



Proposed Sessions

International Association for Great Lakes Research
 61st Annual Conference on Great Lakes Research
 June 18–22, 2018

To make it easier to find an appropriate session, we have grouped them below by theme. We encourage authors to submit abstracts for specific session topics but also will consider those submitted under "General Contributions." The program will be designed so that sessions within a theme will not run concurrently. The ordering of sessions within themes is arbitrary.

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Aquatic Invasive and Nuisance Species in the Great Lakes: Sessions 1-3

#1. Disease, Parasites, and Pathogens of the Great Lakes and Freshwater Ecosystems

Chaired by Kevin Strychar

Aquatic diseases, parasites, and pathogens have a negative impact on recreation and economics costing the US coastal and inland water billions of dollars annually and the Great Lakes Region approximately \$200 million dollars per year. Less known are the novel and emergent diseases and pathogens, some of which are/were brought in via invasive species and ballast water dumping. This session will focus on those aspects covering parasites, pathogens, bacteria, fungi, and viruses, and the impact(s) they have or may have in years to come.

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#2. Status and Management of Invasive Carps in the Great Lakes

Chaired by Patrick Kocovsky, Becky Cudmore, Nicole King, and Christine Mayer

Problem statement: Bighead carp *Hypophthalmichthys nobilis*, silver carp *H. molitrix* and black carp *Mylopharyngodon piceus* threaten to invade the Laurentian Great Lakes (LGL) via interconnections with the Mississippi River basin or by



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intentional or accidental human-mediated introduction. Grass carp *Ctenopharyngodon idella* have been found in all of the LGL except Lake Superior and are reproducing in at least two tributaries of Lake Erie. Each of these species has the potential to fundamentally alter the ecology of the LGL if they establish large populations. Even lesser-sized populations may alter conditions that tip the balance against ecologically and economically important native species. The objective of this session is to provide an overview of research, risk assessment, population status, and management efforts of these invasive carps in the LGL. The session will be open to presentations by researchers whose work on these species outside of the Laurentian Great Lakes might inform prevention, control, or further risk assessment in the LGL. Many of the presentations will be invited, but the option for submissions will remain open.

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#3. Science and Policy for Management of Invasive Crayfish

Chaired by Patrice Charlebois and Reuben Keller

The impacts of non-native crayfishes are recognized to be very large, but compared to other invasive species there has been relatively little basic research on preventing the arrival of new species or controlling those that are already established. This session will bring together a group of crayfish experts to present on basic science, control methods, and the requirement for effective outreach and policy. While our focus will be on the Laurentian Great Lakes Basin the session will be relevant to aquatic ecosystems across the globe.

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Reuben Keller, Loyola University Chicago, Chicago, IL; 773-508-2952; rkeller1@luc.edu

Areas of Concern in the Great Lakes: Sessions 4-7

#4. Restoring Hamilton Harbour: Tilting at Windmills or a Possible Dream?

Chaired by Kristin O'Connor, Chris Marvin, and Julie Vanden Byllaardt

Hamilton Harbour and Cootes Paradise Marsh are situated at the western end of Lake Ontario. Environmental conditions had significantly degraded in many areas such that Hamilton Harbour was identified as an Area of Concern on the Canadian side of the Great Lakes in 1986. Decades of research and monitoring by government and universities in



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the harbour, marsh, and watershed have resulted in both long term data sets and emerging opportunities for new investigations. Restoration of ubiquitous issues of water quality, fish and wildlife, and toxic sediment are complicated by unique morphologic features, a history of heavy industrial uses, and the continuing urban pressures of the area. Consideration for delisting is still years away, but recent glimpses in achieving the end goal continues to drive both science and management decisions in the Hamilton Harbour Remedial Action Plan.

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#5. Within Reach: The Path to De-listing Toronto and Region as a Great Lakes Area of Concern

Chaired by Valerie Francella and Susan Doka

The Toronto and Region Area of Concern (AOC) is one of 43 locations identified by the International Joint Commission where degradation of local environmental conditions may be causing harm to the wider Great Lakes System. Since the mid-90s, restoration and remediation projects undertaken as part of the Remedial Action Plan (RAP) have contributed to fundamental improvements in the quality of water and sediment, condition and amount of terrestrial and aquatic habitat, and health of aquatic organisms and communities. Nevertheless, there is still much to be done on the path to de-listing Toronto as an AOC by 2020 – work made more complex by ongoing and emerging challenges like climate change and continued population growth in an already densely urbanized region. In this session we will explore how ongoing and upcoming restoration projects are working to address these challenges by enhancing resiliency of Toronto's shoreline.

