

PROGRAM

64th Annual Conference on Great Lakes Research



Bridging: Knowledges • Seven Generations • Land to Lake

#IAGLR21

Convened by the
International Association for Great Lakes Research
with support from
Michigan Technological University

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International Association for Great Lakes Research
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iaqlr.org

Conference logo by Jenifer Thomas



CONTENTS

- 2 Sponsors & Exhibitors
- 3 Conference Organizers
- 4 IAGLR Board & Committees
- 5 Awards & Scholarships
- 6 Schedule Overview
- 8 Plenary Speakers
- 9 Workshops & Discussions
- 10 Oral Presentations by Session
- 21 Poster Presentations

IAGLR 2021 Acknowledgment

IAGLR 2021 planners acknowledge that Nayaano-nibiimaang Gichigamiin (the Great Lakes) bioregion is the ancestral, traditional, and contemporary lands and waters of numerous Indigenous nations. We acknowledge Indigenous peoples as the region's original caretakers and knowledge keepers, and recognize their contributions to the stewardship and governance of the world's largest system of freshwater. We extend our gratitude to members and staff of the Keweenaw Bay Indian Community, Chippewa Ottawa Resource Authority, Great Lakes Indian Fish and Wildlife Commission, and the 1854 Treaty Authority for their commitment to the planning and organization of the 2021 conference. Such partnerships are critical to bridging diverse knowledges, seven generations care, and sustaining land-to-lake relations in Nayaano-nibiimaang Gichigamiin. Finally, we remember that the teachings and practices we carry today were built and shared by many who came before us, including our human ancestors and many relatives with fins, wings, legs, and roots.

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Thank you to those serving anonymously to judge student presentations at the conference.

IAGLR BOARD & COMMITTEES

Thank you to all who have served the IAGLR Board of Directors and our committees this year. These individuals help keep our organization strong, and we couldn't do it without their help. If you'd like to get involved, please contact Wendy Foster, IAGLR Business Manager, at wendy@iaglr.org.

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AWARDS & SCHOLARSHIPS

Congratulations to all recipients!



Lifetime Achievement Award
HENRY ("HANK") VANDERPLOEG, NOAA Great Lakes Environmental Research Laboratory. For important and continued contributions to the field of Great Lakes research over a period of 20 years or more.



Elsevier Early Career Scientist Award
JORDAN MATLEY, Great Lakes Institute of Environmental Research, University of Windsor. For 2020 most notable paper in the *Journal of Great Lakes Research*, titled "[Seasonal habitat-use differences among Lake Erie's walleye stocks.](#)"



John R. (Jack) Vallentyne Award
MARGARET LANSING, NOAA Great Lakes Environmental Research Laboratory. For important and sustained efforts to inform and educate the public and policymakers on large lake issues.



Elsevier Student Author Award
RYAN GROW, University of Minnesota, Duluth. For 2020 most notable paper in the *Journal of Great Lakes Research*, titled "[Spatial and vertical bias in down-looking ship-based acoustic estimates of fish density in Lake Superior: Lessons learned from multi-directional acoustics.](#)"



Anderson-Everett Award
PAULA MCINTYRE, International Association for Great Lakes Research (contractor)/Loracs Design LLC. For outstanding contributions to the International Association for Great Lakes Research.



IAGLR Scholarship
MATT THORSTENSEN, University of Manitoba. For research titled "Genomics, movement, and ecology of the Lake Winnipeg walleye."



Best Associate Editor 2020 Award
ERIN DUNLOP, Ontario Ministry of Natural Resources and Forestry. For outstanding support of the review process for the *Journal of Great Lakes Research*.



Norman S. Baldwin Fishery Science Scholarship
ZOE ALMEIDA, Ohio State University. For research titled "Do early-life conditions set lifetime trajectories in fish? Evaluating how experiential legacies influence individual and population responses to changing environments."



Best Reviewer 2020 Award
MICHAEL RENNIE, Lakehead University. For outstanding support of the review process for the *Journal of Great Lakes Research*.



Norman S. Baldwin Fishery Science Scholarship
GRACEANNE TARSA, University of Wisconsin. For research titled "Round goby, *Neogobius melanostomus*, abundance and productivity in the rocky nearshore zone of Lake Michigan."

Chandler-Misener Award–2020
LAUREN OLDFIELD, SABINA RAKHIMBEKOVA, JAMES W. ROY, and CLARE E. ROBINSON. For 2020 most notable paper in the *Journal of Great Lakes Research*, titled "[Estimation of phosphorus loads from septic systems to tributaries in the Canadian Lake Erie Basin.](#)"

Chandler-Misener Award–2019
TED R. ANGRADI, KATHLEEN C. WILLIAMS, JOEL C. HOFFMAN, and DAVID W. BOLGRIEN. For 2019 most notable paper in the *Journal of Great Lakes Research*, titled "[Goals, beneficiaries, and indicators of waterfront revitalization in Great Lakes Areas of Concern and coastal communities.](#)"



David M. Dolan Scholarship
STEPHANIE FIGARY, Cornell University. For research titled "Zooplankton as indicators: Understanding the Great Lakes through decades of zooplankton monitoring."

SCHEDULE OVERVIEW

MONDAY

Workshops

Automatic/explainable machine learning with H2O.ai in R for Great Lakes research

Broadening the impact of your work: designing a route to intentional engagement

Best practices for monitoring ecosystem & invasive species using modern genomics

The \$500 Observing System: How to purchase, configure, and view real-time data with IoT sensors

TUESDAY

9–9:30 a.m.

Acknowledgements, Welcome & Logistics

Acknowledgement: Noel Urban, IAGLR21 Conference Chair, Michigan Technological University

Welcome: Warren (Chris) Swartz, President, Keweenaw Bay Indian Community

Welcome Song: The Woodland Singers

Welcome: Ed Verhamme, IAGLR President, International Association for Great Lakes Research

Welcome: Richard Koubek, President, Michigan Technological University

Logistics: Noel Urban

9:30 a.m.–Noon

Concurrent Sessions

Bridging knowledge systems between indigenous and nonindigenous communities

Great Lakes HABs: Bridging ecology, human dimensions, and management

Spread the word, engage the world |

9:30 Chair: Sandra Svoboda

Using multidisciplinary techniques to understand contaminants in the Great Lakes

Spatial considerations to Great Lakes fisheries management

Bridging the divide between Great Lakes research and youth engagement

Great Lakes coastal storms, water levels, and shoreline impacts

Improved prediction via model coupling, data assimilation, and machine learning

My lake, their lake, our lakes: Perspectives from lakes Michigan to Malawi

Noon–1 p.m.

Lunch Break/Exhibits

1–2 p.m.

Plenary: Henry Lickers

2:15–3:45 p.m.

Concurrent Sessions

Bridging knowledge systems between indigenous and nonindigenous communities cont'd

Great Lakes HABs: Bridging ecology, human dimensions, and management cont'd

Using multidisciplinary techniques to understand contaminants in the Great Lakes cont'd

Spatial considerations to Great Lakes fisheries management cont'd

Physical processes in lakes

Great Lakes coastal storms, water levels, and shoreline impacts cont'd

Improved prediction via model coupling, data assimilation, and machine learning cont'd

Operationalizing an early warning system for the Great Lakes)

3:45–4:45 p.m.

Poster Session

WEDNESDAY

9–9:15 a.m.

Announcements

9:15 a.m.–Noon

Concurrent Sessions

Bridging knowledge systems between indigenous and nonindigenous communities cont'd

Great Lakes HABs: Bridging ecology, human dimensions, and management cont'd

Data-driven innovation: Monitoring, networking, and analytics for Great Lakes

Spatial considerations to Great Lakes fisheries management cont'd

Bridging connections: Rewiring of Great Lakes food webs under ecological change

Global to local: Canada's post-2020 freshwater biodiversity goals and targets

Great Lakes coastal storms, water levels, and shoreline impacts cont'd

Role of ag BMPs on the export of nutrients and contaminants into waterways

Integrated modelling and valuation of ecosystem services in the Great Lakes

My lake, their lake, our lakes: Perspectives from lakes Michigan to Malawi cont'd

Noon–1:15 p.m.

