

In this issue, we take a look at biodiversity and the world's large lakes.

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All hands on deck for the freshwater biodiversity crisis

by Steven Cooke

CRISIS. Emergency. Disaster. Catastrophe. Hyperbole? Unfortunately not. Those words all serve as reasonable descriptors of the global state of freshwater biodiversity. By all accounts, freshwater ecosystems and their biota are in trouble. Freshwater ecosystems are among the most threatened systems on the planet—on the same plane as tropical rainforests that are being clearcut. The [WWF Living Planet Index](#) assesses the change in population status of various freshwater organisms relative to 1970. It reveals declines of over 85%, which is higher than that of either marine or terrestrial systems. Amphibians are among the most threatened taxa on the planet, with freshwater fish not far behind. From headwater streams to wetlands, and from water-filled caves to the world's largest inland lakes, no system is immune to anthropogenic threats.

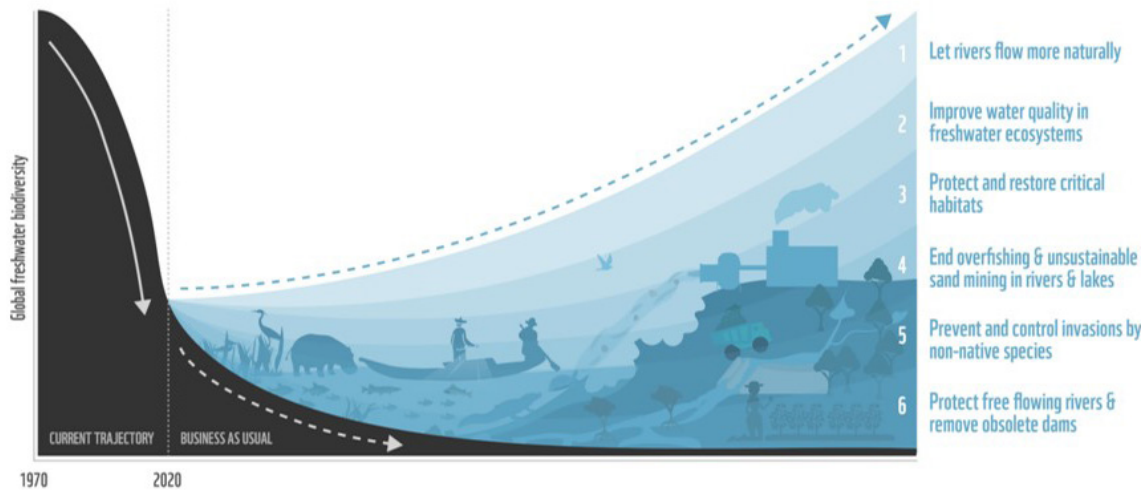


[Work by David Dudgeon and colleagues](#) in 2006 identified several key threats facing freshwater biodiversity: habitat alteration, invasive species, pollution, overexploitation, and climate change. Some 15 years later, [Andrea Reid and colleagues](#) revisited the threats facing freshwater biodiversity and revealed that not only do those threats persist, but there are emerging threats and greater evidence of complex interactions among threats that make things even more dire for freshwater biodiversity.

In recognition of the grim state of freshwater biodiversity, David Tickner from WWF recently led an initiative focused on creating an [Emergency Recovery Plan](#) intended to “bend the curve” for freshwater biodiversity. The plan consists of six priority actions: accelerating implementation of environmental flows; improving water quality; protecting and restoring critical habitats; managing the exploitation of freshwater ecosystem resources, especially species and riverine aggregates; preventing and controlling non-native species invasions; and safeguarding and restoring freshwater connectivity.

The plan itself is rather simple, yet there remain many challenges with implementation. On the global scale, freshwater ecosystems and biodiversity are often forgotten when it comes to discussions about the United Nation's [Sustainable Development Goals](#), the [Convention on Biological Diversity](#), and other international policy instruments and initiatives. At a regional level, those tasked with managing or restoring freshwater biodiversity are often under-resourced and faced with continual pressure to trade off biodiversity for short-term economic gain. Underpinning these challenges is the reality that freshwater ecosystems are often not valued, making it difficult for decision makers to comprehend the benefits of putting freshwater biodiversity ahead of economic

“Freshwater ecosystems are among the most threatened systems on the planet—on the same plane as tropical rainforests that are being clearcut.”



Six priority actions outlined in the [WWF Emergency Recovery Plan](#) to address the freshwater biodiversity crisis.

development. Nutritional security, cultural services, livelihood support, nutrient cycling, and the many other freshwater ecosystem services are massive yet difficult to quantify and easy to ignore.

Although research needs related to freshwater biodiversity and management certainly exist, what is really needed is action. In the developed world, there is reasonable capacity for freshwater management, yet most efforts focus on organisms of socio-economic value (e.g., gamefish) and fail to approach management from a holistic perspective. For the most part, we know what works, yet lack the courage to make good decisions that value freshwater biodiversity.

A [new toolbox](#) has been developed with the intention of equipping practitioners with the evidence needed to guide decision making about freshwater management interventions. Such an approach will hopefully help the Emergency Recovery Plan move from something that is aspirational to something that is realized.

It has only been two years since the WWF Emergency Recovery Plan was developed, and it remains unclear the extent to which it has been embraced. What is clear is that we need all hands on deck. If there was ever a call to arms for freshwater biodiversity, this is it. Beyond the specific actions that constitute the Emergency Recovery Plan, there are many other ways to engage, including building public appreciation for freshwater ecosystems and demonstrating their value to politicians, leading stakeholder events that involve hands-on restoration, or enabling community monitoring.

