The IAGLR delegation included Treasurer Mike McKay (University of Windsor, Great Lakes Institute for Environmental Research), Executive Director Jérôme Marty, and colleagues from the River Institute and Water Rangers. IAGLR also plans to contribute to the U.S. Great Lakes Day event in Washington, D.C., in March.

Meet the new members of the IAGLR Board of Directors

Congratulations to the following IAGLR members, recently elected to serve on the IAGLR Board of Directors. Their terms will start in May 2026.

Suzanne Gray
University of Prince Edward Island
VICE PRESIDENT

Heather Stirratt
The Nature Conservancy
U.S. REGULAR MEMBER

Sullamithe Mercy Manduwa
University of Malawi
INTERNATIONAL STUDENT MEMBER

Sabina Rakhimbekova
Western University
CANADIAN REGULAR MEMBER

Cody Sheik
University of Minnesota Duluth
U.S. REGULAR MEMBER

Julia Obuya
Bowling Green State University
U.S. STUDENT MEMBER

IAGLR to help assess erosion of Great Lakes science capacity

Earlier this month, the University of Michigan Water Center announced the launch of the Great Lakes Horizon Initiative with support from a 12-month, $610,000 grant from the Fred and Barbara Erb Family Foundation to create a structured process for identifying emerging environmental, social, economic, and governance issues, including those not yet visible.

The initiative also addresses a growing concern across the basin: the erosion of Great Lakes science capacity. IAGLR will partner with the Water Center to assess losses in science funding, staffing, data systems, and workforce development programs in 2025

"Developing evidence-based estimates of research capacity loss is of interest to many organizations working at the binational level in the Great Lakes region," said Jérôme Marty, executive director of IAGLR. "The association will help to assess not only the direct cuts to funding and employees, but also to other programs, such as internships and scholarships, that rely on federal funds to train future leaders."

Exhibitor and sponsor opportunities at the 2026 conference

Gain visibility at the 2026 conference, scheduled for May 25–29 in Winnipeg, Manitoba. Check out exhibitor and sponsor opportunities to highlight your organization and support aquatic science. You won't want to miss this joint conference of the International Association for Great Lakes Research and the Society of Canadian Aquatic Sciences—where global research on the world's large lakes meets Canada's rich tapestry of aquatic systems.

Download the 2026 Prospectus for details

HOST IAGLR 2028!

We're looking for a Canadian host for the IAGLR 2028 conference. Is that you?

We consider proposals from host institutions based on the following criteria:

- Proposed scientific program
- Conference facilities and logistics
- Location

If you're interested in hosting IAGLR 2028, or any future conference, please contact Conference Committee Co-Chair Noel Urban at confchair@iaglr.org.

Joining us in Winnipeg?

Opportunities to save on your conference costs

Did you know IAGLR offers support to attend the annual conference? The IAGLR & SCAS-SCSA Joint Conference is no exception, so if you're looking for a bit of financial assistance, make sure to check out the following opportunities. We hope to see you there in May!

- **Student Travel Awards** provide funds to IAGLR student members to help with travel costs. Make sure to sign up for your 2026 IAGLR membership to qualify! This year, we're offering 24 awards of $250 each, first come, first served. Conference registration will open in early March, and applicants are accepted through early bird registration.
- Our **registration-waiver program** supports Indigenous and Black scholars and others who historically may not have participated in the conference.
- **IAGLR members enjoy discounted registration**. For best rates, make sure to join IAGLR or renew your membership before you register.

- Register early and save! Everyone can take advantage of **discounted early rates** when registration opens in March.

Journal welcomes new associate and ECR editors, announces departure

We say farewell and thanks to Marc Gaden (Great Lakes Fishery Commission), who stepped down at the end of 2025 after 10 years on the *Journal of Great Lakes Research* Editorial Board. We also welcome the following new associate editors: Christopher Mulanda Aura, Serghei Bocaniov, Jeppe Kolding, Emily Pomeranz, Yulia Sapozhnikova, and Yindong Tong.

Marc Gaden

"The new AEs will help provide specialized expertise in high demand areas where current AEs are overloaded," notes JGLR Editor Margaret Docker. "They will also help us to meet our goal to attract more manuscripts from outside of Canada and the United States. Our AEs now hale from 10 countries and four continents."

We are also pleased to welcome four Early Career Researcher Editors to the Editorial Board. They are Daniel Abiriga, Jacob Cianci-Gaskill, Alex Duncan, and Erin Smith. These newly created positions will provide professional development for ECRs with strong interests in scientific publishing and peer review; harness the enthusiasm and expertise of ECRs working in the natural and social sciences related to large lakes; and more directly involve the next generation of large lake researchers in the peer review and editorial process.

Christopher Mulanda Aura
Kenya Marine and Fisheries Research Institute
ASSOCIATE EDITOR

Serghei Bocaniov
University of Waterloo
ASSOCIATE EDITOR

Jeppe Kolding
University of Bergen
ASSOCIATE EDITOR

Emily Pomeranz
Michigan State University
ASSOCIATE EDITOR

Yulia Sapozhnikova
Siberian Branch of the Russian Academy of Sciences
ASSOCIATE EDITOR

Yindong Tong
Tianjin University School of Environmental Science and Engineering, China
ASSOCIATE EDITOR

Daniel Abiriga
Kabale University, Uganda
ECR EDITOR

Jacob Cianci-Gaskill
Old Woman Creek National Estuarine Research Reserve, Ohio
ECR EDITOR

Alex Duncan
Centre for Indigenous Fisheries, University of British Columbia
ECR EDITOR

Erin Smith
St. Lawrence River Institute
ECR EDITOR

IAGLR

Renew your IAGLR membership today!






It takes a strong, diverse community to advance understanding of the world’s great lake ecosystems.

iaglr.org/membership

MEMBER NEWS

Member Kudos

Our members are the driving force of the association, and their dedication and expertise make a lasting impact. From career milestones to distinguished honors, their successes showcase the strength and excellence of our community. We invite you to recognize and celebrate the accomplishments listed below.

Anna Boegehold for her new position at the International Joint Commission as a physical scientist. Boegehold works with the IJC's advisory boards to investigate and assess Great Lakes water quality issues.

Steven Cooke (Carleton University) for being appointed by Canadian Prime Minister Mark Carney to serve as a commissioner to the Great Lakes Fishery Commission. Cooke has an extensive history supporting the Commission's science mandate. He was a member of the Sea Lamprey Research Board from 2008 to 2023, serving as its chair for more than a decade. Currently, he serves as the chair of the Board of Technical Experts, a role he has held since 2023, and as a member of the Commission's Science Transfer Committee.

Kaylynne Dennis (Annis Water Resources Institute, Grand Valley State University) for successfully defending her master's thesis. Her thesis research focused on long-term trends in the carbon cycle and the relationship between production, respiration, and their drivers in Muskegon Lake, a drowned river mouth ecosystem and recently delisted Great Lakes Area of Concern.

Samwel Mchele Limbu (University of Dar es Salaam, Tanzania) for being promoted to associate professor in the Department of Aquaculture Technology, School of Aquatic Sciences and Fisheries Technology and for being appointed as head of the Department of Quality Assurance in Research, Publication, and Innovation.

Heather Stirratt for her new position with The Nature Conservancy, where she'll begin March 9 as the water and agriculture director for the Minnesota–North Dakota–South Dakota Chapter. TNC's mission—to conserve the lands and waters on which all life depends—has shaped so much of her career. Stirratt has spent years working on freshwater resilience, climate adaptation, and collaborative governance with sovereign nations, agencies, nonprofits, and community partners. Those experiences at the intersection of science, policy, and partnership have prepared her well for this next chapter.

Submit a kudo

Members, do you have a recent achievement, award, or milestone you'd like to celebrate? Let us know! Submit a kudo to lakesletter@iaglr.org, and we'll share your accomplishment with the IAGLR community. Your success inspires us all!

Welcome new IAGLR members!

Please join us in welcoming the following members who joined the association between November 2025 and January 2026. We're glad to have you as part of the IAGLR community!

Christopher Aura
Keri Baugh
Steven Cooke
Raegan Davis
McKayla Dzyngel
Nia Everson
Jeppe Kolding
Nick Longo
Jonathan Low
Bahati Mayoma
Alexandra Ochs
Kefa Otiso
Emily Pomeranz
Ryan Ransom
Yulia Sapozhnikova
Sal Suri
Yindong Tong
Sarah Warrack
Maxwell Wilder

Write for *Lakes Letter*

We're looking for authors! If you're interested in writing for *Lakes Letter* or have ideas of what you'd like to see in the magazine, drop us a line. We especially welcome stories from our members.