Business Lunch

1:30–2:30 p.m.

Plenary: Karen Diver

SCHEDULE OVERVIEW

2:45–4:15 p.m.

Concurrent Sessions

Bridging knowledge systems between indigenous and nonindigenous communities cont'd

Great Lakes HABs: Bridging ecology, human dimensions, and management cont'd

Data-driven innovation: Monitoring, networking, and analytics for Great Lakes cont'd

Bridging connections: Rewiring of Great Lakes food webs under ecological change cont'd

Global to local: Canada's post-2020 freshwater biodiversity goals and targets cont'd

Role of ag BMPs on the export of nutrients and contaminants into waterways cont'd

Analysis of cumulative impacts on the environment

Invasive species

THURSDAY

9–9:15 a.m.

Announcements

9:15 a.m.–Noon

Concurrent Sessions

Bridging knowledge systems between indigenous and nonindigenous communities cont'd

Marine debris and microplastic in the Great Lakes: Sources, impacts, and solutions

Data-driven innovation: Monitoring, networking, and analytics for Great Lakes cont'd

Bridging connections: Rewiring of Great Lakes food webs under ecological change cont'd

Fish growth, health and ecology

Linking quality systems with adaptive management for ecological restoration

Role of ag BMPs on the export of nutrients and contaminants into waterways cont'd

Exploring the role of groundwater in the Great Lakes basin -- the invisible bridge

Running out of oxygen: Dynamics and impacts of hypoxia in large lakes

Invasive species cont'd

Noon–1 p.m.

Lunch Break/Exhibits

1–1:30 p.m.

Awards

1:30–2:30 p.m.

Plenary: Sherri Mason

2:45–4:15 p.m.

Concurrent Sessions

Coastal remote sensing

Marine debris and microplastic in the Great Lakes: Sources, impacts, and solutions cont'd

Improved measuring of Great Lakes-St. Lawrence River basin water quantity

Fish growth, health and ecology cont'd

Justice, Equity, Diversity, and Inclusion (JEDI) in the IAGLR community

Running out of oxygen: Dynamics and impacts of hypoxia in large lakes cont'd

Invasive species cont'd

FRIDAY

9–9:15 a.m.

Announcements

9:15–9:30 a.m.

Welcome

IAGLR Board Introductions: Andrew Bramburger, IAGLR President

9:30–11:45 a.m.

Concurrent Sessions

Coastal remote sensing cont'd

The UN Decade on Restoration: Advancing restoration with community partnerships

Great Lakes observing: Advances, best practices, challenges

Biogeochemistry, bacteria, benthos and lower trophic level ecology

Decision support tools: A bridge from environmental monitoring to knowledge

Linking science and restoration in the Great Lakes connection channels

Bridging knowledge on detection methods to manage Great Lakes invasive species

Invasive species cont'd

PLENARY SPEAKERS

TUESDAY PLENARY

1–2 p.m.

Translators needed to bridge gap between Science and Traditional Knowledge Systems



HENRY LICKERS is a member of Seneca Nation, Turtle Clan. He has been married for over 50 years and has three grown children and two granddaughters. He was the director of the Mohawk Council of Akwesasne, Department of the Environment for 34 years and senior environmental science officer for six. At present, he is the first Indigenous Canadian Commissioner on the International Joint Commission. During his career, he served as principal investigator on the EAGLE (Effects on Aboriginals in the Great Lakes Environment) Project and the Naturalized Knowledge Systems Project, both of which investigated First Nations environmental issues.

WEDNESDAY PLENARY

1:30–2:30 p.m.

Taking Care of Our Relatives: Indigenizing Science and the Value in Supporting Tribal Sovereignty



KAREN DIVER is the director of business development for Native American Advancement Initiatives at the University of Arizona. Previous positions include Faculty fellow for Inclusive Excellence at the College of St. Scholastica, special assistant to the President (Obama) for Native American Affairs at the White House, and chairwoman of the Fond du Lac Band of Lake Superior Chippewa. She has a bachelor's degree in economics from the University of Minnesota Duluth and a Master of Public Administration from the Kennedy School of Government at Harvard University.

THURSDAY PLENARY

1:30–2:30 p.m.

Bridging Knowledge Gaps in Plastic Pollution: From Land to Lake (to Ocean)



SHERRI (“SAM”) A. MASON is a professor of chemistry and sustainability coordinator at Penn State Behrend located in Erie, PA. She was a faculty member at the State University of New York Fredonia from 2001 to 2018 where she was also chair of the Department of Geology and Environmental Sciences from 2016 to 2018. Dr. Mason has a B.S. in Chemistry from the University of Texas at Austin and a Ph.D. in Physical Chemistry from the University of Montana as a NASA Earth System Science scholar. Dr. Mason's research was among the first to study the prevalence and impact of plastic pollution within freshwater ecosystems, most notably the Laurentian Great Lakes. Her research formed the basis for the Microbeads-Free Water Act, which was signed into law by President Obama in December 2015. She has also been awarded EPA Environmental Champion in 2016, Excellence in Environmental Research by the Earth Month Network in 2017, and the Heinz Award in Public Policy in 2018.

WORKSHOPS—MONDAY

Automatic/explainable machine learning with H2O.ai in R for Great Lakes research

Great Lakes water quality research recently underwent a data shift. Previously, data were limited to expensive time intensive sample collection in the field. Today, automated in-situ data technologies are increasing the spatial scale, frequency, and amount of data available for analysis. As ecologist we must now begin to adopt tools of data scientists in order to bring these new large datasets to bear on hypothesis testing. In response, we are running a 1-hour workshop on the use of machine learning techniques applicable to Great Lakes water quality research. The co-chairs represent a researcher who uses machine learning techniques in R and a data scientist from a leading machine learning software developer. The workshop will have three sections (1) introduction to Great Lake issues necessitating the use of machine learning and an introduction to H2O.ai software, (2) a case study of multivariate non-linear analysis using Quagga and Zebra mussel data from Lake Huron, and (3) a review of how the machine learning output can be interpreted in the context of Great Lakes research. The workshop will be a combination of PowerPoint presentation and live-example R code, both the code and data used in the workshop will be publicly available. This workshop will be entirely presented on-line and we anticipate participants questions following the presentation. Data is driving research making this workshop broadly attractive to graduate students, academic principal investigators, regulators, and private industries whom are all awash in data. *Organized by Timothy J Maguire.*

Broadening the impact of your work: designing a route to intentional engagement

Applied scientists must factor in end users of their research and the needs of communities that research affects or serves, whether it's the requirement of a funding program, a mechanism for informing project development, or a step in the operationalization of research outputs. It can be difficult to know where to start, given the many terms used to describe involving people or partners in research, management, or decision-making. In this workshop, you will learn solid definitions for each of these terms, explore when and why engagement makes sense in your research program, glean best practices from case studies of selected approaches, and reflect on how you might broaden your initiatives using some of these methods

for clearer science, better engagement, and greater inclusivity. *Organized by Martha Gerig.*

Best practices for monitoring ecosystem & invasive species using modern genomics

Modern genomics tools development is rapidly increasing as the cost of the genetic tools are drastically decreasing day by day. Species specific biomarkers developed based on the genomic tools can produce results instantly and economically. These biomarkers can be used to detect and quantify using quantitative PCR (qPCR) for a wide range of species including but not limited to invasive species, native species, and endangered species, pathogens, harmful algal blooms. Environmental DNA (eDNA) sample collection and preservation is one of the key parameters for successful application of these genomic tools. We will focus on the 1) what precautions to take during the eDNA sample collection and preservations, 2) how to use the inventory of species specific biomarker database, 3) selection criteria for biomarkers, and 4) application of high throughput quantitative PCR for detection and quantifying over 50 species from an individual eDNA sample simultaneously. *Organized by Subba Rao Chaganti.*