I strongly encourage all IAGLR members to take the time to familiarize themselves with the Emergency Recovery Plan for freshwater biodiversity and consider what they can do to aid in its implementation. It is time to bend the curve for freshwater biodiversity and begin to restore our damaged ecosystems and rebuild our imperiled populations. The plan is grand and will take decades to be fully realized, but time is ticking and there is real urgency. Unfortunately, the tale I tell is not hyperbolic, and if anything may understate the true state of affairs. Fortunately there are exceptions, but they are far too few. I consider the [WWF Emergency Recovery Plan](#) to be a must-read. Please check it out.

Steven Cooke is a biology professor at Carleton University in Ottawa, Canada.

“I strongly encourage all IAGLR members to take the time to familiarize themselves with the Emergency Recovery Plan for freshwater biodiversity and consider what they can do to aid in its implementation.”

MEET THE NEW MEMBERS OF THE IAGLR BOARD OF DIRECTORS

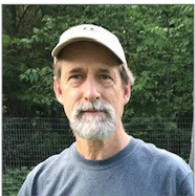
Congratulations to Alex Maguffee, appointed to fill out the remainder of the previous secretary's term, and to Calvin Hitch, Noel Urban, and Les Warren, newly elected members of the IAGLR Board of Directors. Thank you for your commitment to serve the association!



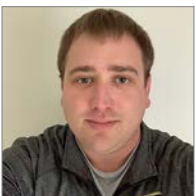
ALEX MAGUFFEE
Michigan State University
Secretary



CALVIN HITCH
Toronto and Region Conservation Authority
Canadian Regular Member



NOEL URBAN
Michigan Technological University
U.S. Regular Member



LES WARREN
Purdue University
U.S. Student Member

JOIN US ONLINE JUNE 15 FOR OUR ANNUAL BUSINESS MEETING & AWARDS CEREMONY

The IAGLR Annual Business Meeting will be held online June 15, 3–4:30 p.m. All IAGLR members are welcome to learn about the business of the association, share any issues or concerns, welcome new board members, and celebrate the 2022 award and scholarship recipients. Watch your email for your invitation and Zoom details.

ANNOUNCING FIRST COHORT OF IAGLR LARGE LAKE CHAMPION AWARD WINNERS

We are proud to announce the debut of the IAGLR Large Lake Champion Award, which recognizes and honors individuals whose work has made significant contributions to sharing the social, economic, and ecological understanding of large lakes of the world. We look to pay tribute to the luminaries and rising voices for large lakes that will help shape the association for years to come and pave the way for IAGLR's future. We're pleased to introduce this year's recipients. To learn more about their contributions, please see the [press release](#) announcing the award.



PATRICIA CHOW-FRASER
Professor, McMaster University
Department of Biology
Former IAGLR President



CATHERINE FEBRIA
Canada Research Chair in Freshwater Restoration Ecology and Assistant Professor, University of Windsor
Great Lakes Institute for Environmental Research

Photo credit: Shayenna Nolan



ABRAHAM FRANCIS
Program Manager
Environment Program
Mohawk Council of Akwesasne

Photo credit: Stephany Hildebrand



JAMES OLSON
Founder and Senior Legal Advisor
For Love of Water (FLOW)



ALI SHAKOOR
Ph.D. Student
Wayne State University
Department of Biological Sciences

CONGRATULATIONS IAGLR AWARD AND SCHOLARSHIP WINNERS



Anderson-Everett Award
JESSICA IVES, University of Windsor. For outstanding contributions to the International Association for Great Lakes Research.



Norman S. Baldwin Fishery Science Scholarship
MORGAN PICZAK, Carleton University. For research titled “Advancing foundations of restoration ecology for fish habitat of the Laurentian Great Lakes.”



Best Associate Editor in 2021 Award
NOEL URBAN, Michigan Technological University. For outstanding support of the review process for the *Journal of Great Lakes Research*.



Norman S. Baldwin Fishery Science Scholarship
CHRISTOPHER ROUNDS, University of Minnesota. For research titled “Who, what, when, where and how: Optimizing eDNA sampling for detecting multiple aquatic invasive species.”



Best Reviewer in 2021 Award
MATTHEW KORNIS, U.S. Fish and Wildlife Service. For outstanding support of the review process for the *Journal of Great Lakes Research*.

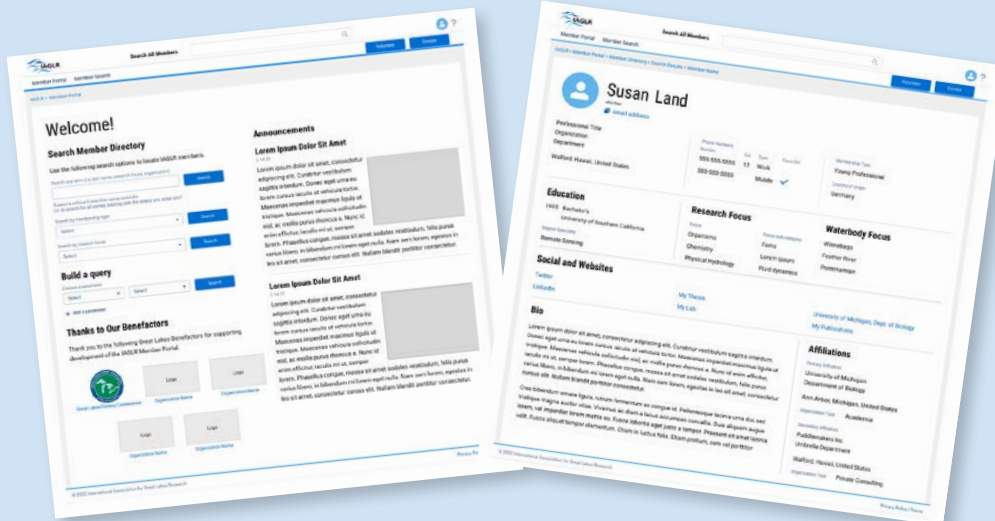


David M. Dolan Scholarship
EMILY LILJESTRANDS, Michigan State University. For research titled “How data availability and quality influence output in state-space stock assessment models applied to Great Lakes fisheries.”