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Susan Doka, GLLFAS, Dept. of Fisheries & Oceans, Burlington, ON; 905-336-4498; susan.doka@dfo-mpo.gc.ca

#6. Ecosystem Health and Recovery of the Bay of Quinte, Lake Ontario

Chaired by Andrew Morley, Shan Mugalingam, Dong-Kyun Kim, and Yuko Shimoda

The Bay of Quinte is one of the Great Lakes' Areas of Concern (AOC) with a long history of eutrophication problems primarily manifested as spatially extensive algal blooms and predominance of toxic cyanobacteria. Reduction of phosphorus in detergents along with upgrades at local wastewater treatment plants resulted in substantial decline of point-source loadings during the 1970s, prompting a significant decrease of nutrient concentrations and phytoplankton biomass levels. Nonetheless, the delayed response of the sediments, coupled with the invasion of dreissenids in the mid-1990s, continue to pose challenges for delisting the system for the beneficial use "Eutrophication or Undesirable Algae". There is also a great deal of work that is currently being done to impartially evaluate the likelihood of delisting the system for the impaired beneficial uses "Fish and Wildlife Consumption" and "Degradation of Phytoplankton and



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Zooplankton Populations". With these delisting decisions in mind, we welcome a broad range of presentations that focus on understanding the Bay of Quinte and identifying key factors that will shape our restoration efforts. The relevant topics will include, but not limited to, biogeochemical processes and socioeconomic relationships in connecting aquatic monitoring & research, invasive species, best management practices, harmful algal blooms, fisheries, ecosystem services, public/stakeholders perception, and management options for post-delisting phase.

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#7. Effects of Environmental Contamination on Fish Communities

Chaired by Ariola Visha, Nilima Gandhi, and George Arhonditsis

A great deal of research is currently conducted toward establishing the spatio-temporal fish contaminant trends and impartially evaluating the progress with delisting Areas of Concern for the Beneficial Use Impairments "Restrictions on Fish and Wildlife Consumption", "Degraded Fish and Wildlife Populations", and "Fish Tumours or Other Deformities". In this session, our focus is on issues surrounding fish contamination, fish tumours, and fish consumption advisories in the Great Lakes. We welcome presentations that offer insights into the trends regarding legacy contaminants and their physiological effects on fish populations as well as suggestions for tomorrow's solutions.

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Fisheries and Fishery Management: Sessions 8-13

#8. Restoration of Native Fishes

Chaired by Timothy Johnson and Dmitry Gorsky

Multiple stressors have impacted native fish species within the Great Lakes basin. Resource managers and researchers have applied multiple techniques to assess and restore these imperiled species. This session will bring together presentations addressing the multiple facets of native fish species restoration including: assessment and monitoring,



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mitigation of stressors, habitat enhancement, conservation genetics, culture / propagation, reintroduction, and technological innovations for assessment (DNA sequencing, telemetry / tracking, multispectral imagery, etc.).

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Dimitry Gorsky, U.S. Fish and Wildlife Service, Basom, NY; 585-948-7045; dimitry_gorsky@fws.gov

#9. Modeling, Detecting, and Managing Rarity

Chaired by Fielding Montgomery and Rowshyra Castaneda

This session will focus on highlighting multiple and diverse approaches to inform the current and future management of rare species in the Great Lakes. These species are found at environmentally low abundances and/or densities (i.e. are endangered, invasive, or naturally rare) and present particular challenges in their detection and quantification. By bringing together researchers working with novel technologies (e.g. E-DNA, underwater cameras, etc.), modeling approaches, and frameworks for the management of rare species, this session is of particular relevance to researchers and practitioners in the fields of conservation, invasion ecology, and natural resource management.

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#10. Physiology and Conservation of Sturgeon in the Great Lakes

Chaired by Oana Birceanu, Laura Tessier, and Michael Wilkie

Sturgeon are a unique, prehistoric looking cartilaginous fish with a worldwide distribution. In the Laurentian Great Lakes and in much of their historic range in North America, different species of sturgeon populations are in peril, with many listed as extirpated, endangered or as a species of concern due to previous overfishing and habitat degradation. This session will highlight the current research being done to increase our knowledge of the biology of lake sturgeon (*Acipenser fulvescens*), with a focus on their ecology, physiology and conservation in the great lakes. While the primary focus will be on potadromous lake sturgeon, contributors to this session are welcome to discuss a variety of topics related to the biology of other sturgeon species, to create a diverse research atmosphere.