The \$500 Observing System: How to purchase, configure, and view real-time data with IoT sensors

This workshop will guide participants through steps required to purchase, configure, and view real-time data from several cheap environmental monitoring sensors. There are hundreds to thousands of sensors available that scientists could be using right now to jump start their monitoring program or to integrate in to environmental science classroom activities. Participants will be able to see exactly the steps to take from unboxing all the way to viewing data online and setting up an online alert. Users will be able to create a free cloud account to join along as the demonstration is conducted and watch data flow from sensor to a LoRaWAN (long range wide area network) gateway and to several cloud servers. *Organized by Ed Verhamme and Jeff Pu.*

ORAL PRESENTATIONS BY SESSION

01. Role of ag BMPs on the export of nutrients and contaminants into waterways

Chair: Angélica Vázquez-Ortega

M.G. Bezold

Sediment microbial nitrogen dynamics in an agricultural settling pond

Y.B. Dibike

Impacts of Beneficial Management Practices on Nutrient Loading in a North American Prairie Watershed

A.M. DiCarlo

The influence of microbial community on sediment equilibrium phosphorus concentration (EPC0)

M.M. Mader

Water quality and land cover in Lake Michigan drowned river mouths

W. Midden

A dewatering process that reduces nutrient loss from agricultural fields fertilized with CAFO manure

W. Midden

Alginate-iron hydrogels used in manure treatment fertilize crop growth

T. Patel

Assessing methods-based differences in sediment phosphorus adsorption capacity (EPCo)

D.R. Pearsall

Improving wetlands, soil health and water quality through invasive plant harvest and biomass use

P.C. Peterson

WITHDRAWN: Hierarchical Bayesian model for regionalized agricultural

conservation practice effectiveness

J. Simoes

Targeting watershed BMPs with PTMApp on the Eastern Prairies

S.L. Speir

Winter cover crops reduce nutrient losses from fields to waterways in two agricultural watersheds

D.W. Ure

Multimetal Hydrogel Composites for the Removal of Inorganic Phosphate from Tile Drainage

A. Vázquez-Ortega

Role of Fe- and Mn-(oxy) hydroxides on Carbon and Nutrient Dynamics in Agricultural Soils

L.A. Weller

Characterizing carbon complexity across the land-water interface in agricultural landscapes

B. Young

Water quality responses to agricultural BMP implementation in the Silver Creek conservation study

02. Great Lakes coastal storms, water levels, and shoreline impacts

Chairs: John Lenters, Guy Meadows, Ethan Theuerkauf, Pengfei Xue

D. Apps

Comparison of Events that Led to the 1980s and Recent High-Water Periods and the Impacts to Shoreline Communities

G. Depper

Identifying community and household vulnerability to

storm impacts and climate stressors

J. Ferguson

Factors contributing to recent extreme water levels and challenges from a water management perspective

L.M. Fry

Implications of surface observation network on historical estimates of net basin supply

A.M. Harrison

Using long-term monitoring data to evaluate impacts of Great Lakes water levels on coastal wetlands

Y. Hong

Towards improved coastal flood modeling for the Great Lakes

M.B. Kayastha

Projections of Great Lakes' water level based on a 3D regional climate modeling system

J. Kessler

Simulating coastal flooding in Lake Michigan with a land-lake coupled framework

C. Lenard

Characterizing the 2020 wave climate of Lake Superior with a new network of Spotter buoys

J.D. Lenters

Waves and circulation on Lake Superior during an intense autumn gale: The Halloween storm of 2020

B.M. Llew-Williams

Hydrological effects of Early Holocene drought on the Upper Great Lakes

B.M. Lofgren

Ice Cover's Influence on Lake Evaporation Over

Annual and Multi-Annual Periods

M.E. Miller

Mapping the bridge between land and lake by modeling wetland hydrological connectivity

S.A. Nummer

Spatial and Temporal Trends in Great Lakes Ice Cover Duration in Response to Climate Change

F. Seglenieks

Future water levels on the Great Lakes basin based on climate change and stochastic analysis

J.P. Selegean

Quantifying coastal resilience on Lake Michigan with a nearshore geomorphic vulnerability index

E. Theuerkauf

Nearshore response to coastal Great Lakes storms: insight from recent studies using drones and ROVs

C.A. Volpano

Hydrodynamic modelling of storm impacts on a sandy beach: Point Beach State Forest, Lake Michigan

P. Xue

Modeling the coastal flooding: a study case in Ludington, Michigan

Z. Yang

Convection Systems and Summer Storms over the Great Lakes Region

03. Exploring the role of groundwater in the Great Lakes basin—the invisible bridge

Chairs: Howard Reeves, Martha Nielsen

ORAL PRESENTATIONS BY SESSION

T.K. Cowdery
Hydrologic change in the St. Louis River Basin from mining in northeastern Minnesota

Z. Curtis
Adaptive Data-enabled Groundwater Management Platform for the Great Lakes Region

D. Wiitala
Groundwater levels and stream baseflow in Marquette County, Michigan during changing climate

S. Xu
Modeling Direct Groundwater Discharge into the Laurentian Great Lakes

04. Linking science and restoration in the Great Lakes connection channels

Chairs: Erin Redding, Rebecca Johnson

A. Hannes
Beneficial use of dredge material restores wetland habitat in the upper Niagara River

J.H. Hartig
Checkpoint: Assessing Ecosystem Health of the Detroit River and Western Lake Erie

A. Molina-Moctezuma
Restoring connectivity in a Great Lakes connecting channel: challenges and lessons learned

W. Paterson
RestoreCorps: Long-Term Shoreline Habitat Volunteer Stewardship Program

E. Redding
Supporting the Buffalo-Niagara Common Tern Breeding Population

D.J. Spiering
Lessons learned from the East River Marsh restoration in the Niagara River, Grand Island, NY

E. Tyner
Establishing a National Estuarine Research Reserve for the Lake Michigan-Huron Biogeographic Region

05. Invasive species

Chair: Rochelle Sturtevant

J. Barker
Golden mussel overwinter survival at northern invasion front implies high latitude distribution

A. Bartos
Estimating habitat occupation and preference of Great Lakes invasive fish using GLAHF and GLANSIS

H.A. Bootsma
Life without mussels: Benthic community response to a mussel removal experiment

P.A. Bzonek
Acoustic deterrent to stop invasive cyprinid: phylogenetic signal found in a fish-community response

B.C. Cahill
Development and Application of an Adaptive Management Framework for European Frog-bit Management

A. Camilleri
Dreissenid mussel distributions in Western Lake Erie in 2018 and 2019: Implications for Hexagenia

L. Chadderton
Rusty Crayfish on native fish spawning reefs. Can fall suppression reduce overwinter egg predation?

J.K. Connolly
Lake Ontario Meiobenthic Harpacticoid Copepod Community Impacted by Nonindigenous Species

A.K. Elgin
Lake Erie quagga mussel growth estimates and evidence of barriers to local population growth

A. Gouveia
A simple Bayesian method to estimate abundance of rare species: using grass carp as a case study.

S.E. Hansen
Aggregated occurrence data informs management of invasive European frog-bit

F. Holm
WITHDRAWN: Assessing the Complex Governance of Aquatic Invasive Species in the Great Lakes

A. Huff
Environmental variability and nutrient cycling by deep-water quagga mussels in the upper Great Lakes

S. Jaffe
Predicting the presence of grass carp eggs based on tributary flow and temperature

D. Jensen
Reporting Underreported Aquatic Invasive Species Sightings in Northeast Minnesota

K.L. Kapuscinski
Ecological responses to hand removal of European frog-bit

S. Katsev
Quagga mussels now control the phosphorus cycle in the Great Lakes

J.T. Kvistad
WITHDRAWN: Ecology and life history of the invasive rusty crayfish on northern Lake Michigan spawning reefs