IAGLR Scholarship
MOLLY WICK, University of Minnesota, Duluth. For research titled “How do aspects of place and personal identity influence cultural benefits from Great Lakes coastal ecosystems?”

Still to come: Lifetime Achievement, John R. Vallentyne, Chandler-Misener, Elsevier Early Career Scientist & Elsevier Student Author awards!



COMING SOON! IAGLR MEMBER DIRECTORY

We're excited to share a peek at the IAGLR Member Directory currently under development! Pictured at left, the landing page for current members will offer a robust member directory search feature plus announcements from IAGLR. Profiles of members who choose to participate in the directory, shown at right, will feature contact information, preferred pronouns, education, research focus, waterbody focus, a bio, and links to social media accounts and relevant websites. We hope this information will help you to more effectively network with one another. The landing page will also recognize platinum-level Great Lakes Benefactors—such as the Great Lakes Fishery Commission—who choose to support the portal's development. [Learn how your organization can be one of just five Great Lakes Benefactors featured in the member portal.](#)

JASM | IAGLR 2022 SNAPSHOTS

It was great to see old and new IAGLR friends in Grand Rapids, Michigan, at the Joint Aquatic Sciences Meeting | IAGLR 2022!



OCTOBER 24-26, 2022
TRAVERSE CITY, MI

Proposed sessions due May 27

Abstract submission opens in June



Presented by the
International Association for Great Lakes Research

iaglr.org/sol/solm22

Special sections in the *Journal of Great Lakes Research*

Special sections on a range of topics enrich the *Journal of Great Lakes Research*. Look for the upcoming special sections noted below, and make sure not to miss the most recent ones listed. If you're interested in publishing a special section, please contact the editors to discuss your idea. There are no page charges for special sections.

UPCOMING SPECIAL SECTIONS

[African Great Lakes status and research needs](#)

The papers in this special section highlight the importance of the seven African Great Lakes of eastern and southeastern Africa (Lakes Albert, Edward, Kivu, Malawi/Niassa/Nyasa, Tanganyika, Turkana, and Victoria).

[Assigning agency: how communities, individuals, and organizations engage in environmental cleanup and revitalization](#)

This special section explores one of the understudied dimensions of Great Lakes remediation, restoration, and similar environmental programs—the role of communities and organizations in the environmental cleanup process.

[Lake of the Woods—Five Years of Research \(2016–2021\)](#)

This collection highlights research outcomes on this sixth largest waterbody shared between the United States and Canada during the last five years, the syntheses of existing data, tools for adaptive management, and approaches for recovery.

[Bridging Knowledge Systems between Indigenous and non-Indigenous communities](#)

Inspired by a session at IAGLR 2021, these papers highlight recent work informed by diverse ways of knowing, understanding, and interacting with natural systems of large lakes of the world, drawing on examples of work that transcend boundaries between knowledge systems.

RECENT SPECIAL SECTIONS

48(2) April 2022

[Stressors and Successes, Lake Ontario in Intensive Year 2018](#)

Edited by Jim Watkins, Lars Rudstam, Alexander Karatayev, Warren Currie, Anne Scofield, Tom Hollenhorst

47 Supp 1 Dec 2021

[Supplement on Sea Lamprey International Symposium III \(SLIS III\)](#)

Edited by Jean Adams, Jessica Barber, Margaret Docker, Nicholas Johnson, Robert McLaughlin, Todd Steeves, Michael Wilkie

47(6) Dec 2021

[Dynamics of Sandy Beach and Dune Systems](#)

Edited by Robin Davidson-Arnott, Zoran Kilibarda, Suzanne DeVries-Zimmerman

47(3) June 2021

[Lake Winnipeg – the emerging view after 15 years of whole-lake, whole-ecosystem science](#)

Edited by Eva Enders, Ram Yerubandi, Bob Brua, Geoff Koehler, R. Michael McKay

47(2) April 2021

[Assessing Progress in the Toronto and Region Area of Concern](#)

Edited by Todd Howell, Tom Edge, Jon Midwood, Erin Dunlop, Anett Trebitz

47(1) Feb 2021

[Research and management efforts on invasive Asian carps in the Laurentian Great Lakes](#)

Edited by Patrick Kočovský, Christine Mayer, Kelly Robinson, Tim Johnson



IAGLR 2023
MAY 7–12, 2023
TORONTO

SAVE THE DATE!

66th Annual Conference on Great Lakes Research

KUDOS

Congratulations to the following IAGLR members on their accomplishments!


JEAN ADAMS (U.S. Geological Survey), IAGLR vice president, for donating her kidney to an anonymous person experiencing kidney failure. Her donation spurred a chain of donations to four people in need of a transplant.

LUCINDA JOHNSON (University of Minnesota Duluth, Natural Resources Research Institute) was appointed the U.S. co-chair of the International Joint Commission's Science Advisory Board's Science Priority Committee. Johnson has served on the IJC SAB since 2014. Johnson also was reappointed as vice chair of the U.S. EPA's Board of Scientific Counselors, which provides guidance to the EPA's Office of Research and Development. Johnson has served on the BOSC since 2019.

EVIE S. BRAHMSTEDT (Clarkson University and IAGLR Board of Directors student member) for defending their Environmental Science & Engineering doctoral thesis titled *Mercury Mobilization in Upper St. Lawrence River Wetlands*.