Each issue of *Lakes Letter* explores a theme related to global large lake science. We welcome ideas for longer feature articles and shorter research briefs. We also invite you to consider being a guest editor of an upcoming issue. Browse issues in the archive for examples and note the following planned themes for upcoming issues.

May 2026
Policy
Content is due April 27

August 2026
Early Career Research
Content is due July 27

Contact *Lakes Letter* Editor Paula McIntyre at lakesletter@iaglr.org

MEMBER SPOTLIGHT

Ronald Semyalo

IAGLR INTERNATIONAL COMMITTEE CO-CHAIR

Lecturer, Makerere University, Kampala, Uganda

Photo by Stephany Hildebrand.

Describe your work.

I have been a lecturer in hydrobiology and biostatistics at the Department of Zoology, Entomology, and Fisheries Sciences at Makerere University for the past 10 years. Additionally, I have administrative experience in academic collaboration, serving as the academic coordinator for the 30-year collaboration between Makerere University and the University of Bergen, Norway, for the last five years. I am a principal investigator since 2018 on two multinational projects involving up to 11 partners, focusing on building capacity in water and society issues. Over the past 25 years, I have collaborated with local and international teams to address the challenges of cyanobacteria and cyanotoxins on Lake Victoria, often providing technical support for national surface water abstraction projects. My work has also involved close collaboration with social and environmental scientists to improve access to safe water, particularly for vulnerable informal communities such as refugees and those living in urban slums. Currently, my research is concentrated on the environmental challenges posed by aquaculture, cyanobacteria, and plastic pollution, and developing methods to quantify the problems.

What inspired you to enter this work?

My inspiration to enter this field stems from regular field visits to Lake Victoria, particularly Murchison Bay, which is significantly affected by human activities. These visits highlighted how the selfish actions of a few can profoundly impact the health of an ecosystem and the livelihoods of millions. This experience has shaped my perspective on water-related issues, particularly water and society. Consequently, I have concentrated on addressing water pollution concerns, such as cyanobacteria, cyanotoxins, and plastic pollution. The societies surrounding these lakes, especially the African Great Lakes, are often informal and vulnerable. They deserve a voice in decision-making processes regarding the ecosystem services these lakes provide, and I view them as the frontline custodians of these ecosystems.

What do scientists studying the world's large lakes most need to learn from one another, and why does that global perspective matter?

As the chair of the International Committee, I have the privilege of interacting with the advancements in large lake science, especially outside of North America. One of the most crucial lessons scientists working on these mostly shared water bodies can learn from one another is the importance of adopting a transboundary perspective. Many of the African Great Lakes and all but one of the Laurentian Great Lakes are shared waters, and the life forms and communities that depend on them do not adhere to internationally established boundaries. Therefore, it is essential for scientists to move beyond a national lens and engage in collaborative research, knowledge sharing, and joint actions. This approach is vital for developing regionally recognized policies that effectively manage these shared resources. A transboundary perspective matters now more than ever because the challenges facing large lakes, such as climate change, pollution, and overfishing, are not confined to national borders. A good step in this direction is the work of the African Center for Aquatic Research and Education in establishing scientific advisory groups at the lake level for African Great Lakes.

What is something about yourself that you'd like to share with other IAGLR members?

I am an avid football/soccer fan, with my preferred position being goal keeping, and I am looking forward to the next soccer game at the IAGLR conference.

Lake Balaton, Hungary. *Photo by Frank Wagner.*

PORTABLE GENOMICS FOR LAKE MONITORING

Lessons from Balaton

BY TARAS K. OLEKSYK

I'M NOT A LIMNOLOGIST by training. I approach lakes the way I approach any living system: as an evolutionary geneticist attuned to how communities shift under pressure. From this vantage point, the DNA suspended in water and embedded in sediments is more than just another dataset. It is a natural monitoring system that detects rapid, subtle changes early because it is produced by microbes, the first responders of the food web. That's why I have become convinced that environmental metagenomics—sequencing DNA directly from lake water and sediments with next-generation sequencing—belongs in the standard toolkit for inland water monitoring.

When I came to Michigan to help establish a genomics program at Oakland University, long-read Oxford Nanopore Technologies sequencing (ONT) was still a very new technology. Like many labs, we were excited by its promise, especially the possibility of field-based sequencing and real-time results. I wanted to adopt the platform, but I knew it wouldn't truly be useful until we could run it, troubleshoot any issues, and interpret the data at least once.

I was new to the Great Lakes region and had few local contacts, but I had a friend and collaborator, Viktor Tóth, at the Balaton Limnological Research Institute in Hungary. Viktor and I had wanted to work together ever since we were undergraduate students in Ukraine, almost 30 years ago.

Viktor was looking for new ways to monitor the biota of Lake Balaton and the Kis-Balaton Water Protection System, a semi-artificial wetland complex designed to intercept nutrients and organic matter before they reach the lake. To me, that wetland–lake continuum was not only an ecological system; it was a natural experiment. Water flow connects the habitats, yet the system's distinct boundaries should leave identifiable bacterial signatures. I suggested that sequencing could be a powerful tool for this purpose, and together we devised a project. We would create a lab exercise to learn the technology, allowing us to rigorously evaluate its claimed portability for field applications.

ONT sequencing had already demonstrated its field credibility in extreme settings, with researchers generating data in Antarctica and even in space. If it works there, why not in the waters of Central Europe's best-known shallow lake? Our effort would differ from previous work on Balaton because nanopore's long reads enable sequencing full-length 16S rRNA genes, improving taxonomic resolution compared with traditional culturing methods and short-read platforms. This higher resolution would be crucial for us to identify

The Oakland University team during a hike around Lake Balaton. Left to right, Sofiia Kolchanova, Stephanie Castro Márquez, Walter Wolfsberger, and Taras Oleksyk. *Photo by Taras Oleksyk.*

bacteria down to the species level and establish a stable, reproducible monitoring signal that can be compared across seasons and years. Our proposal to secure funding from the Hungarian Academy of Science was successful, and before long, my whole lab was on a plane to Hungary.

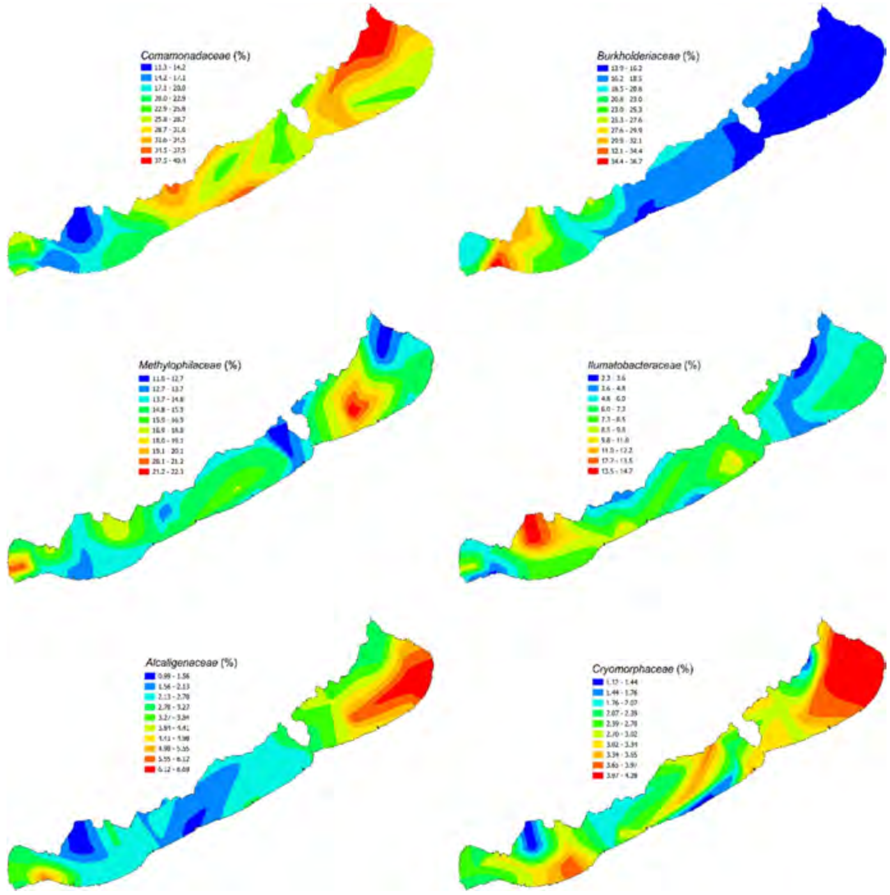
Fieldwork at Balaton has a way of quickly turning theory into reality. One can see the monitoring challenge in plain view: a river input, wetland compartments, littoral zones, and open water all interconnected yet far from uniform. Different habitats exhibit varying residence times, particulate loads, and organic matter quality. A sampling approach that collects a few convenient samples without accounting for this heterogeneity would yield confusing, misleading results. To address this challenge, we developed a comprehensive sampling map that can be replicated year after year to evaluate microbial biodiversity.