M. Labib
What is the native range of the invasive "rusty crayfish (*Faxonius rusticus*)?"

E.K. Lower
Alien Language: Reflections on the Rhetoric of Invasion Biology

R. MacLellan-Hurd
Invasive dreissenids effects on sediment nutrient composition and other benthic organisms

E.C. Marano
Great Lakes larval fish diets in a post-dreissenid invasion era

H.B. Reid
Interpopulation variation in thermal responses by the invasive round goby (*Neogobius melanostomus*)

R. Sturtevant
History of introduction and competitive impacts of nonindigenous aquatic plants of the Laurentian Great Lakes

M.J. Windle
Downstream expansion of the tubenose goby (*Proterorhinus semilunaris*) in the St. Lawrence River

J. Wu
Analysis on the composition of by-catch in crayfish long trap nets in Poyang Lake

Z. Xia
Multiple factors regulate filtration by invasive mussels: implications for whole-lake ecosystems

ORAL PRESENTATIONS BY SESSION

J.A. Zalusky
Survival, Nutrient Recycling and Tissue Composition of Profundal Quagga Mussels during starvation

06. Analysis of cumulative impacts on the environment

Chair: Esteban Chiriboga

S. Cardiff
Cumulative extent of iron mine influence on water quality in Lake Superior Ojibwe Territories

E. Chiriboga
Characterizing Risk of Crude Oil Pipeline Spills to the Anishinaabeg - Gichigami Tribal Fishery and Fish Habitat

M.E. Fraker
Contrasting states of the Lake Erie ecosystem and their implications for ecosystem-based management

E. Ho
Monitoring for cumulative effects assessment (Cladophora) in the Grand River and Lake Erie

E.T. Howell
Parry Sound, an Embayment Complex of Georgian Bay Protected from Dreissenid Mussels

D.D. Kane
When It Snows It Pours: Recent Increases in Chloride in Lake Erie Tributaries with a focus on the Cuyahoga River

07. Running out of oxygen: Dynamics and impacts of hypoxia in large lakes

Chairs: Casey Godwin, Mark Rowe, Bopi Biddanda, Thomas Johengen

J. Ackerman
Episodes of extreme winds reduce water quality via upwelling into the western basin of Lake Erie

H. Anderson
Accelerated release of phosphorus from sediments in Lake Erie's central basin is a symptom of anoxia, not hypoxia

S.L. Bartlett
Shifting temperature and dissolved oxygen patterns over a multi-decade analysis in Green Bay, Lake Michigan

B.A. Biddanda
Deep, dark and deoxygenated: Exploring multi-annual hypolimnetic trends in a Great Lakes estuary

S.A. Bocaniov
WITHDRAWN: High Sensitivity of Lake Hypoxia to Physical and Nutrient-Related Anthropogenically Induced Forcings

L.E. Burlakova
Exploring Great Lakes Benthoscapes: Can we visually delineate freshwater benthic communities?

P. Collingsworth
Spatio-temporal analysis of hypoxia in the Central Basin of Lake Erie

D.G. Gill
Co-production of a Lake Erie Hypoxia Forecast with Ohio Public Water Systems

C.M. Godwin
Sediment oxygen demand kinetics in Lake Erie's central basin

T.H. Johengen
In situ monitoring of sediment phosphorus flux during seasonal hypoxia in

the central basin of Lake Erie

C. Kitchens
Distribution and Speciation of Manganese With Respect to Hypoxia in the Central Basin of Lake Erie

K. McCabe
A Reassessment of Phosphorus Distributions with Respect to Hypoxia in Lake Erie's Central Basin

P. McKinney
Autonomous glider-based observations for understanding Lake Erie hypoxia

M.D. Rowe
Simulation of 2019-20 Coastal Upwelling Events in a Lake Erie Hypoxia Forecast Model

08. My lake, their lake, our lakes: Perspectives from lakes Michigan to Malawi

Chairs: Ted Lawrence, Stephanie Smith, Zephaniah Migeni, Jessica Ives

D. Banda
Effectiveness of solar tent dryer on drying time, microbial and fat quality of fishes, Lake Malawi

M.A. Fabrice
River Ruzizi: Integrating hydropower production, ecological integrity and sustainable land use

G.L. Fahnenstiel
Carbon Fixation Trends in eleven of the World's Largest Lakes: 2003-2018

E. Gondwe
Setting small scale fisheries in food and nutrition security themes: Trends in Sub Saharan Africa

S. Gubamwoyo
Phytoplankton and macroinvertebrates dynamics in the Murchison Bay

J.S. Halafo
WITHDRAWN: Seasonal Variations of usipa (Engraulicypris Sardella) Fishery in the Mozambican Portion of Lake Niassa
J.T. Ives
Impact of mixing on seasonal variations of productivity and phytoplankton communities of Lake Edward

T. Kisekelwa
Environmental investigation of fish in Lake Kivu, a lake with a complex history

P. Limbu
WITHDRAWN: Lessons from fisheries co-management on Lake Tanganyika - Tanzania

S. Mbabazi
Flooding and its impacts on Lake Victoria fisheries, a case of Uganda

Z.A. Migeni
Strengthening freshwater experts' collaboration for Improved Health of the African Great Lakes

D.B. Namuyiga
Economic and financial impact assessment: An application to Lake Victoria fisheries, Uganda

A. Nankabirwa
Algal communities of L. Victoria and small ponds in its basin and response to industrial pollution

J. Perlinger
Session 8 Discussion

L. Tunu Kaaya
Building leadership for early-career African women

ORAL PRESENTATIONS BY SESSION

scientists in the African Great Lakes region

A. Vodacek
Long-term analysis of Lake Turkana surface temperature and turbidity using Landsat data

M. Wakjira
Fish diversity and Fisheries of Omo-Turkana Basin in the face of hydrological modifications

09. Physical processes in lakes

Chairs: Chin Wu, Eric Anderson, Cary Troy, Jay Austin

E.J. Anderson
WITHDRAWN: Evaluation of modeled ice thickness using satellite-based ice type classification (ICECON)

J.A. Austin
An abrupt decline in springtime zooplankton diel vertical migration due to a shift in stratification regime

J. Fredrickson
Spatial Scales and Gradients during Radiatively Driven Convection in Lake Superior

S. MacIntyre
Variability in Near-surface Turbulence in Lakes at Different Latitudes: Implications for Gas Transfer Velocities

D. Roman
Lake Surface Topography from Water Gauging, GNSS Observations and Gravimetric Geopotential Models

D. Titze
Development of a Flood Forecasting System for Lake Champlain

10. Biogeochemistry, bacteria, benthos and lower trophic level ecology

Chair: Gordon Paterson

T. Connolly
Ecological drivers of zooplankton community characteristics in an Arctic great lake

E. Eberhard
Heterogeneity of nutrient cycling across wetland-stream-lake interfaces of Lakes Superior and Huron

R. Eveleth
Lake Erie biogeochemistry in a low-ice winter

A.Y. Karatayev
Benthos of Laurentian Great Lakes: Inventory of lake-wide surveys

E. McKay
Ecology of giant, filamentous, sulfur-oxidizing Thioploca bacteria in Great Lakes sediments

H.A. Niblock
Assessing the microbial food web of Lake Winnipeg, 2003-2004

C. Sibomana
Benthic macroinvertebrates diversity and physicochemical parameters in Lake Tanganyika littoral zone

A. Trebitz
Nearshore Lake Superior invertebrate biodiversity patterns from two high-density surveys

11. Fish growth, health and ecology

Chair: Wendylee Stott

L. Almeida
Maternal experience and recent growth influence growth rate in Lake Erie Walleye

J. Burbank
Seasonal prey consumption by an imperiled small-bodied fish is influenced by riparian vegetation

K. Cunningham
Temporal trends in larval lake whitefish (*Coregonus clupeaformis*) density and growth in Lake Huron

K.B. Fitzpatrick
Minimizing cost and uncertainty: assessing marking techniques to distinguish stocked and wild fish