REBECCA ROONEY (University of Waterloo) for receiving the university's Excellence in Science Research Award for her work studying the effects of human disturbance and invasive species on wetlands.

TITUS SEILHEIMER (Wisconsin Sea Grant), whose team won gold in the podcast category from the Association of Natural Resource Extension Professionals. [Introduced](#) was created and produced by Bonnie Willison, Sydney Wydell, Tim Campbell, and Titus Seilheimer.

 Submit kudos to lakesletter@iaglr.org



Welcome to the following new IAGLR members, who joined the association between February and April 2022.

Nathaniel Arringdale	Steven McMurray
Michael Back	Raissa Mendonca
Nathan Backenstose	Tryon-Petith Miles
Jenna Bailey	Hadis Miraly
Austin Bartos	Emilie Montreuil Strub
Joseph Berg	Troy Naperala
Rebecca Bowen	Kayden Nasworthy
Dante Bresolin	Rebecca Nixon
Sarah Caltabiano	Shayenna-Rae Nolan
Paul Carlson	Oluwaseun Olubodun
Wendy Carr	Yvette Onyango
Kerry Caslow	Kimberly Panozzo
Jacob Cianci-Gaskill	Daniel Peters
Ayooluwateso Coker	Julia Petersen
Brianna Curtis	David Porter
Lauren Damphousse	Ge Pu
Suzanne DeVries-Zimmerman	Tongyao Pu
Carl Dister	Laura Reitz
Nate Dugener	Benjamin Reuss
Kristina Fite	James Riske
Hillary Glandon	Christopher Rounds
Theresa Gruninger	Alexis Sakas
Lara Hargrave	Margaret Scholle
Tyler Hintz	Heather Shepherd
William Hughes	Madeline Stanley
Kathryn Johncock	Elizabeth Stebbins
Olivia Johnson	Samantha Tank
Erik Kiledal	Julia Willsie
Kaitlen Lang	Kylie Wirebach
Andrew Luessenhop	Sean Woznicki

For more information, visit

iaglr.org/membership

NEW MEMBER SPOTLIGHT

Say hello to some of the folks who have recently joined IAGLR. They've kindly agreed to introduce themselves. Below and on the next page are their stories.

Kerry Caslow

Application Development Manager
In-Situ, Inc.

About my work

As an application development manager, I work with scientists all over the world who are leading fascinating projects that use our water quality and level sensors. I help people find the right tools for the job, assist in the development of new technologies, create informational and educational content on a variety of topics, and every once in awhile I get to go back to my roots and help with field deployments.

Favorite part of work

The best part of my job is that I get to continually learn new things. Every day is

a little bit different, so I never know what I will be presented with. However, each of those experiences tend to teach me something that I didn't know about before. It's like being in school without having to worry about a grade!

Something else about myself

I started my career as part of a storm-water monitoring program and having stepped outside of that field, I realize now that there are so many more cool water-related careers and fields of study out there. I am excited to meet other members of IAGLR who are truly making an impact on the world around us.



Jacob Cianci-Gaskill

Monitoring Program Coordinator
Old Woman Creek National Estuarine Research Reserve

About my work

I work at the Old Woman Creek National Estuarine Research Reserve in Huron, Ohio, one of two such reserves in the Great Lakes. I organize the long-term water quality monitoring program at the reserve. Much of our work is focused on measuring nutrient loads into Lake Erie's central basin and collecting the data needed to quantify the ability of the Old Woman Creek wetland to process nutrients. I just started in this position last summer and was surprised to learn that the Old Woman Creek water quality monitoring program has been in existence since 1980!

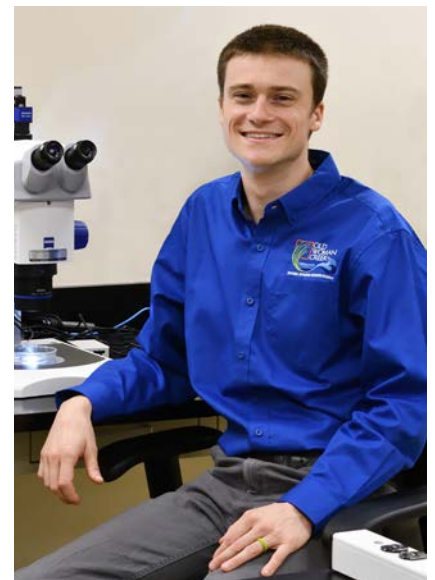
Favorite part of work

Contributing to such a long-lived monitoring program is rewarding and provides

some great opportunities to learn how nutrient loads are processed and used within the estuary. Long-term datasets are challenging to maintain, but are crucial to decision making and vital to understanding how complicated systems adapt and change over time. I really enjoy my work and believe that the work I do matters.

Something else about myself

It is great to be back in the Laurentian Great Lakes! After spending most of my life a short drive from the lakes, I spent the past four years outside of the watershed. I did not realize how much I took the lakes for granted, and I am happy to once again be close to one of the largest bodies of freshwater in the world.



NEW MEMBER SPOTLIGHT

Shayenna Nolan

MSc Student, Integrative Biology | Director of Communications
Healthy Headwaters Lab x Heath Research Group, University of Windsor

About my work

Aaniin, I am a first year MSc student studying microbes and carbon in impacted headwaters across Ontario in the Great Lakes basin. Specifically I am using eDNA metabarcoding to relate bacterial and fungal communities to dissolved organic matter pools, characterized with EEM-PARAFAC.

Favorite part of work

I love every part! As scientists there are different seasons of what we do (a favourite analogy of my supervisor)—fieldwork in spring/summer, analyses and deep work in winter and fall. I love spending time in the water and then getting to explore the

unseen (microorganisms and DOM) in the lab, trying to make sense of it all.