In our initial study on Lake Balaton, we used nanopore full-length 16S sequencing to profile bacterioplankton diversity at high resolution across 56 locations spanning the entire lake's basins and key shoreline/water partitions (littoral, pelagic, sediment; see figure as right). This approach allowed us to establish both a *lakewide baseline* (a broadly shared "core" community signal that recurs across space) and *spatial diversity* (repeatable differences linked to inflow influence, basin structure, and littoral versus pelagic conditions). As a result of our extensive approach, we have become convinced that a practical monitoring program needs both.

Our second manuscript (currently under review) focuses on the Kis-Balaton wetland system. We applied the same long-read logic along an explicit flow path: from the Zala River, through wetland compartments, and into receiving waters of the main lake. Wetlands are often treated as a single category in monitoring plans, but for Kis-Balaton, that can be a mistake because of the sharp microbial transitions within this connected system. From a management standpoint, those transitions can be interpreted as evidence of habitat filtering, organic matter processing, and hydrologic control, all of which can be affected by restoration actions, climate variability, or operational changes.

The lessons from our work are broadly applicable to large lakes worldwide, including the Laurentian Great Lakes. Balaton's hydrologic structure, shallow dynamics, and wetland–lake coupling provide a useful model for studying tributary influences, wetland retention, ecological gradients, and rapid ecosystem transitions. Key take-aways include the following:

Hydrology-first sampling design: Build the sampling frame around waterflow pathways rather than treating them as an afterthought.



Spatial distribution of the six most widespread bacterioplankton families in Lake Balaton (*Comamonadaceae, Burkholderiaceae, Methylophilaceae, Ilumatobacteraceae, Alcaligenaceae,* and *Cryomorphaceae*) using the percentage of sequencing reads representing each taxa. *Credit: Viktor Tóth, in Castro Márquez et al., 2025.*

Real-time sequencing benefits: Nanopore's portability lets us generate data during the sampling campaign, enabling adaptive resampling when unexpected results emerge.

Robust quality control: Continuous verification with blanks, positive controls, and predefined acceptance thresholds is essential, especially in turbid, particle-rich waters that affect what you capture during filtration and what is later amplified in downstream steps.

By reading a lake's bacterial community composition in a reproducible, interpretable way, we gain more than a new method; we obtain a new kind of early warning system grounded in mechanism and suitable for long-term comparison. Our experience confirmed ONT's usability for monitoring, enriched our field expertise, and positioned us to collaborate on environmental monitoring in other systems.

The success of this project rests not only on a cutting-edge platform, but also on its foundation as a training exercise and a long-term partnership. The most transferable lesson is that monitoring-grade science depends on collaborations that are durable enough to outlast a single field season. Recently, Viktor came to Michigan as a Fulbright scholar, and our teams continue to collaborate on writing, analysis, and publication. And we plan our future work. Science has largely moved past the question of whether metagenomics can describe lake communities. We now look to compare them year to year, derive interpretations that matter to managers, and guide decisions while there's still time to act.

Taras K. Oleksyk is an associate professor in the Department of Biological Sciences at Oakland University.

Volunteers with the Lake Winnipeg Community-Based Monitoring Network. *Photo by Paul Mutch.*

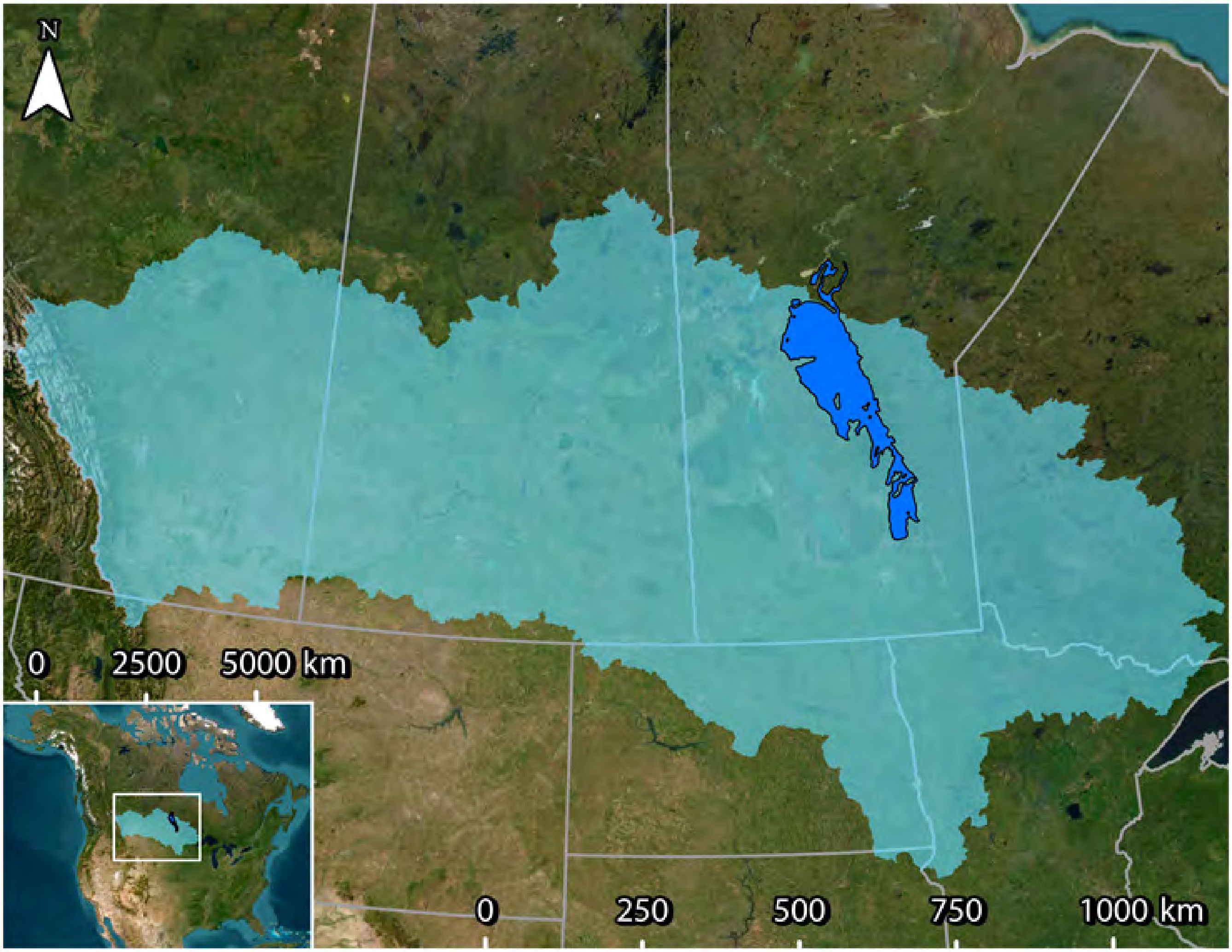
DATA FOR DECISION MAKING

The Lake Winnipeg Community-Based Monitoring Network

BY CHELSEA LOBSON

WHAT IF THE MOST POWERFUL data shaping water policy didn't come from satellites or sensors, but from people living in the watershed? In the Lake Winnipeg watershed, the Lake Winnipeg Community-Based Monitoring Network (LWCBMN) is a collaborative, long-term monitoring program designed to identify localized phosphorus hotspots across the Lake Winnipeg watershed. By partnering with watershed districts and community volunteers, LWCBMN generates high-resolution phosphorus data that complement and are interoperable with federal and provincial monitoring programs, strengthening the evidence base for water quality management and policy.