X. He
Wisconsinites' fish consumption and fish advisory awareness: analysis of 2017-2019 Wisconsin BRFS

M. Myers
When the wall comes crumblin' down: Newly available walleye habitat in the Sandusky River, OH

J.S. Sinclair
Functional traits reveal the dominant anthropogenic drivers of change in Lake Erie fish assemblages

W. Stott
Genetic species identification of coregonines from lakes Michigan and Huron

H. Walsh
Reproductive Health and Endocrine Disruption in Smallmouth Bass from the Lake Erie Drainage

12. Spatial considerations to Great Lakes fisheries management

Chairs: Travis Brenden, James Bence

G.M. Annis
Mapping priority spawning and nursery habitat for cisco and lake whitefish

J.R. Bence
Accounting for movement among populations in stock assessment and fishery management

T.O. Brenden
A combined Lakes Huron and Michigan catch at age model for Chinook salmon accounting for movement between lakes

R. Clark
Development of stock assessment units for lake trout in Lake Michigan

L.H. Elliott
The role of spatial watershed characteristics in determining brook trout distribution

P.T. Euclide
Drift, stocking, and local adaptation determine walleye reproductive connectivity

M. Faust
Do discrete spawning stocks contribute differentially to Lake Erie's walleye fisheries?

D.G. Fielder
Large-scale fish movement affects metrics of management importance as indicated by quantitative stock assessment

ORAL PRESENTATIONS BY SESSION

T. Hayden

Windows of opportunity:
Telemetry reveals optimal
time periods for stocking

C.M. Holbrook

Use of Lake Erie tributaries
by spawning sea lamprey:
Implications for lake-wide
abundance estimates

D. Isermann

Telemetry, genomics, and
conventional tagging Inform
lake whitefish management
in northwestern Lake
Michigan

J. Janssen

Not all mud; rocky habitat
in deep water in the Great
Lakes

M.S. Kornis

Movements of coded-wire
tagged Chinook salmon,
lake trout, and steelhead in
lakes Michigan and Huron

S.M. Larocque

Combining spatial
movements and diet to
better understand salmonid
ecology in Lake Ontario

K.R. McKnight

Time-scale specific (a)
synchrony between Walleye
and Yellow Perch dynamics
across the Great Lakes

H. Nakiyende

Emergence of light fishing
and the socio-economic
implications on the multi-
species fisheries in Lake
Albert

C.R. Ruetz

Movement patterns of
Yellow Perch in eastern
Lake Michigan: implications
for harvest

E. Rutherford

Modeling larval fish
dispersal in Lake Huron and
Michigan: implications for
population connectivity

A. Taabu-Munyaho

Rapid recovery of fish
stocks in Lake Victoria, East
Africa, depicts importance of
good management

C. Vandergoot

Knowledge gaps in Great
Lakes fish movement
studies: what have we
learned over the past
decade?

13. Bridging connections: Rewiring of Great Lakes food webs under ecological change

Chair: Gordon Paterson

J.K. Atalitsa

WITHDRAWN: Lake Turkana
trophic structure as a basis
for ecosystem approach to
fisheries management

H.J. Carrick

Dreissenid Mussel Grazing
on Small Plankton Promotes
Harmful Algal Blooms in
Lake Erie

S. Figary

Comparing Lake Ontario's
nearshore and offshore
zooplankton communities
using long term datasets

T.J. Holda

Comparing mysid
abundance and trends
across the five Great Lakes.

A.R. Hrycik

Biomass Estimates for
Benthic Invertebrates of the
Great Lakes

M.M. Kindree

Invasive species driven
changes in trophic level and
diet composition of a native
stream fish

C. Marshall

Seasonal Rotifer Community
Trends: Lake Ontario CSMI
2018

M. Munawar

Assessing decadal
changes in primary and
bacterial productivity in the
Laurentian Great Lakes

B. Nawrocki

Food web structure of the
Laurentian Great Lakes - a
cross lake comparison

W.F. Otte

Diet similarity and
trophic overlap of lean
and Siscowet lake trout
morphotypes across
ontogenies

G. Paterson

From pelagic to benthic: a
rewiring of the Lake Ontario
food-web

A. Schmidt

Characterizing trophic
linkages across an estuarine
gradient in the Laurentian
Great Lakes

K. Shchapov

Seasonal changes in
zooplankton and seston
fatty acid profiles in
nearshore regions of Lake
Superior

G.K. Tarsa

Round goby productivity on
a rocky nearshore reef in
Lake Michigan

H.A. Vanderploeg

Dreissena feeding and
nutrient excretion affects
seasonal succession of
plankton in Lake Erie

J.M. Watkins

Oligotrophication of
the Great Lakes - the
zooplankton perspective

14. Data-driven innovation: Monitoring, networking, and analytics for Great Lakes

*Chairs: Max Herzog, Ed
Verhamme*

S.R. Bickman

Rapid, portable, multiplexed
detection of harmful algal
toxins in the Great Lakes

L. Birt

Nutrient Reduction through
Real-Time Optimization and
Control

A.M. Brown

An early alert system for
harmful algal blooms in Lake
Erie

S. Chaganti

Impact of environmental
conditions in triggering toxin
(microcystin) producing
strains to bloom

J. Coleman

From Hand-held to Cloud-
based Water Monitoring in
the Great Lakes Basins

G. Cutrell

Use of Real-Time
Autonomous Nutrient
Analyzers in the Maumee
River Basin, OH

G.J. Dick

A Next Generation Research
Database to Harness Great
Lakes Environmental 'Omics
Data

R.M. Errera

Establishing a near real-
time phycotoxin monitoring
network in Lake Erie

ORAL PRESENTATIONS BY SESSION

P.C. Esselman
Conducting a Needs Assessment for the Great Lakes

M.B. Herzog
Smart Citizen Science: Empowering Lake Erie Communities with Technology and Data

J.S. Higley
Environmental RNA for Remote, Non-Disruptive, Identification and Population Activity Analyses

C. Hill
WITHDRAWN: Developing low-cost, open-source observation systems for expanding Great Lakes observation seasons

L.K. Idraikh
Actively controlling Runoff through Data collection

M. Jabot
WITHDRAWN: The integration of youth-led citizen science to hydrologic monitoring

C. Lee
Early detection of HABs using low cost, networked sensor buoys.

P.D. Lorch
Great Lakes data deluge: Using abundant sensor data to inform recreation and manage watersheds

L. Marshall
Integration of Hyperspectral Camera System for Crewed Flyovers

J.D. Ortiz
Spectral decomposition by VPCA using Google Earth Engine: Great Lakes and other locations

P. Plisnier
Toward a multi-lakes monitoring of African Great Lakes

D.M. Robertson
Use of SPARROW model results to extrapolate limited monitored loads to large spatial areas

K. Varma
Training robust neural networks for autonomous plankton classification

E. Verhamme
The \$500 Observing System: Testing New Tech in Ohio

Y. Wang
Opportunities in predictive modeling and distribution analysis enabled by continuous monitoring

B.P. Wong
IoT for watershed management and planning: a case study from the Cleveland Metro Region

N.D. Zgnilec
Exploring Techniques for Continuous, Real-Time Bacteria Monitoring in Southeast Michigan

15. Great Lakes observing: Advances, best practices, challenges
Chairs: Shelby Brunner, Robert McKay

L. Brinks
Lakebed 2030: Building a Better Bathymetric Basemap for the Great Lakes

C. Burmaster
A framework for collaborative glider operations in the Great Lakes

G. Cutrell
WITHDRAWN: Use of Real-Time Autonomous Nutrient Analyzers in the Maumee River Basin, OH

H.A. Dawson
Requirements for AUVs for scientific data collection in the Laurentian Great Lakes: A questionnaire survey

R.C. Grow
Estimating Cisco (*Coregonus artedii*) density in Lake Superior using an up-looking acoustic platform