Something else about myself

In addition to stream ecology, I am a photographer and graphic designer, always looking for new ways to make science accessible to everyone! I also use Anishinaabe cultural principles to guide the philosophy behind my sci-comm work: including all generations in outreach and helping people build relationships with the land.



Tongyao Pu

MSc Student, Water Resources Science
Large Lakes Observatory, University of Minnesota, Duluth

About my work

My research interests center around the stratification of meromictic lakes and their redox chemistry. I use hydrodynamic models to simulate the physical properties of lakes. Additionally, I apply the hydrodynamic conditions to chemistry models to model the change in concentrations of redox species (e.g. oxygen, Fe(II) and sulfide).

Favorite part of work

My favorite part of the work is putting ideas into the computer. This opens up possibilities for me to do all sorts of things without the limitation of laboratory work.

Models also allow us to investigate different possibilities and see the big picture of science.

Something else about myself

Growing up, I resided near [Lake Tai](#). Although seemingly small, Lake Tai is one of the largest freshwater lakes in China and is of great importance to the neighboring four cities and 20 million people. However, human activities disturbed its morphology and chemistry. This was my motivation to do freshwater research. My greatest hope is to have people appreciate our freshwater resources and try our best to protect them.

All the life we cannot see

by Maureen Coleman

Dip a glass into the surface water of Lake Superior and it probably looks indistinguishable from bottled water—clear, empty, lifeless. Yet every liter of this lake water is teeming with life, including nearly a billion tiny cells and 10 billion viruses. Together these microorganisms (“microbes” for short) perform critical functions that support the rest of the ecosystem. Understanding these invisible functions, and the microbes responsible, is an urgent challenge as lakes worldwide face rapid environmental change.

The microscopic aquatic jungle holds enormous biodiversity. There are the familiar phytoplankton—single-celled algae and cyanobacteria with the superpower to turn sunlight, carbon dioxide, and water into the complex molecules that make up cells. But there are also countless species of bacteria and archaea, once lumped together as simple, primitive “prokaryotes.” We now recognize that these microbes hold far more genetic diversity than plants and animals combined. And they are not so simple: microbes are capable of breathing oxygen (like us), but also sulfate, arsenic, solid minerals, and solvents like tetrachloroethylene. Some can pull nitrogen from the air to fertilize plants and algae, while

some produce or consume potent greenhouse gases like methane and nitrous oxide. They perform all these functions as part of their everyday lives, extracting energy and nutrients from their surroundings in order to survive and reproduce.

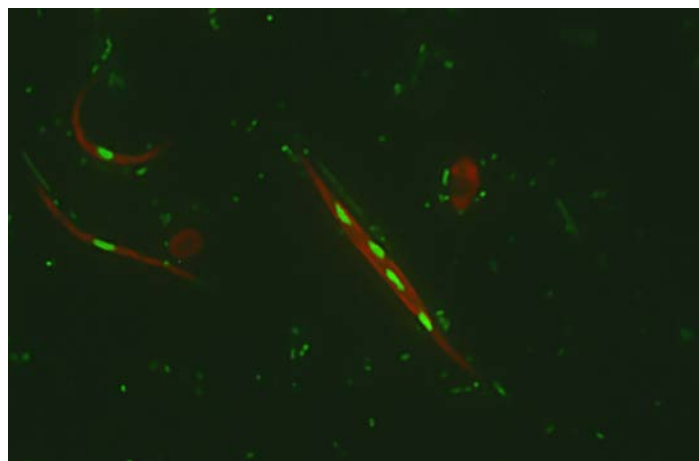
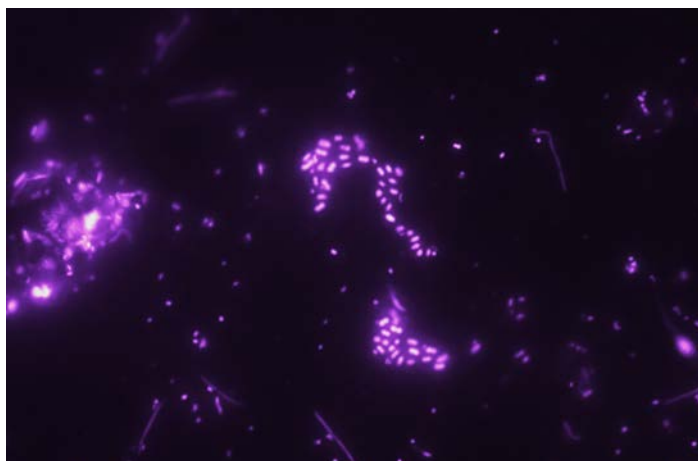
We are now beginning to “see” the biodiversity that underlies this invisible microbial food web in lakes, thanks to new technologies.

This microbial growth is balanced, over time, by death. The killers of microbes are often microbial themselves, including diverse single-celled protists and viruses. Most viruses in lakes infect bacteria and reprogram the cell into a virus factory. When the cell bursts, dozens of progeny viruses are released, along with the molecular remains of the cell. Both protistan grazing and viral lysis are essential processes in lakes, because they recycle cellular carbon, nitrogen, and phosphorus back to the dissolved phase, where it can be taken up by other microbes and thereby keep the biogeochemical wheels turning.

We are now beginning to “see” the biodiversity that underlies this invisible microbial food web in lakes, thanks to new technologies. DNA sequencing of a universal barcode gene, the 16S/18S ribosomal RNA, has revealed hundreds, even thousands of new microbial species in lakes from Baikal to Tanganyika to Superior. The exact number is anyone’s guess, since we lack a consensus definition of a bacterial species. Another sequencing approach, metagenomics, links species with their genetic potential for functions like nitrogen fixation, methane consumption, and toxin production. By applying these methods across lakes and across time, we can extract patterns in microbial species and functions, and relate them to broader ecosystem dynamics.