Over the past three decades, the interaction of climate change and land-use intensification has exacerbated algal blooms on Lake Winnipeg. Decades of whole-ecosystem research at the IISD Experimental Lakes Area have clearly demonstrated that to reduce algal blooms, we must first reduce the excess phosphorus entering the lake from its watershed.



Lake Winnipeg's watershed is one of the largest in the world, encompassing parts of four Canadian provinces and four U.S. states.

Lake Winnipeg's watershed (pictured above) is immense, stretching from the Rocky Mountains across the Prairies, into the Canadian Shield, and nearly to Thunder Bay, with portions extending into the Dakotas and Minnesota. Managing phosphorus runoff across such a vast and diverse landscape is complex, costly, and logistically challenging. To achieve meaningful water-quality improvements, phosphorus-reduction efforts must be strategic and evidence-based, prioritizing the largest sources of phosphorus and working systematically toward smaller contributors. Identifying and targeting phosphorus hotspots is therefore critical to improving Lake Winnipeg's health.

On the Prairies, spring snowmelt and increasingly severe summer storms account for a disproportionate share of annual phosphorus loading. If water samples are not collected responsively during these significant runoff events, phosphorus loads are typically underestimated. Accurately characterizing phosphorus loading requires frequent, spatially distributed, and responsive sampling. For a centrally located organization, mobilizing staff to sample more than 100 flow-metered sites across southern Manitoba immediately following storm events would be prohibitively resource intensive.

LWCBMN addresses this challenge through a community-based monitoring model that is inherently nimble and responsive. Volunteers and watershed partners live, work, or travel near sampling locations and can mobilize quickly during snowmelt, spring floods, and summer and fall storms—periods when runoff flushes phosphorus from the land into waterways (e.g., see hydrograph on following page). As a result, community-based monitoring is uniquely well-suited to identifying phosphorus hotspots within a large watershed and enabling targeted, cost-effective action.

Established in 2016, LWCBMN has now completed its 10th field season. The long-term continuity of the program captures interannual variability and provides the data needed to understand climate and land-use-driven changes in hydrology and phosphorus dynamics in the watershed.

With a decade of data now available, the network has identified persistent

As pressures from climate change and land-use continue to intensify, empowering people on the ground to generate trusted data will remain essential to protecting the health of Lake Winnipeg.

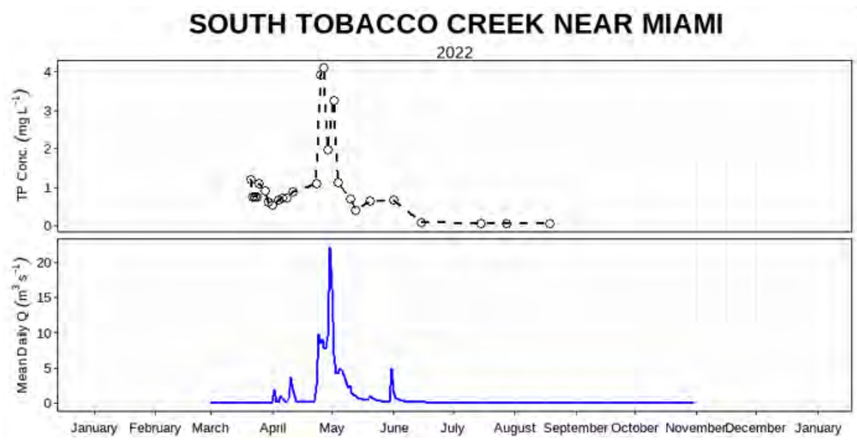
phosphorus hotspots—subwatersheds that consistently export higher amounts of phosphorus relative to others.

In wet years, elevated phosphorus concentrations combined with high flows result in greater phosphorus loads and exports. Phosphorus concentrations are also elevated during flood conditions, when water remains on surrounding landscapes for extended periods, allowing phosphorus bound in soils to dissolve into standing water. This process is especially pronounced in the flat landscapes of the Red River Valley, due south of Lake Winnipeg (see map at right).

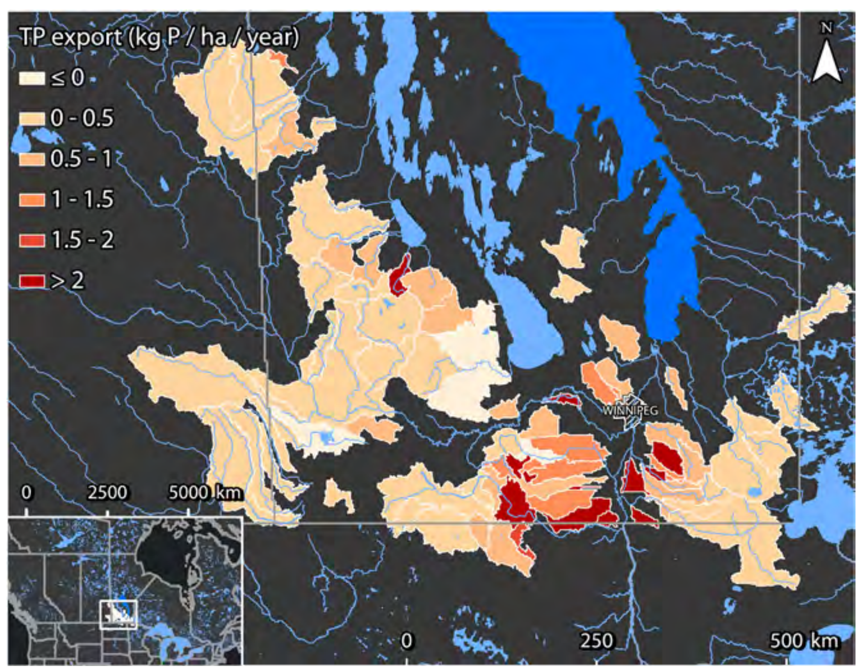
In contrast, dry years are characterized by low stream flows and correspondingly low phosphorus exports across most monitored regions. Some monitoring sites dry up entirely, resulting in substantially reduced phosphorus loading to Lake Winnipeg during those years.

LWCBMN was designed to generate data that inform management and policy decisions for Lake Winnipeg. Science advisors Mike Stainton (analytical chemist) and Greg McCullough (watershed hydrologist) recognized early on that phosphorus-reduction resources were often distributed broadly and inconsistently across the watershed. They identified the need for high-resolution empirical data to support a more targeted and effective approach.

As LWCBMN's dataset expanded, the network prioritized building trust with scientists, policy makers, and other stakeholders by demonstrating methodological rigor and transparency. All field and laboratory protocols are shared openly, the program participates in Proficiency Testing Canada's phosphorus program to ensure



Total phosphorus concentration and water flow (Q) at South Tobacco Creek near Miami, Manitoba, illustrating the flow-responsive sampling schedule.



Phosphorus export (kg/ha/y) from drainage areas sampled in 2022, LWCBMN's seventh field season.

analytical accuracy, and raw data are publicly accessible through Lake Winnipeg DataStream.

Today, LWCBMN data are being translated into action. Academic researchers, such as Darshani Kumaragamage (see sidebar), are using the data to guide studies of phosphorus runoff from agricultural landscapes, while watershed districts are leveraging the information to secure funding for targeted phosphorus-reduction projects. Most recently, the Canada Water Agency's Lake Winnipeg Freshwater Ecosystems Initiative combined LWCBMN data with federal SPARROW model outputs to identify priority areas for focused investment.

When stakeholders view phosphorus hotspot maps, the most common question is "What is driving the high phosphorus exports in these areas?" While LWCBMN data clearly identify where phosphorus is entering the system, they do not explain the underlying sources and mechanisms of phosphorus release. To address this gap, LWCBMN data are now being integrated with land-use data in a spatial correlation analysis aimed at identifying the drivers of elevated phosphorus exports.

Long-term monitoring programs are essential because they reveal patterns and trends that persist despite year-to-year variability. Within the Lake Winnipeg watershed, LWCBMN provides the empirical foundation for targeted phosphorus-reduction efforts, supporting both the prioritization of subwatersheds for intervention and the evaluation of management effectiveness over time.

This dataset exists because of the commitment of community volunteers and watershed partners who enable frequent and responsive sampling. As pressures from climate change and land-use continue to intensify, empowering people on the ground to generate trusted data will remain essential to protecting the health of Lake Winnipeg.