T. Kearns
A New Marine IoT Technology Platform - Serving All of the Great Lakes

T. Kearns
Costs and Approaches to Comprehensive High Resolution Mapping of the Great Lakes

A.E. Scofield
Vertical structure of phytoplankton in the Great Lakes based on fluoroprobe profiles

16. Bridging knowledge on detection methods to manage Great Lakes invasive species
Chairs: Courtney Larson, Anett Trebitz, Joel Hoffman

C.N. Brooks
Applying multispectral drone data to identify extent of Eurasian watermilfoil in northwest L. Huron

S.E. Daniel
Great Lakes DNA Barcode Reference Library: Mollusca, Annelida, and Minor Phyla

T.B. Johnson
Assessing Ontario's vulnerability to aquatic invasive species under climate and human population change

R. Johnson
Bridging Gaps in Aquatic Invasive Species Early Detection Through International Collaboration

C.E. Larson
Dreissena transport from St. Louis River to Apostle Islands detected in eDNA and zooplankton surveys

K.J. Przybyla-Kelly
Multiple studies on eDNA detection of invasive round goby in Lakes Michigan and Huron

E.A. Whitmore
New Monitoring and Detection Methodologies for the Lake Ontario Benthic Cladoceran Community

17. Improved prediction via model coupling, data assimilation, and machine learning
Chairs: Pengfei Xue, Philip Chu, Matthew Hoffman

U. Adhikari
Adaptive data-enabled hydrological and hydraulic modeling platform for the Great Lakes region

H. Ai
Predicting algal blooms in Lake Erie by random forest and long short-term memory methods

P.J. Alsip
An Experimental Biophysical Forecast System to Support Lake Michigan CSMI 2020

ORAL PRESENTATIONS BY SESSION

J. Apriesnig
The consequences of misrepresenting feedbacks in coupled human and environmental models

H. Hu
Simulating Great Lakes wave conditions with one-way coupled hydrodynamic-wave models

I. Kraucunas
New U.S. DOE project on coastal observations, mechanisms, and predictions across systems and scales

M. Notaro
Performance of the NU-WRF Regional Climate Model in the Great Lakes Region

D. Russell
Developing a Data Assimilation System for Lake Erie Using the Local Ensemble Transform Kalman Filter

N.K. Shrestha
SWAT-RAVEN coupled model for enhanced streamflow simulation over the Great Lakes region

Z. Song
Testing the impacts of multiple factors on nearshore surface water quality in large lakes

A. Wagh
Using Long short-term memory networks to improve hydrodynamic modeling

J. Wang
Impacts of Great Lakes on warm season precipitation using high resolution simulations

P. Xue
Assessment of the two-way coupling of FVCOM and NU-WRF in the Great Lakes Region

X. Ye
Improved lake surface temperature analysis in Lake Michigan through data assimilation

18. Coastal remote sensing
Chairs: W. Charles Kerfoot, George Leshkevich, Michael Sayers, Caren Binding

K. Bosse
Impact of COVID-19 Shutdowns on Water Quality in the Great Lakes

L. Bourgeau-Chavez
Progress on Developing a Framework for Monitoring Coastal Wetlands with High Resolution Satellite Imagery in 4D

A. Grimm
Updating and expanding the Landsat-based submerged aquatic vegetation map for the Great Lakes

W. Kerfoot
Coastal remote sensing: Comprehensive data integration of stamp sand drift onto Buffalo Reef

G. Leshkevich
An in situ IOP/AOP database for Great Lakes satellite bio-optical algorithm development and product validation

S. Liu
NOAA Great Lakes CoastWatch Coastal Remote Sensing Data and Integration Efforts

A.M. Marcarelli
Autonomous and remotely-operated surveys of nearshore river plumes in Lake Superior

S. Ruberg
Great Lakes Water Quality and Primary Productivity

M.J. Sayers
A New Underwater Hyperspectral Radiometer System for Improved Bottom Albedo Characterization

M.J. Sayers
A Refined Model to Retrieve Dissolved Organic Carbon in the Great Lakes using Ocean Color Remote Sensing Data

R. Shuchman
Development of Adaptive Hyperspectral Algorithms for Improved Chlorophyll and HABs Retrievals from PACE

19. Linking quality systems with adaptive management for ecological restoration
Chairs: Louis Blume, Timothy Lewis, Craig Palmer

L.J. Blume
Can't have one without the other: the marriage of quality systems and adaptive management

J.F. Bratton
Lessons learned about quality systems in developing an adaptive management framework for Lake Erie

C.E. Dumoulin
Reproducible quality control of multi-input, participant-reported Phragmites management data

J.L. Fischer
Setting Measurable Objectives: Determining Ability to Detect Changes in Fish CPUE through Simulation

E. Houghton
Compliance in the watershed: Working outside the treatment plant

C. May
Project Manager Perceptions of the Human Wellbeing Benefits from Great Lakes Restoration Efforts

T.R. Tucker
The Phragmites Adaptive Management Framework: Programmatic quality control of participatory data

M.T. Tuttle-Lau
Process Improvements to a long-term eDNA Monitoring Program

20. Operationalizing an early warning system for the Great Lakes

Chairs: Michael Twiss, Lucinda Johnson, Matthew Child, Lizhu Wang

D. Henshel
Using GIS to Identify Community-Based Critical Infrastructure Weaknesses to Storm-Induced Flooding

A. Kuczynski
Predicting algal debris risk at water intakes: an application of the Great Lakes Cladophora Model v3

E. Mimouni
Multi-year assessment of scale-based patterns of phytoplankton fluorometry in the St. Lawrence River

ORAL PRESENTATIONS BY SESSION

M.R. Twiss
Operationalizing a Great Lakes Early Warning System: Progress by the IJC Science Advisory Board

21. Integrated modelling and valuation of ecosystem services in the Great Lakes

Chairs: Rute Pinto, Roy Brouwer, Jorge Garcia-Hernandez

R. Brouwer
What are the Great Lakes worth?

J.A. Garcia
Estimating Total Economic Costs of Nutrient Emission Reduction Policies to Halt Eutrophication in the Great Lakes

J. Garcia-Hernandez
Balancing Phosphorus runoff reduction and farmers' utility: An optimization for Lake Erie Area

Y. Huang
Economic costs of eutrophication in the Great Lakes Basin: a preliminary study

G. Lau
WITHDRAWN: Great Lakes wave energy resource classification and Blue Economy opportunities

S. Phelps
Modeling the economic value of Great Lakes restoration through ecological linkages

R. Pinto
Methodological challenges in integrated hydro-economic modeling of water quality changes

R. Pinto
Discussion Panel Session 21

M. Zischke
The Impacts of COVID-19 on the Charter Fishing Industry in Lake Michigan

22. Improved measuring of Great Lakes-St. Lawrence River basin water quantity

Chairs: Peter Johnson, Judith Kirby

L. Berthot
Inclusion of wetted perimeter in environmental flow analysis in Southern Québec rivers

E. Chiriboga
A Framework for the Analysis of Impacts from Water Withdrawals in the Anishinaabeg-Gichigami Watershed

M. Davis
Great Lakes Regional Water Use Database: improving data quality

P.J. Martin
WITHDRAWN: Refined Consumptive Use Calculation for High Volume Permits

J. Nicholas
Cumulative Impact Assessment of Withdrawals, Consumptive Uses, and Diversions

H.W. Reeves
Estimating impacts of groundwater withdrawals on streamflow

23. Decision support tools: A bridge from environmental monitoring to knowledge

Chair: Judith Schofield

A. Chiandet
Integrating subwatershed-scale tributary monitoring guides local decision-making

B. Fevold
Data Management Plan Tools for Ecological Restoration

P. Landisch
A decision support tool for prioritizing coldwater stream habitat restoration and management

J. Launspach
Utilizing Qlik to visualize the multiagency spatiotemporal data driving effects-based monitoring

T. Redder
A Web-based Decision Support Tool for the Protection and Restoration of Great Lakes Coastal Wetlands

K.M. Reynolds
Spatial decision support for environment analysis and planning with the EMDS system