We are now faced with an urgent question: how is the invisible microbial biodiversity in lakes responding to climate change? With microbes, the priorities for biodiversity conservation are not necessarily particular species, but the functions performed by a healthy and resilient community. What’s crystal clear is that the microbes still have much to teach us.

Maureen Coleman is an associate professor in geophysical sciences at the University of Chicago.



The microscopic freshwater jungle. Both images use a fluorescent DNA stain to make tiny cells appear (left: DNA appears purple, right: DNA appears green). The right image also shows chlorophyll (red). The smaller circles and rods are bacteria (~1µm), and the larger cells with chlorophyll are eukaryotic phytoplankton (10-20µm). Photos by Maureen Coleman.



Lake sturgeon. Photo courtesy of Michigan Sea Grant.

GREAT LAKES WATER LIFE

A database documenting biodiversity of Great Lakes native species

by El Lower and Rochelle Sturtevant



The biodiversity of the Great Lakes makes them unique on a global scale. To document the wide variety of flora and fauna native to the basin, NOAA-GLERL, U.S. EPA, and the Great Lakes Sea Grant Network have worked together to create the [Great Lakes Water Life database](#) (GLWL), an accessible, comprehensive inventory of aquatic species found throughout the region.

GLWL is designed to support researchers and environmental managers by hosting ecological information about native species. The database itself includes lists of expected species in a specific area and records of rare or unfamiliar taxa, while other parts of the GLWL site feature identification guides for native species, summaries of broad-scale biodiversity patterns, and more. This site is also available for public use to students, citizen scientists, and other Great Lakes residents who want to learn about native species in their area, providing new opportunities for outreach and education online.

GLWL is registered with the Marine Biodiversity Observation Network as a Great Lakes-specific

biodiversity atlas. The database allows users to search for species by taxa (including both scientific and common names), origin (whether a species is native throughout the region, is native to one part of the Great Lakes and introduced in others, or nonnative), domain (whether a species lives in sediment, on the shoreline, or in the water column), and broad geographic location (such as Lake Superior or Lake St. Clair). Each species' result links to taxonomic information, a bibliography of reference and sighting information, and links into Barcode of Life DNA markers (placing eDNA into geographic context), Catalogue of Life taxonomy, and Integrated Taxonomic Information System reports for each organism. The database also includes links to other taxonomic keys and field guides to native species, information about the purpose and history of this project, and a user contribution portal where researchers can share new photos, sightings, and collection records to be added to the site.

This database expands upon a project formerly known as the "Great Lakes Waterlife Gallery" originally created

Species	Common Name(s)	S	M	H	E	O	StMR	HEC	NR	AT	B	Lm	Lt	TW	More...	
	lake sturgeon	X	X	X	X	X		X				X	X	X	X	Info
<i>Acipenser fulvescens</i>																
	bowfin, beaverfish, blackfish, bonnetmouth, cottonfish, cypress trout, freshwater dogfish, grindle or grinnel, john a. grindle, lawyer, marshfish, scaled ling, speckled cat, western mudfish	X	X	X	X	X		X					X	X		Info
<i>Amia calva</i>																
	american eel, common eel, freshwater eel, silver eel	X	X	X	X	X						X		X		Info
<i>Anguilla rostrata</i>																
	brook silverside	X	X	X	X	X		X					X	X		Info

Sample search results from the Great Lakes Water Life database showing the species name and image, common name(s), and the lakes, rivers, or environmental domains where the species has been observed. Courtesy of Michigan Sea Grant.

in 2002 in support of Sea Grant’s Great Lakes Fisheries Leadership Institute in partnership with NOAA-GLERL and the Great Lakes Sea Grant Network. The original site was a static photo gallery with access to regionally specific taxonomic lists and keys, as well as links to regional resources for the various taxa. Additional components were added by the partners over the years in support of a variety of projects, and eventually included fish, benthic invertebrates, zooplankton and algae. With funding from the Great Lakes Restoration Initiative, staff of the EPA Office of Research and Development Mid-Continent Ecology Division (since renamed the Great Lakes Toxicology and Ecology Division) used the original gallery as one resource for the creation of a more comprehensive reference inventory of aquatic fauna (Trebitz et al 2019). The historic gallery has since been merged with data from the inventory to create a new Great Lakes Water Life database, programmed with support from the Cooperative Institute for Great Lakes Research, which offers many more interactive features in an easily accessible format. GLWL has recently received an additional \$200,000 in GLRI funding to add vascular aquatic plants. Development and validation of this new component will be led by Michigan Natural Features Inventory staff.

The Great Lakes Water Life partnership welcomes review and contributions from Great Lakes scientists and managers to provide the most accurate and up-to-date ecological information.

Another NOAA-led regional database, the [Great Lakes Nonindigenous Species Information System](#) (GLANSIS), runs in parallel with GLWL to more comprehensively document the non-native aquatic species that have been introduced to the Great Lakes. Cross-linking the two systems helps GLANSIS to provide DNA information on non-native species and identify species that may be expanding their ranges, highlighting the value of the native species inventory to monitoring for and understanding the impact of aquatic invaders.

The Great Lakes Water Life partnership welcomes review and contributions from Great Lakes scientists and managers to provide the most accurate and up-to-date ecological information. In particular, the GLWL team is requesting distribution information, updated taxonomy and alerts about any potential species misidentification, and clear, high-resolution photos to aid in species identification guides; in short, we’d love to hear from you.

To learn more about the Great Lakes Water Life database or contribute information, please visit the site or contact Rochelle Sturtevant at Rochelle.Sturtevant@noaa.gov.

EI Lower is a GLANSIS research associate, and Rochelle Sturtevant is GLANSIS program manager with Michigan Sea Grant.