Chelsea Lobson is programs director at the Lake Winnipeg Foundation.

Installing snowmelt collection devices in farmers' fields. *Photo by Doug Goltz.*

Managing phosphorus for healthy soils and clear lakes

Phosphorus is a nutrient essential for crop production, but when excess phosphorus leaves the fields and reaches water bodies like Lake Winnipeg, it contributes to algal blooms and poor water quality. The main goal of our research is to reduce phosphorus loss from agricultural lands in the Red River Basin to protect Lake Winnipeg and other water bodies. This research is funded by the Canada Water Agency with partner contributions from the University of Winnipeg and the Lake Winnipeg Foundation and will be carried out in collaboration with Agriculture and Agri-Food Canada, University of Manitoba, the Lake Winnipeg Foundation, Environment and Climate Change Manitoba, and Seine Rat Roseau Watershed District.

In the Canadian Prairies, including the Red River Basin, most of the phosphorus runoff doesn't happen during rainfall, but during snowmelt. That's why our work specifically targets phosphorus loss in snowmelt runoff. Our previous research has shown that phosphorus loss from agricultural soils to snowmelt is highly variable across the region. We now aim to assess and map regions with excessive phosphorus loss via snowmelt in Manitoba's Red River Basin and facilitate more targeted management approaches to retain phosphorus in soil and reduce losses. For this research, we aim to collect 300–400 soil samples from fields with varying cropping and management histories over three years, focusing more on regions identified as phosphorus hotspots by the Lake Winnipeg Community-Based Monitoring Network. To date, we have contacted many farmers in the region who have shown strong support for the project by allowing us to take soil samples from their fields and letting us install snowmelt collection devices.

If we can reduce phosphorus loss from agricultural lands during snowmelt in the Red River Basin, we will keep more of the phosphorus on the land, where it is needed, and less amounts in the lakes, where it is not. That would be a win-win situation.

By Darshani Kumaragamage, University of Winnipeg, and Nelum Jayarathne and Inoka Amarakoon, University of Manitoba.

Aerial view of Kati Thanda–Lake Eyre, an endorheic lake (i.e., having no outlet) in the outback of South Australia. *Photo by Marco Taliani.*

THE 2025 RISE OF KATI THANDA–LAKE EYRE

Insights from Australia's largest ephemeral lake

BY MATHIEU SCHUSTER, JOEP STORMS & JAN-HENDRIK MAY

KATI THANDA–LAKE EYRE (KTLE), Australia's largest ephemeral lake, lies in the arid heart of South Australia. Usually dry, its vast whitish evaporitic surface contrasts with the surrounding orange-red dunes and the dry riverbeds converging toward this terminal basin—the continent's lowest point. Water occasionally collects in the KTLE after heavy rainfall in its immense drainage basin of 1.14 million square kilometers. Quaternary paleoshorelines attest to past perennial lake episodes, shaped by waves and currents.

According to historical records, the lake last completely filled in 1974, an event that has occurred only four times in the past 160 years. Last year, record-breaking rainfall triggered the supposedly largest riverflood in about 50 years, also drawing widespread attention to the anticipated lake filling. In July 2025, our team visited KTLE to document this rare event, focusing on sediment transport and mapping ancient coastlines using observations from a small airplane. These aerial surveys, combined with ground observations, allow us to reconstruct water levels and climatic conditions during previous floods, providing critical data for understanding dryland lake dynamics.

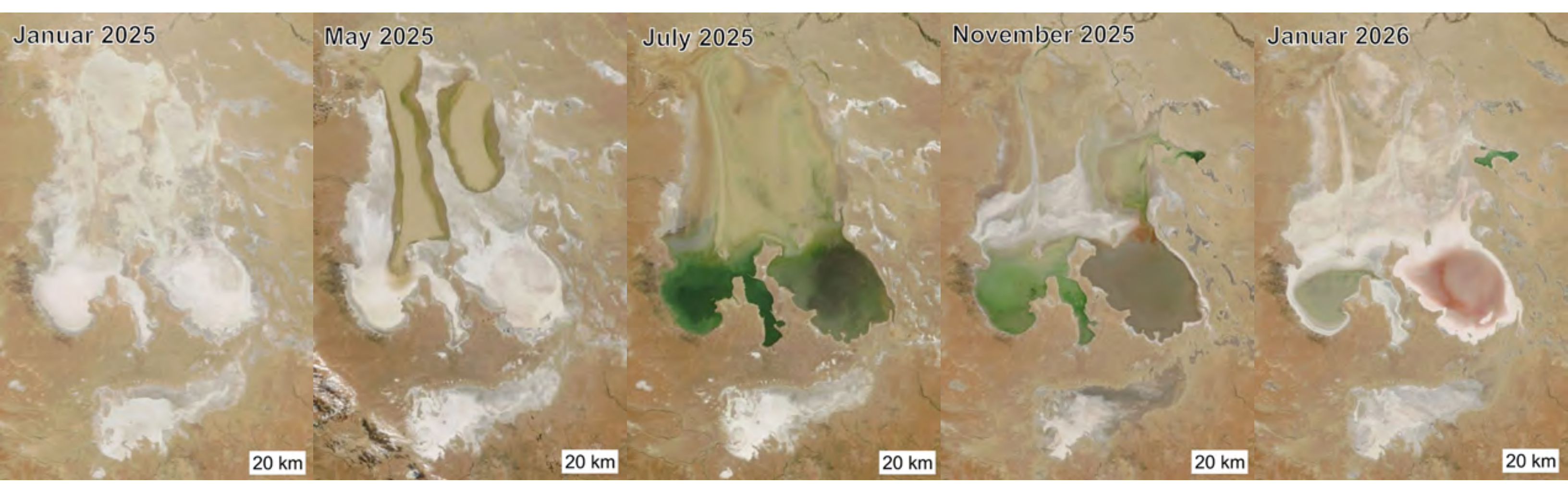
With their high revisit frequency, modern satellites offer unprecedented detail on hydrodynamics, sediment and algal transport, and evaporation—a capability that is indispensable for studying unmonitored lakes like KTLE. Such data are vital for our project, as we use them to validate Delft3D, an open-source, state-of-the-art hydrodynamics model that simulates water flow and sediment transport driven by wind and waves. While many lakes have abundant data to validate models, KTLE is a unique challenge due to its highly ephemeral nature and scarcity of hydrological data. Currently we are adapting the model for KTLE with limited data building on our experiences of modelling other data-sparce lakes such as Lake Turkana in Kenya and Ethiopia (see Zăinescu et al., 2022) and Lake Hulun in Inner Mongolia (see Xue et al., 2025).

By linking Delft3D with climate models, we aim to deepen our understanding of how climate impacts lakes, potentially even predicting tipping points in these vulnerable systems. This work at KTLE serves as a global case study, offering insights into the dynamics of arid-zone lakes and their future under changing climatic conditions.

For further reading, see our publications on Lake Eyre (May et al., 2022) and wind-driven waterbodies as a new category of lake (Nutz et al., 2018).

Top: Aerial view of Kati Thanda–Lake Eyre in July 2025, illustrating the lake's vast dimensions and highlighting the influence of wind-driven waves and longshore currents. *Photo by Mathieu Schuster.* **Inset:** The 2025 field team observing the Kati Thanda–Lake Eyre flood. From left, Joep Storms (Delft University of Technology), Thomas Faraon (University of Melbourne and University of Strasbourg), Mathieu Schuster (CNRS Strasbourg), and Guilherme Bozetti (University of Strasbourg). *Photo by Joep Storms.*

Mathieu Schuster is a field sedimentologist at the National Centre for Scientific Research in Strasbourg, France; Joep Storms is a sedimentary geologist at Delft University of Technology, The Netherlands; and Jan-Hendrik May is a physical geographer at the University of Melbourne, Australia.



One-year time series capturing the latest lacustrine pulsation of Kati Thanda–Lake Eyre. Satellite images reveal the lake's dynamic filling and drying phases. *Source: NASA Worldview; composition: M. Schuster.*

Photo via Good Free Photos.