K. Semmendinger
Exploration of the Sensitivity of Lake Ontario Flow Regulation to Annual Water Supply Forecast Skill

24. Global to local: Canada's post-2020 freshwater biodiversity goals and targets

Chairs: Catherine Masson, Mary Thiess

T.D. Androschuk
WITHDRAWN: Freshwater biodiversity is under-represented in protected areas in Canada, including the Great Lakes basin

L. King
Wild Swimming as Citizen Science? Immersion, Local Knowledge, and Water Advocacy for Our Great Lakes

C. Masson
The global to local roles of a UNESCO Biosphere Reserve: Protecting, conserving and exploring Great Lakes ecosystems

C. Masson
Part One: Learning from our shared history to honour our responsibilities to future generations

C. Masson
Part Two: Learning from our shared history to honour our responsibilities to future generations

C. Masson
WITHDRAWN: Canada's Boreal Great Lakes: A Freshwater Biodiversity Case Study

J. Olson
WITHDRAWN: A Framework for Great Lakes-St. Lawrence River Basin Public Trust Protection

P.A. Owl
WITHDRAWN: Seeking Balance: Natural Law and Great Lakes Anishinaabe

S.R. Parker
Building a Great Lakes Protected Areas Network

M. Puzyreva
Understanding the value of protected areas: case of the Seal River Watershed

C. Raudsepp-Hearne
Key Biodiversity Areas to focus biodiversity conservation in Canada

ORAL PRESENTATIONS BY SESSION

M. Thiess
Opening in a Good Way:
Land Acknowledgement
and Welcome

M. Thiess
Introduction: Canada's
post-2020 global to local
freshwater biodiversity
goals and targets

M. Thiess
United Nations Convention
on Biological Diversity and
the 2021 Global Biodiversity
Framework

M. Thiess
Science, Law, Policy and
Culture for Freshwater
Biodiversity Protection: A
Guided Discussion

M. Thiess
Closing in a Good Way:
Summary and Next Steps

25. Bridging knowledge systems between indigenous and nonindigenous communities

*Chairs: Kaitlin Almack,
Nicholas Boucher,
Alexander Duncan, Andrea
Reid*

S. Alexander
Bridging Indigenous and
Western sciences in aquatic
research, monitoring, and
management in Canada

K. Almack
Panel on Wise Practices
in Co-developing
Knowledge with Indigenous
Communities (75 min)

K. Almack
Using the Two-Eyed Seeing
Approach" to Resolve
Conflict and Build Trust: A
SON/OMNRF Case Study"

N.W. Boucher
Traditional Opening
Ceremony

N.W. Boucher
Traditional Opening
Ceremony - Part 2

N.W. Boucher
Dialogue Session on the
Two-Eyed Seeing Approach
in the Great Lakes (60 min)

N.W. Boucher
Traditional Closing
Ceremony

A.T. Duncan
Ciscoes, Indigenous
ecological knowledge, and
the Saugeen Ojibway Nation

C.M. Febria
Committing to reconciliation
and accelerating ecosystem
restoration through
#KindnessInScience &
Allyship

H.L. Harrison
Seeing beneath disputes:
reading the stories in natural
resource conflict

M. Holtgren
WITHDRAWN: Multi-cultural
strategies for equitable
collaboration

J.T. Johnson
Indigenous Research
Sovereignty: Setting a Tribal
Agenda for Environmental
Research

P. Kebec
Discussion on the Chippewa
Ceded Territory Traditional
Food System Regulatory
Project

K. Keeshig
Building a holistic research
program to address
freshwater restoration
through a community-
centred approach

R. Lauzon
Together with Giigoonyag:
Developing an Acoustic
Telemetry Array for Ontario
waters of Lake Huron

P. Lennox
The Development of
Community-Based
Environmental Monitoring
Program with Weenusk First
Nation

P.A. Loring
Bridging knowledge
systems to steward
biodiversity: linking local
and traditional knowledge
and eDNA

J.O. Manyala
Application of Indigenous
Knowledge on Fish
Breeding Areas and
Seasons in Lake Victoria,
Kenya

K. Marin
Long-standing, collaborative
knowledge leads to
community-based
conservation: Mistassini
fisheries

G. Martin
FISHES: Fostering
Indigenous Small-scale
fisheries for Health,
Economy, and food Security
in Sahtu, NT

E. McKnight
Identifying challenges to
- and recommendations
for - reconciliation in
environmental science
research

P. Meis enheimer
Anishinabek/Ontario
Fisheries Resource Centre:
Key Learnings from the Two-
Eyed Seeing Approach

A. Pamajewong
Restoring Native Fish
Populations: Developing a
Community Based Walleye
Program in Shawanaga First
Nation

R.L. Paulsen
Creating Space for
Synergistic Relationships:
Two-Eyed Seeing

A. Rayne
Centring Indigenous
knowledge systems to
re-imagine conservation
translocations

A.J. Reid
Two-Eyed Seeing: An
Indigenous framework to
transform fisheries research
and management"

C. Sampson
Bkejwanong Walpole Island
First Nation: Safeguarding
Our Waters Through
Sustainable Practices

E. Shaw
Seasons of research with/
by/as the Keweenaw Bay
Indian Community

J. Stinson
New Journey to Save Fish:
Oshki Maadaadiziwin Jaa
Bimaaji'ut Gigooyike

D.J. Young
Sturgeon thunder:
Integrating western science
and indigenous knowledge
to save a species in peril

26. Bridging the divide between Great Lakes research and youth engagement

*Chairs: Kristin TePas, Marte
Kitson, Megan Gass, Allison
Neubauer*

ORAL PRESENTATIONS BY SESSION

K.M. Alofs
Online case studies for teaching science and management in the Laurentian Great Lakes

M. Kitson
How to Connect to Educators and Tomorrow's Decision-makers

A.K. Neubauer
Scientists to Students! Using Great Lakes video calls to connect with youth learners

K.T. Scribner
Virtual learning to train community scientists about lake sturgeon and coupled Great Lakes-tributary ecosystems

K.M. TePas
Bring-a-Teacher-to-Work Week

27. Spread the word, engage the world

Chair: Sandra Svoboda

S. Nolan
Stories are Data, too! Delivering Science with Impact from the Healthy Headwaters Lab's Storyteller Initiative

N. Schroeck
Carp, climate change and Canadian pipelines: A decade of news and law in Great Lakes media

S. Svoboda
Watch This: Using Facebook watch parties to engage new audiences

28. The UN Decade on Restoration: Advancing restoration with community partnerships

Chairs: Jessica Ives, Catherine Febria, Katrina Keeshig

G. Gardner
The Property Value Benefits of Remediating the Ashtabula River Area of Concern

S. Hickel
Restoring coastal wetlands to benefit people: Enhanced patterns from the Blue Accounting Database

S. Simoliunas
Public consultation on the Great Lakes Water Quality Agreement

K.C. Williams
Social and organizational dimensions of Great Lakes remediation, restoration, and revitalization

29. Justice, Equity, Diversity, and Inclusion (JEDI) in the IAGLR community

Chairs: Gordon Paterson, Judith Perlinger

C. Foley
Incorporating Justice, Equity, Diversity, and Inclusion into Research and Fellowship Competitions

J.J. Josephs
Social Remediation and Restoration in Great Lakes Areas of Concern Communities

C. Masson
An Ethical Principles Research-to-Action Agenda

30. Using multidisciplinary techniques to understand

contaminants in the Great Lakes

Chairs: Ryan Lepak, Joel Hoffman

B. Alipour Parvizan
Concentration and Temporal trend of HBCDD in fish tissues from the Great Lakes using UPLC-HRMS

G. Ankley
Pathway-Based Approaches for Assessing Biological Hazards of Complex Mixtures of Contaminants in the Great Lakes

A.G. DeMeyer
Per- and polyfluoroalkyl substances (PFASs) in the Great Lakes atmosphere and precipitation

L. Grapentine
Monitoring nearshore sediment conditions in the Great Lakes: Applications to research and management

J.C. Hoffman
Tracing mercury sources through a Great Lakes coastal wetland food web using a multi-stable isotope approach

A. Jacob
Contaminant monitoring in the Great Lakes by NOAA's Mussel Watch

R. Lepak
Reconstructing the energy pathways and contaminant burden to lake trout in contrasting Great Lakes

T. Long
Spatiotemporal trends of polychlorinated biphenyls (PCBs) and mercury in Lake Ontario's nearshore sediment

A. Point
Blood protein diversity as a potential driver for perfluoroalkyl acid trophodynamics in aquatic food webs

A. Renaguli
Nontargeted screening of halogenated organic compounds in the Great Lakes fish

31. Marine debris and microplastic in the Great Lakes: Sources, impacts, and solutions

Chairs: Sarah Lowe, Lisa Sealock

J. Bartolotta
Skip the Straw, Ban the Bag: Does it really work?

S.L. Belontz
WITHDRAWN: Linking tributary inputs and anthropogenic factors to greater microplastic abundances in sediments of Lake Huron.