Fish diversity and fisheries of Omo-Turkana Basin in the face of hydrological modifications

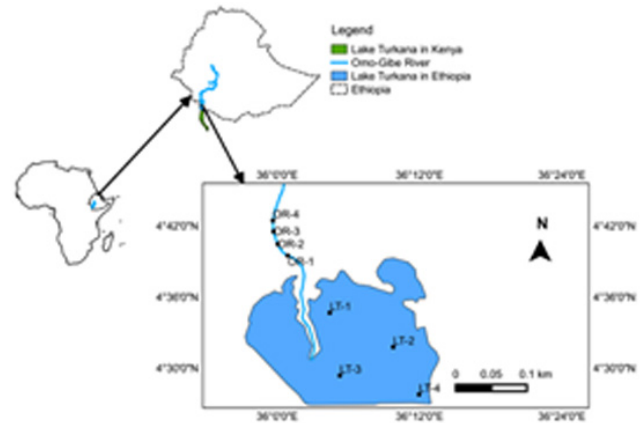
The basin of the Omo River and Lake Turkana spans a large portion of southwestern Ethiopian highlands and northern Kenya. It is presumed to be rich in its fish diversity that supports considerable fisheries. However, despite the widespread development activities with potential hydrological modifications and impacts on the ichthyofauna, the Ethiopian part of the basin generally lacks comprehensive scientific documentation on its fish diversity and fisheries.

To address these gaps, fish were sampled from lower Omo River and Lake Turkana in Ethiopia. Structured questionnaires, focus group discussions, key informant interviews, and personal observations were used to gather data on the fisheries socio-economics and management problems.

The study recorded 79 valid native species for the entire basin and 69 for the part of the basin within the Ethiopian jurisdiction. The Omo River system was found to be richer in species, while Lake Turkana has a higher abundance.

This fertile fishing ground provides a key alternative livelihood for the riparian community (particularly, the Daasanach in Ethiopia), which has much fewer livelihood options apart from pastoralism. However, effective development of fisheries is marred by lack of material and technical support to the fishers, lack of government commitment to capacitate relevant institutions, illegal fishing, and lack of security due to conflicts arising between the Ethiopian and Kenyan fishers in an apparent competition over a fertile fishing ground.

A solution to the development of fisheries therefore requires an approach that integrates conflict resolution and co-manage-



Sampling sites on the lower Omo River (OR1–OR4) and the Ethiopian part of Lake Turkana (LT1–LT4); the reference datum used for geographic coordinates is WGS84.

ment arrangement by the two countries. Moreover, it is highly imperative to capacitate and sustain the scientific roles of the Lake Turkana Advisory Group, a team of professionals from various institutions in Ethiopia and Kenya established in 2019 and supported by the African Center for Aquatic Research and Education. Its goal is to pursue a collaborative, holistic, and integrated approach to a more comprehensive assessment of the basin biodiversity and its management to guide the nations' policy development and actions.

By [Mulugeta Wakjira](#), Jimma University, and [Abebe Getahun](#), Addis Ababa University, Ethiopia. Detailed findings are published in [Check List](#) and [Ecohydrology & Hydrobiology](#).

In the benthos: Bottom-up biodiversity in the Great Lakes

Every great lake has thousands of contributing streams and rivers, and each stream is inextricably connected to the land around it. Throughout these connected systems is the benthos, a rich ecological community that includes macroinvertebrates that play an important role in ecosystem functions through interactions with the environment. Aquatic invertebrates have different levels of tolerance to water quality, a characteristic that offers a useful tool in biomonitoring assessment and restoration. Diversity measures provide an indication of ecological condition and are useful in understanding the effects of anthropogenic stressors on stream environments.

My research explored the best methodology to sample macroinvertebrate diversity in 19 headwater streams in southwestern Ontario. I hypothesized that a petite ponar grab would sample a better representation of the macroinvertebrate community composition instead of a D-framed sweep net due to stream char-

acteristics resembling a wetland. However, I found that taxa richness was greatest using the D-framed sweep net and results better reflected the biodiversity of the stream.

Although the D-framed sweep net provided a greater diversity, the water quality at the sites ranged from poor to very poor as indicated by the Hilsenhoff Biotic Index. These degraded scores were due to the presence of tolerant taxa. Typically, a stream with good water quality would have greater macroinvertebrate diversity; however, as these results indicate, macroinvertebrate tolerance plays a large role in ecological condition as well.

In the [Healthy Headwaters Lab](#) founded by Dr. Catherine Febria, longer-term local insights into benthic communities



Sampling macroinvertebrates in Silver Creek, Ontario. Photo by Shayenna Nolan.

are laying the groundwork for new theory to be tested on how restoration strategies can be designed to address negative or unhealthy attributes of resistance and resilience in streams and rivers ([Barrett et al. 2021](#)). In continuing to explore macroinvertebrate biodiversity, greater insights can be gained into the assessment, condition, and restoration in systems.

By [Alyssa Frazao](#), Healthy Headwaters Lab, University of Windsor.

The Global Biodiversity Framework

The United Nations General Assembly and member states have undertaken transformative action toward the 2050 Vision for Biodiversity, *Living in Harmony with Nature*. The UN Convention on Biological Diversity (CBD) post-2020 Global Biodiversity Framework (WG2020) envisages a world where “by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people.”

The WG2020 will be concluded in Kunming, China later in 2022. The [first draft of WG2020](#) is available online for review. Intersessional working groups met in Geneva in March. Joint closing statements offer a concise foundation for further research (see [CBD Geneva YouTube channel](#)). Groups will resume negotiations in Nairobi in June.