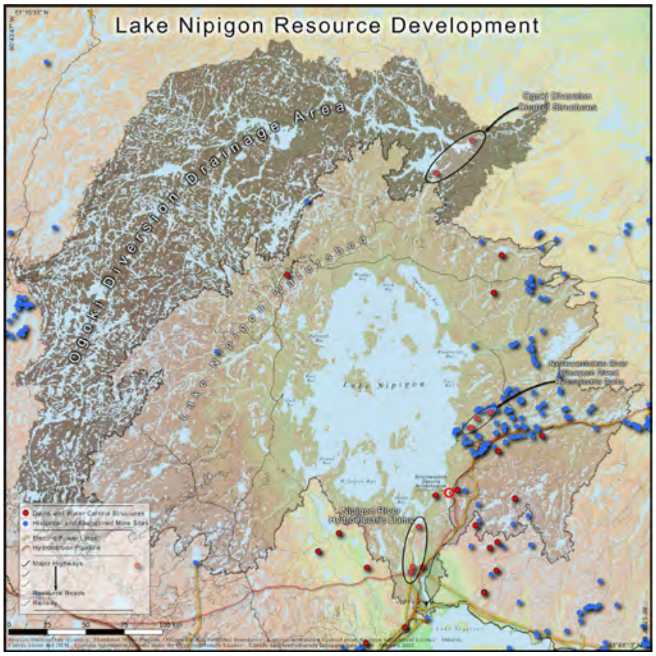
TOLD THROUGH SEDIMENT CORES

Stories of Lake Nipigon

BY JENNIFER KOROSI, TIM HOLLINGER, DALE HARDY, JOSHUA THIENPONT, ROBERT STEWART, NATHAN WILSON & ADAM KOWTIASH

IN THE 1920s, University of Toronto researchers undertook a comprehensive study of the limnology and aquatic ecology of Lake Nipigon, a large (38th largest globally) headwater lake that flows into Lake Superior through the Nipigon River. More than 100 years later, this remains the only comprehensive aquatic ecosystem study ever conducted for Lake Nipigon. Over this time, the basin has been impacted by a plethora of stressors, including hydroelectric power generation, mining, and invasive species. Most notable among them is the Ogoki Diversion, constructed in 1943 to divert the flow of the Ogoki River from the Hudson Bay watershed into the Great Lakes watershed through Lake Nipigon. Water levels on Lake Nipigon are manipulated to influence flows through the Laurentian Great Lakes system, but it is not uncommon for Lake Nipigon to be excluded entirely from Great Lakes watershed maps.

At left: Jackfish Creek prior to the 1943 Ogoki Diversion. *Photo courtesy of Ontario Power Generation.* **Above:** Drone image (2023) of a rotational slide along the banks of the Little Jackfish River just upstream from Ombabika Bay. *Photo by Tim Hollinger.*



Map of the Lake Nipigon watershed, including the expanded drainage basin arising from the Ogoki Diversion. *Credit: Reg Nelson.*

The First Nations of Lake Nipigon have witnessed the impacts of industrial development on the health of the lake but have largely been left out of management decisions and Great Lakes monitoring. This impedes their ability to engage fully in consultation and fulfill their role as rightful stewards of Lake Nipigon. In response, Biinjitiwaabik Zaaging Anishinaabek (BZA – Rocky Bay, one of the six Lake Nipigon First Nations) created an Indigenous Guardians program and partnered with academic researchers at Lakehead University to study the cumulative impacts of past development on Lake Nipigon. These investigations began with a community country foods study, which identified the community's vulnerability to mercury in walleye, and later led to a community-based fish consumption study for mercury in popular fishing spots across Lake Nipigon. BZA's research program then expanded to include a new partnership with York University to use lake sediment cores to learn more about post-colonial ecosystem changes in Lake Nipigon, guided by traditional knowledge.

The Ogoki Diversion

The construction of the Waboose and Summit dams in northern Ontario (see circled area at top right in map) redirected the flow of a roughly 14,000-square-kilometer drainage area of the Ogoki River basin into the Little Jackfish River, which empties into Ombabika Bay at the northern end of Lake Nipigon. This increased the watershed size of Lake

At left: Vibracoring in Ombabika Bay from the BZA research vessel, the *Velma Linda. Photo by Tim Hollinger.* **At right:** Abe Kowtiash, BZA Elder and captain of the *Velma Linda*, fishing for walleye in the Little Jackfish River. *Photo by David Jackson.*

Nipigon by over 60%, and the volume of diverted water was high enough to increase hydroelectric production more than 1,500 kilometers downstream at Niagara Falls. Raised water levels on Lake Nipigon contributed to widespread shoreline erosion and forced the relocation of First Nation communities. Increased mercury concentrations in fish were also of concern, as dams are known to result in higher rates of mercury bioaccumulation, and Ombabika Bay and the Little Jackfish River act as the "Walleye Factory" of Lake Nipigon. BZA Elders also recounted widespread sediment plumes in Ombabika Bay and outwards into the main basin of Lake Nipigon in the years following the construction of the Ogoki Diversion. It has been estimated that up to 9 meters of sediment were deposited in Ombabika Bay near the mouth of the Little Jackfish River, and that 30 million cubic meters of sediment was scoured along the banks of the Little Jackfish between 1943 and 1972. Large rotational slides are still visible on the banks of this formerly small creek channel pictured on the previous page (Ontario Power Generation, 2022). Resolving the legacy impacts of the Ogoki Diversion is a priority for BZA, as further hydroelectric development has been proposed for the Little Jackfish River.

Lakes as storytellers

Lakes hold memories within their sediments. Sediments are continuously settling on the lake bottom, with younger sediments settling over top of older sediments, providing a record of change over time that can be inferred from biological fossils and sediment physical and chemical characteristics. Interpreting the stories told in sediment cores allows us to learn about how Lake Nipigon has changed over time. But Lake Nipigon is not an easy lake to collect sediment cores from. There are no bathymetry maps available to identify ideal coring locations, and navigation on Lake Nipigon can be hazardous to those who are unfamiliar with its waters. Partnership and BZA leadership have been critical to the success of the project. Every summer since 2021, BZA Guardians and university researchers have spent about a week together aboard the *Velma Linda* (BZA's research vessel) traveling around Lake Nipigon collecting sediment cores, sharing knowledge and stories, and building relationships. We've collected "short" sediment cores (20–40 centimeters) from 12 embayments of Lake Nipigon and dated them using radioisotopes (^{210}Pb, ^{137}Cs). These sediment cores span the last roughly 200–300 years of history in southern Lake Nipigon, but only the post-Ogoki period in the northern part of the lake. The extensive amount of sediment released from the Little Jackfish River meant that we had to drill deeper to see what conditions were like prior to the Ogoki Diversion. In 2025, we returned to Ombabika Bay with a more advanced coring device called a vibrating corer and collected two 3-meter-long sediment cores (pictured above, left). The stories that we will be able to tell from the sediment cores eventually can be woven with oral history and archival data to provide a holistic understanding of the health of Lake Nipigon, in support of Indigenous-led stewardship. Lake Nipigon is a jewel within the Great Lakes watershed and should be protected for generations to come.

Jennifer Korosi and Joshua Thienpont, York University; Tim Hollinger, Robert Stewart, Nathan Wilson, Lakehead University; and Dale Hardy, Biinjitiwaabik Zaaging Anishinaabek.

Lake Winnipegosis through time: A paleolimnological perspective

LAKE WINNIPEGOSIS is Manitoba's second largest lake and one of the world's great inland waters. Despite its size and cultural importance, its long-term ecological history remains poorly understood compared with many other large lakes. My research uses paleolimnology, the study of lake sediments, to reconstruct how Lake Winnipegosis has changed over time. Conducted within the Gushulak limnology lab at the University of Manitoba, this study contributes to the lab's ongoing research goals to understand how and why lakes across climate and land-use gradients respond differently to human stressors.

Lake Winnipegosis has long been a cultural and lifeways resource for local First Nation and Métis communities. In recent years, rising concerns over declining water quality and fisheries health have highlighted the need to understand how the lake is changing. This study is one of the first to look at the lake's past and present water conditions, and I hope to help communities to protect and manage this important resource for generations.

Lake sediments act as archives. Layer by layer, they preserve biological remains, chemical signals, and particles washed in from the surrounding landscape. By extracting sediment cores from the lake bottom, we can look back in time and track changes in water quality, nutrient inputs, and ecosystem structure. Indicators such as diatom communities, sedimentary pigments, and stable isotopes help reveal how the lake has responded to climate and land-use changes across its large and complex watershed.