K.M. Chomiak
Cascading impacts of microplastics on ecosystem function in lakes

J.M. Daily
Modeling the 3D distribution of microplastic in Lake Ontario and Lake Erie

P. Helm
Levels, sources, and fate of microplastics in the Great Lakes / St. Lawrence River - A review

N. Kokilathanan
Nanoplastics: Impacts and Detection in Aquatic Environments - A Review

E. Kostelnik
Synthetic microfiber loads in green algae, Cladophora, in Lake Erie and Lake Michigan

ORAL PRESENTATIONS BY SESSION

P.L. Lenaker
From Rivers to Lakes - The Movement and Distribution of Microplastics from Tributaries to the Great Lakes

C. Tyler
Microplastic deposition potential in freshwater ecosystems of the Lake Ontario basin

C. Wardlaw
Microplastics in white sucker (*Catostomus commersonii*) and common carp (*Cyprinus carpio*) from the Thames River, ON

J.T. Yu
Sources of microplastics in nearshore surface waters of the Great Lakes

32. Great Lakes HABs: Bridging ecology, human dimensions, and management

Chairs: Mary Anne Evans, Kenneth Gibbons, Michelle Selzer, Katie Stammler

G. Boudreaux
Great Lake beach visitor preferences toward harmful algal bloom and bacterial warnings

A.J. Bramburger
The plenism of the plankton; or, Cyanobacteria abhor a vacuum

J. Breidenbach
Exposure to Aerosolized Harmful Algal Bloom Toxin Microcystin-LR Induces Inflammation of the Airways

S.D. Buchholz
Second generation cyanotoxin detection technology in routine monitoring and citizen science groups

J. Callaghan
Spatial and temporal patterns of Cyanobacteria in Lake Superior

J.D. Chaffin
The HABs Grab: A binational characterization of the the Lake Erie cyanobacterial blooms

N.W. Falk
In situ Biogeochemical Controls on Suspended and Bed Sediment Phosphorus Buffering in Southern Ontario Headwaters

M.A. Fitzpatrick
A long term (> 40 years) analysis of algal blooms in the Bay of Quinte, Lake Ontario

S.T. Haller
HABs Toxin Microcystin-LR Exposure Exacerbates Pre-existing Inflammatory Bowel Disease

H. Henderson
Monitoring harmful algal bloom driving dynamics in western Lake Erie using nutrient sensor moorings

M. Klasic
What's HAB-enig to Lake Erie? Using social-ecological network analysis to target action

R.M. Kreiling
Phosphorus retention potential in the riverbed sediments of the Maumee River basin

A. Lad
Pre-existing liver disease increases susceptibility to chronic low-dose Microcystin-LR exposure

P.L. Lawrence
Spatial Distribution Model for Manure from Permitted Livestock Facilities, Maumee Watershed, Ohio

Q. Liu
Probabilistic forecast of microcystin using remote sensing, in situ observations and numerical model

C.P. McDonald
Temperature and water column stability explain an algal bloom in the Keweenaw Waterway

J. Murray
Impact of Harmful Algal Blooms on the Water-Food-Climate-Health Nexus: An Update

K.E. Natwora
Nitrogen fixation, physiological response of Lake Superior *Dolichospermum* under varying environments

M. Nevers
Assessing *Cladophora* growth in Lakes Michigan, Huron, Erie, and Ontario

H.L. Purcell
Bridging the Gap Between Prototype and Market Ready: An Evaluation of MBio Gen 1 Rapid Toxin Detection Technology

C. Salter
Investigating the Microbial Dynamics of Microcystin-LR Degradation in Lake Erie Sand

M. Selzer
Michigan's Active Adaptive Management Approach to Reduce Lake Erie Harmful Algal Blooms

R.S. Shahmohamadloo
Microcystins, intracellular and extracellular, of cyanobacteria can cause disease-related effects in fish

C. Sheik
Molecular approaches provide insight to past and present *Dolichospermum* blooms in Lake Superior

D.J. Smith
Individual *Microcystis* colonies harbor bacterial communities that differ by *Microcystis* oligotype and with time

C.G. Weisener
WITHDRAWN: Developing a chemical/bioindicator tool box" for Greenhouse Storm Water Pond Nutrient Management"

A. Zastepa
Toxic and other bioactive metabolites in deep chlorophyll layers of *Planktothrix* in Georgian Bay, Lake Huron

POSTER PRESENTATIONS

B. Alsip
Deep dives in Lake Erie:
flying a glider in the
shallowest Great Lake

A. Ames
HAB associated health
effects and airborne
microcystin levels among
recreational lake users

O.C. Anderson
The influence of extreme
water levels on coastal
wetland extent across the
Laurentian Great Lakes

E. Bagosy
Seasonal occurrence and
production of potentially
harmful algal blooms in
western Lake Erie

C.M. Bangkong
Molecular identification of
antibiotic resistant plastic-
associated freshwater
bacteria

M.A. Barnard
Nutrient limitation dynamics
of Western Lake Erie
CyanoHAB biomass,
microcystin, and anatoxin
production

A.A. Beecher
Summer Timeline of
Microcystin Production in
Western Lake Erie using
Solid Phase Adsorption
Toxin Tracking (SPATT)

R. Chan
Linking Land Use
and Agricultural Best
Management Practices with
Water Quality in the Bay of
Quinte

A. Chiandret
Microplastics
concentrations in small
wastewater treatment
plants

J.R. DeMarco
Using in situ sensors to
determine phosphorus
sources driving HABs in
Chautauqua Lake, NY

D.N. Demro
CREEQ: Linking public
perceptions to biochemical
indicators of stream water
quality

P.A. Den Uyl
Comparative Analysis of
Microcystis Buoyancy in
Western Lake Erie and
Saginaw Bay of Lake Huron

C. Goltz
The Impacts of Nitrogen
on Cyanobacterial Harmful
Algal Blooms in Eutrophic
Water Bodies

S. Henson
Remote Sensing Monitoring
of Lake Okeechobee
Harmful Algal Blooms
Using the KSU VPCA
Method

Y. Lin
Wind stress effects on the
mixed layer depth and ice
formation in Lake Superior

J. Mouradian
Light synthetic crude alters
microbial communities
in various Great Lake
ecosystems

K.L. Reinl
A cyanobacteria life cycle
model for blooms in
oligotrophic Lake Superior

J. Robson
WITHDRAWN: Benthic
Macroinvertebrate
Communities of Detroit
River Wetlands

M.A. Schmidt
Nitrate groundwater
contamination in Lake
Ontario watersheds: data
mining informs spatial
patterns.

Z. Swan
Hypoxia in Lake Erie:
Temperature's Effect on
Phosphorus Release from
Anoxic Sediments

M.M. Woller-Skar
Changing water levels
in Lake Superior impact
periphytic diatoms

B. Zhou
Characterization and
modeling of phosphorus
cycling in urban
bioretention cell under
climate change