Of the major biomes, freshwaters are in steepest decline (see [CBD Global Biodiversity Outlook-5](#)). The grand challenge

is to guide implementation of the four 2050 WG2020 goals, 2030 milestones, 21 targets, and related indicators when freshwater sustainability remains subsumed under the overarching “land and sea areas” proxy heading. Given the global magnitude of the freshwater biodiversity crisis, proponents recommend adding a “third realm” freshwater category ([Expert Input to the Post-2020 Global Biodiversity Framework, Van Rees et al. 2021](#)).

The availability of clean water indicates good governance ([Organisation for Economic Co-operation and Development–Water](#)). Key factors include multilateral accord and bilateral agreement architecture, responsibility and accountability of agencies and actors, and framing enabling environments to support allocation and access at regional and basin levels. Tasks include scoping dynamic interactions at discrete spatial and temporal dimensions and integrating scientific knowledge of ecosystem drivers into decision making.

The world is watching as the CBD Secretariat addresses matters of Indigenous,

international, interjurisdictional, and intergenerational concern. Stay tuned.

~ By Catherine Masson, Trent University

Freshwater Research News

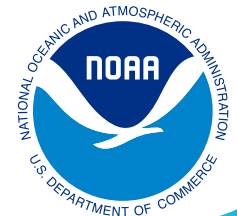
Freshwater Research News (FRN) is a free newsletter covering all aspects of freshwater research. Compiled by Kev Warburton at Charles Sturt University in Australia, it highlights the broad significance and applicability of recent findings from around the world.

FRN is produced for scientists, practitioners, educators, and conservationists. It’s a convenient way for specialists to stay abreast of developments in freshwater areas outside, as well as within, their own field, and its jargon-free style makes it ideal for community consumption.

FRN is issued in PDF form four times per year. To receive the newsletter, email Kev Warburton at KWarburton@csu.edu.au. You can [view a sample issue](#).

The graphic features a blue background with white contour lines. On the left, a dashed white circle contains the text "NOAA provides products & services in 5 key areas". To the right of this circle, five circular images are arranged vertically, each with a corresponding text label: "Weather" (with a lightning bolt), "Coasts" (with a person on a beach), "Research" (with a person in a boat), "Habitat" (with a person in a field), and "Climate" (with a globe). A north arrow is positioned above the "Weather" image. On the right side of the graphic, there is contact information for NOAA products and services, the NOAA logo, and a mission statement: "Connecting people with the Great Lakes and achieving our mission of science, service, and stewardship." Below the mission statement is the website URL: www.noaa.gov/regional-collaboration-network/regions-great-lakes.

To learn more about NOAA's products and services contact: Great.Lakes@NOAA.gov



Connecting people with the Great Lakes and achieving our mission of science, service, and stewardship.

www.noaa.gov/regional-collaboration-network/regions-great-lakes

New Society of Canadian Aquatic Sciences forms

We are excited to announce the formation of the Society of Canadian Aquatic Sciences (SCAS/SCSA) and welcome you to join us! SCAS/SCSA has been created jointly by the Canadian Conference on Fisheries Research and the Society of Canadian Limnologists. Our vision is to be the leading scientific society for the excellence, integration, and dissemination of expert knowledge in fisheries, limnology, and aquatic sciences. Our mission is to offer an impartial, diverse, and inclusive forum to share, integrate, and advance knowledge of fisheries, limnology, and aquatic sciences in Canada.

We look forward to having SCAS play a vital role in Canada's diverse aquatic science community by presenting and advancing holistic and impactful research. SCAS activities and opportunities include the following:



- Quarterly newsletter, jobs board, seminars, and workshops;
- Opportunities for open dialogues with public and private Canadian organizations to improve the understanding of aquatic ecosystems and their importance for all Canadians;

- Build on the 74 years of conferences where students and working professionals present research results and network through seminars, panel discussions, and get-togethers;
- Continue our focus on students and recent graduates and early career researchers through the Clemens-Rigler Travel Fund and Early Career Awards;
- And more to come!

We are keen to forge alliances with organizations such as IAGLR to work collaboratively to address pressing issues facing aquatic resources and help to train the next generation of aquatic professionals. Stay tuned for more information, and in the meantime, [consider joining SCAS](#).

~ By Kerri Finlay, SCAS president, University of Regina

HABs Research Mapper ready for beta testing

Since 2015, the [Great Lakes HABs Collaborative](#) has sought to improve communication between scientists and decision makers on harmful algal bloom issues. To support this work, members of the HABs Collaborative Steering Committee have worked with the Great Lakes Commission's GIS team to develop the HABs Research Mapper. This app will help the Great Lakes research community share information and increase collaboration, as well as direct the water management community to research projects of interest around the Great Lakes basin. Please consider adding your research project to the Mapper and share your thoughts if you see opportunities to improve this app! Visit www.glc.org/work/habs to learn more.





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Lakes Letter is published quarterly by the International Association for Great Lakes Research, a scientific organization made up of researchers studying the Laurentian Great Lakes, other large lakes of the world, and their watersheds, as well as those with an interest in such research.

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Share your knowledge in *Lakes Letter*

We're looking for feature articles and research briefs for upcoming issues on the following themes:

THEME	COPY DUE	ISSUE
Nearshore/coastal	July 29	August '22
Long-term research	October 28	November '22
Big collaborations	January 27	February '23

Research briefs are about 250 words plus an illustration. They highlight the findings of a specific project or initiative. Features can range in length (300–550 words) and should include several photo options. Drop us a line at lakesletter@iaglr.org if you're interested in pitching a story. We'd love to hear from you! In addition, we welcome brief *Member Kudos* to celebrate current members' good news as well as items for the *Community News* section.

iaglr.org/lakesletter

Registration now open!

Ecosystem Approach Conference
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conferences.aehms.org/ecosystem-approach/

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