This study explores long-term and spatial patterns in the water quality of Lake Winnipegosis, focusing on the influence of land-use change, multiple inflows, and climate gradients across the lake. We collected four sediment cores from distinct depositional basins across the lake and established their chronologies using ^{210}Pb alpha spectroscopy, producing age models that extend back to around 1850. We analyzed organic matter content (by loss on ignition) and algal and cyanobacterial pigment concentrations (using high-performance liquid chromatography). To identify periods of major changes in sedimentary pigments, we applied constrained cluster analysis, a statistical method that groups successive layers with similar characteristics. This analysis showed that the lake experienced clear changes in water quality over time, and that these changes differed between basins depending on their location, river inputs, and surrounding land use. Future analysis using other water quality proxies, such as stable isotopes and diatom assemblages, will provide a more detailed understanding of the timing and magnitude of water quality changes in Lake Winnipegosis.

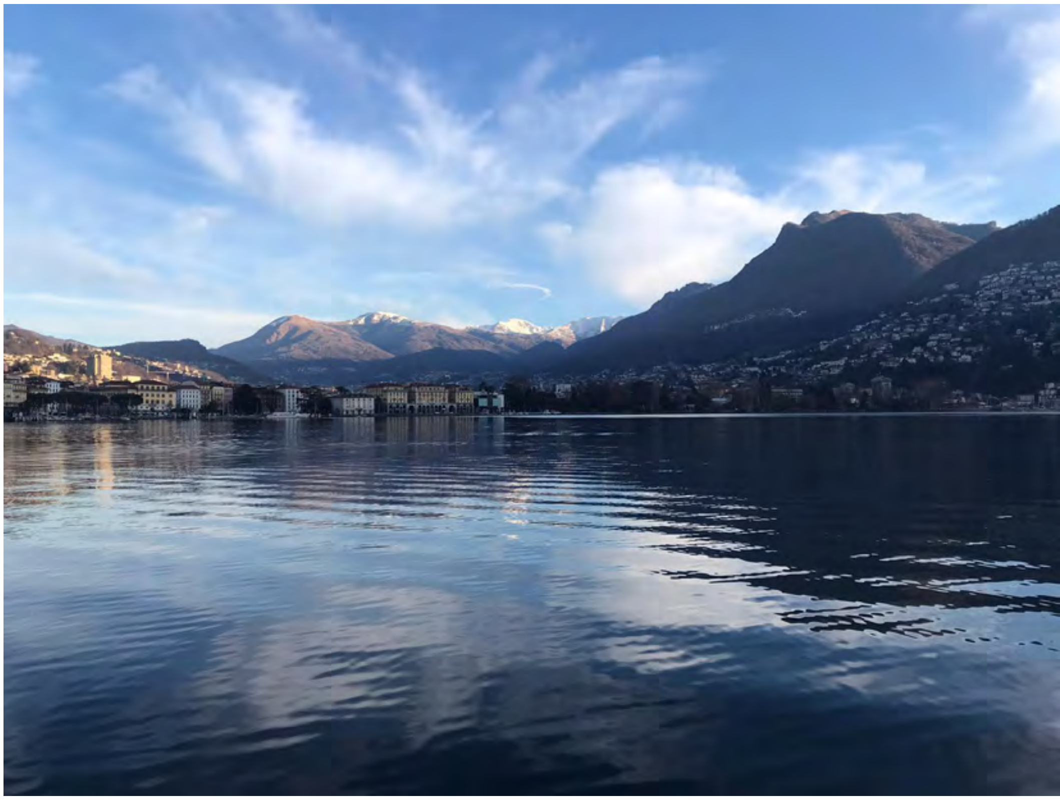
By Samadhi Jayathissa, a graduate student at the University of Manitoba.

Extracting a sediment core from the bottom of Lake Winnipegosis. *Photo by Geoff Klein, Manitoba Natural Resources and Indigenous Futures.*

The author will be presenting this research at the IAGLR & SCAS Joint Conference in May in the session *Studying Canada's Other Great Lakes.*

Looking beneath the surface

Revealing the hidden threat of microplastics in lakes



Located on the Swiss-Italian border at the southern side of the Alps, Lake Lugano is known for high levels of microplastic pollution on its surface. Although small in surface area, the lake's depth, temperature layering, and long water residence time are similar to those of much larger lakes. *Photo by Federica Rotta.*

WHEN TALKING about microplastic pollution in lakes, we are used to thinking about tiny particles floating on the water's surface. This idea has guided most research to date, from the vast North American Great Lakes to smaller European subalpine lakes. Consequently, we know surprisingly little about how microplastics behave in the deeper layers of lakes worldwide, leaving many relevant questions unanswered. What happens once these particles leave the surface? Do they sink or accumulate at certain depths? And which parts of the lake's ecosystem are most exposed?

To address these gaps, we looked beneath the surface to the deep waters of Lake Lugano—a lake on the Swiss-Italian border—to reveal the hidden pathways of microplastics through the water column. What we found was remarkable, but not unexpected: microplastics were present throughout the lake, all the way down to 80 meters, with their vertical distribution shaped by seasonal changes in water density driven by thermal stratification. Pollution hotspots occurred within the upper layers of the lake in the bright, sun-lit zone where primary producers, zooplankton, and many other freshwater organisms live. This indicates an elevated exposure risk for freshwater biota, a risk that could grow as climate change intensifies thermal stratification, trapping microplastics in these biologically active depths for longer periods. At the same time, the particle composition reflects human contributions: polypropylene and polyethylene fragments and fibers dominate, consistent with inputs from urban littering, textile-derived wastewater, and surface runoff from nearby densely populated areas.

Why does this matter? Beyond Lake Lugano, large, deep lakes are integral to urban life, providing drinking water, supporting biodiversity, and offering economic services and recreational opportunities to millions of people nearby. Microplastics threaten these ecosystems in ways we are only beginning to understand. We hope our contribution will encourage moving beyond surface-only studies, supporting better environmental monitoring, improved risk assessment, and the effective long-term protection of freshwater resources in today's rapidly changing world.

By Federica Rotta, PhD Student, Freshwater Ecology Group, University of Applied Sciences and Arts of Southern Switzerland – Institute of Earth Sciences; Department of Earth and Environmental Sciences, University of Pavia.

JGLR Editor's Choice

To learn more, see the article "Beyond the surface – Microplastic hotspots in the water column of a top plastic-polluted deep lake" in the *Journal of Great Lakes Research.* Authors include Federica Rotta, Camilla Capelli, Agnese Marchini, Barbara Leoni, Giusto Lo Bue, Maya Musa, Maria Pia Riccardi, and Fabio Lepori. Selected as the Editor's Choice article for the journal's February 2026 issue, the article will be available via open access for 60 days.

Beyond the catch

What motivates fishers and their role in managing Lake Tanganyika

Young men on their routine fishing expedition with longlines in the shallows of Lake Tanganyika for their pots and surplus for immediate sell. These traditional fishers are in the habit of ignoring the licensing system but making a living. *Photo by Kabunda Malukutila.*

FISHING IS A VITAL livelihood on Lake Tanganyika in Zambia. The fishery is largely made up of artisanal fishers whose numbers have doubled in recent decades according to national surveys. This growth has been accompanied by an increase in fishing gear and the adoption of new harvesting technologies. With the addition of strong market demand, population growth, and the absence of effective legal restrictions, pressure on the lake's fish stocks has steadily increased.

The result has been widespread overfishing and the use of destructive fishing techniques that damage habitats and undermine collaborative management efforts. Studies show that fish catches in this part of Lake Tanganyika have declined by more than 50 percent over the past 25 years, raising concerns about both environmental sustainability and long-term food security.

To further clarify these conclusions, our study investigated the underlying causes of fishing overcapacity and the factors influencing low fisher participation in community-based fisheries management, or *co-management*. We found that despite falling catches and modest incomes, fishing has remained an attractive occupation for many lakeshore communities. According to our survey of 370 fishers, for households with small landholdings, large families, limited access to credit, and low educational levels, fishing offers one of the most accessible ways to earn a living. Social ties also matter: people are more likely to enter the fishery if they have relatives who fish or live in communities where fishing is deeply embedded in daily life.

Our research also highlights why co-management has struggled to gain broad participation. Although village-level fishers' committees exist, involvement in resource management is uneven and shaped by social factors such as gender, age, ethnicity, family size, and awareness of fisheries laws. Women, in particular, remain underrepresented in decision making. In addition, fishers who lack knowledge of regulations or feel excluded from management processes are more likely to be marginalized and less able to defend their local conservation efforts.

Understanding these human dimensions is critical for addressing overfishing in Lake Tanganyika. Our study suggests that reducing pressure on the fishery will require more than stricter rules. Proposed solutions include expanding non-fishing livelihood opportunities through skills training, access to loans, market provision for alternative products, and improved infrastructure to support proposed innovations. Limiting the number of fishing licenses issued each year could also help control the continued growth of the fishery. Also important are public awareness campaigns in fishing communities to address issues of management and conservation concerns.

The author will be presenting this research at the IAGLR & SCAS Joint Conference in May in the session *Informing Freshwater Policy & Practice by Reflecting on Successes and Failures.* Also see Haambiya et al., 2018 for a discussion of earlier research on this topic.

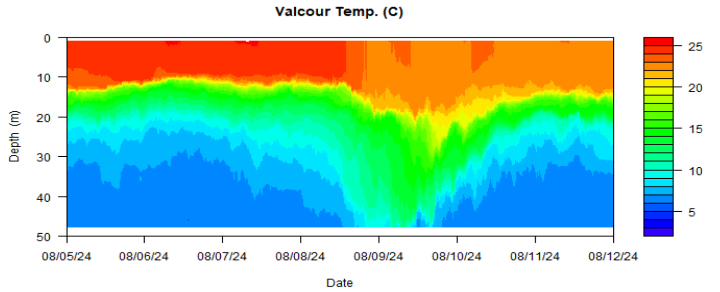
By Lloyd Haambiya, Lake Tanganyika Science Advisory Group.

Weather under water

Lake Champlain data buoy reveals storm impact on lake thermal structure

SINCE 2016, the Lake Champlain Research Institute at SUNY Plattsburgh has operated a data buoy that records temperatures from the lake's surface down to its bottom at 50 meters depth. Using these data, graduate student Miranda Rummell is investigating the lake's thermal structure and how storm events alter it.

Rummel's work is revealing several noteworthy patterns. Not all storms are alike; they vary both in intensity and their impact on the water column. Some storms mainly perturb surface waters, while others have deeper impacts (pun intended). To capture this variability, we have developed a five-tier storm intensity classification for Lake Champlain events. The strongest storms can displace warm surface water to depths exceeding 45 meters. Disturbances are a natural part of lake dynamics, and studying them is crucial for understanding potential impacts on the ecosystem, especially in a deep, northern temperate lake that has not yet adapted to such perturbations.



Seven-day thermal temperature profile at the Valcour buoy site. Note the warm water being pushed down on August 9 compared to the normal conditions on August 5–7. This is an example of the strongest storm (L5).

By Tim Mihuc, director of the Lake Champlain Research Institute, and Miranda Rummell, MS in Ecology and Natural Resource candidate at SUNY Plattsburgh.

Chasing storms with Miranda Rummell

Growing up with the Great Lakes in my backyard, I always felt a pull toward the water and everything in it. When I joined the plankton project in June 2024, I expected boat trips and routine plankton counts. But I never imagined that I'd become fascinated by the hidden storms beneath Lake Champlain's surface.

The project's plankton sampling had started in 2022 with funding from the Great Lakes Fishery Commission. When I joined the project, I spent the first couple months identifying zooplankton and phytoplankton from past collections. Upon seeing stark differences in species abundance and vertical distribution across the samples, I knew I needed to find an explanation and set out to analyze the Valcour buoy's temperature data in RStudio. I discovered that the storms recorded since the buoy was first deployed in 2016 behaved differently from one another. Classifying these events became a priority to guide our fall 2025 sampling schedule.

That analysis led to even more questions: How does wind translate its energy into the water column? How do these physical forces shape the plankton communities we're studying? My goal now is to raise awareness among scientists that large, deep, temperate freshwater lakes remain understudied, especially regarding storm impacts on aquatic life. I also want to emphasize the importance of taking a vertical profile within a few hours when sampling due to rapid changes in stratified conditions. This is important because thermal disturbances can lag behind the wind, meaning a storm may be happening underwater while the surface looks perfectly calm.

Uncovering unknown processes in Lake Champlain and connecting those physical events with the plankton samples we've collected has been exhilarating. And there's still so much more to explore beyond temperature, including currents, nutrients, and dissolved oxygen. This has been a rewarding opportunity to answer questions while finding new ones. And now, I can proudly say that I am a storm chaser.

Miranda Rummell during a plankton net sampling event at the buoy site on Lake Champlain.

A *Phragmites* oasis exposed on the eastern playa of Great Salt Lake in Utah. *Photo by Ebenezer Adomako-Mensah.*

Hidden freshwater oases

Uncovering pressurized groundwater beneath the Great Salt Lake playa

AS TEMPERATURES RISE and warm seasons lengthen, Great Salt Lake in Utah is a sentinel of climate change. Direct evaporation from the lake is increasing while runoff to the lake declines due to increased water demand in the surrounding watershed. The lake's extreme sensitivity to climate arises from its vast surface area—about 30 billion square feet—relative to a maximum depth of about 30 feet, a ratio of a billion to one. This makes Great Salt Lake appear as a mere sheen on the desert tarmac, sustained partly by groundwater but mainly by precipitation and stream inflow.

Until recently, groundwater inflow estimations relied on subtracting estimated evaporation from measured inflow. A recent study installed piezometers directly on the exposed *playa* (a flat, arid basin that periodically fills with water and then dries, leaving a salty crust) to examine groundwater inflow (Adomako-Mensah et al., 2025). That investigation discovered pressurized ancient freshwater under the eastern playa, ranging from about 30 feet down to potentially several thousand feet. Environmental tracers indicate the water is recharged at mountain elevations, presumably on the Wasatch Mountains about 30 miles east of the lake. Dating by ^{14}C suggests millennia-scale age since recharge (Adomako-Mensah et al., 2025).

While scouting sites to install the piezometers, we'd observed on Google Earth dozens of round spots exposed on the drying playa. To our knowledge, these features had never been described. They're difficult to access, often many miles from reliable roads and accessible only when the playa has not been turned to sticky mud by rain or snowmelt and when the sun is not so intense as to cause heat stroke. Our curiosity led us to use snow bikes to ride out to some of these locations (pictured above), where we discovered islands of *Phragmites*, the largest being roughly 100 to 200 feet in diameter (Adomako-Mensah et al., 2025).

It's surprising what can be accomplished with hand tools and mountain bikes. Suspecting a hydrologic origin, possibly springs, we brought an electric hedge trimmer and hand augers and installed 11-foot-deep piezometers into the center, edge, and midway point. This was hard work on top of that done just to reach these features, so we were relieved to find fresh groundwater at the center and hypersaline water at the edges, showing that these circular "mystery islands" or "*Phragmites* oases" are windows through the salt lens into this pressurized freshwater system beneath the playa.

The presence of pressurized freshwater beneath the eastern playa and the pipe-like nature of the round spots has been further substantiated by on-ground electrical resistivity surveys (Jacketta et al., in review) and airborne geophysical surveys (Zhdanov et al., in press). The latter hold promise for determining whether ancient freshwater exists not only under the periphery of the lake, but under Great Salt Lake itself.

Being able to place a small well anywhere on the playa and have water flow to the surface without mechanization could be handy for dousing localized dust hotspots on the exposed playa, as we've proposed to examine. However, the hype that this ancient (possibly Ice Age) resource could refill Great Salt Lake and replace watershed diversions is concerning, since understanding the quantities of groundwater that can be extracted without harming other benefits needs additional study. While the pressurized freshwater below the eastern playa might be used to extinguish dust much like a household fire extinguisher, it doesn't justify lapsing on home insurance or defunding the fire department.

We need to continue efforts to bring more water into Great Salt Lake, keeping foremost in mind that the ultimate driver of lake shrinkage is climate. Overcoming the current malaise that views climate change as hopeless is essential. As Bill McKibben argues in his recent book *Here Comes the Sun: A Last Chance for the Climate and a Fresh Chance for Civilization*, we now possess the technical capacity to meet this challenge, and meaningful benefits can be realized within the next decade, hopefully before sentinels such as Great Salt Lake are lost.

By William Johnson, professor, Department of Geology & Geophysics, University of Utah.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