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#11. Acoustic Telemetry Applications in the Great Lakes

Chaired by Jill Brooks and Jonathan Midwood

Acoustic telemetry is increasingly used to track movements of fishes within and among areas of interest. This session will bring together experts applying acoustic telemetry to better understand the spatial ecology of fishes, their habitat requirements, and their responses to dynamic environments.

*Jill Brooks, Fish Ecology and Conservation Physiology (Carleton University), Ottawa, ON; 6136005895;
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Jonathan Midwood, Department of Fisheries and Oceans, Burlington, ON; 647-836-9577; jon.midwood@dfo-mpo.gc.ca

#12. History of Great Lakes Fish, Fisheries & Governance: Dr. Henry Regier's Legacy

Chaired by Nicholas Mandrak, William Taylor, and Mohiuddin Munawar

Prof. Henry Regier (Member, Order of Canada) has been documenting and classifying the knowledge gained from fisheries management practices in the Great Lakes. He has proposed studying the long term praxis (i.e. the practice and application) of fisheries management over 5 historic time periods: Early history including indigenous communities and the arrival of Europeans; post colonization up to the 1920s; 1920 – 1967; 1968 – 1993, and 1993 – present. This session is a tribute to Professor Regier. We invite papers that complement the scientific history of fishes, fisheries, governance and development of improved ecosystem health in the Great Lakes as we celebrate his vision, professional accomplishments and legacy.

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#13. Building Relationships of Anglers and Scientists toward Sustainable Fisheries

Chaired by James Watkins and Jesse Lepak

Commercial fisherman, charter boat captains, and recreational anglers can offer a lifetime of experience observing and working with fish and aquatic environments. This wealth of information is often overlooked by scientists as they initiate new research and monitoring programs. We welcome contributions that describe the development of relationships between scientists, extension associates, and stakeholders aimed at building trust, informing fisheries management and maintaining sustainable fisheries practices. Potential tools for partnerships include angler diaries, fish and diet



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collections, fish tagging and recoveries, real-time delivery of buoy or remote sensing data, long-term time series interpretation, and reporting research findings to end-users.

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Jesse Lepak, New York Sea Grant, SUNY Oswego Penfield 4, Oswego, NY; 315-312-3042; Jesse.Lepak@cornell.edu

Genomics, Microbiology, and Emerging Technologies: Sessions 14-16

#14. Microbial Dynamics and Human Health Risks in the Beach Sand

Chaired by Joao Brandão, Richard Whitman, and Tom Edge

Research on microbial life in beach sands began during the 1980s. Since then, many reports and scientific papers have been published on the subject, especially after the year 2000. The number of publications in this area is currently increasing exponentially, most of which address methodological approaches and considerations on the microbiome characterization and its influence on human health. Clear and precise guidance on the subject, however, has not been achieved. Yet, it could serve as a working basis for regulators and research groups engaged in this field. This session aims to bring together those that can help move this concern forward in a broad consensus within the beach safety professional community.

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Richard Whitman, USGS (Retired), Chesterton, IN; 2194060924; psammonman@gmail.com

Tom Edge, Environment and Climate Change Canada, Burlington, ON; 905-319-6932; thomas.edge@canada.ca

#15. Environmental 'omics: New Tools for Aquatic Ecosystem Science and Management

Chaired by Felicity Ni, Maryam Anaraki, and Tae Jeong

Given the increasing anthropogenic stresses placed on aquatic ecosystems, there is strong demand for reliable tools that can offer insights into ecosystem dynamics and directly support new environmental management strategies. This session will focus on the development and application of molecular-based techniques, a.k.a. “environmental ‘omics” (e.g., genomics, transcriptomics, proteomics, metabolomics, etc.), for aquatic ecosystem science and management. We welcome presentations that: (1) highlight recent advancements in environmental ‘omics methods or techniques that elucidate organism stress; (2) develop aquatic ecosystem models that integrate environmental ‘omics data, to address food web dynamics or water quality issues under multiple stressor environments; and/or (3) explore ideas for future application of these methods to fundamental questions in aquatic ecology and toxicology.

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Tae Jeong, University of Toronto Scarborough, Toronto, ON; taeyong.jeong@utoronto.ca

#16. How can Microbial Metagenomics Inform Management of Great Lakes Ecosystems?

Chaired by Janis Thomas and Tom Edge

This session is intended for a broad audience to enhance understanding about the applications of microbial metagenomics for assessing ecosystem changes in the Great Lakes basin. The session intends to identify how the use of these genomics tools can inform ecosystem management and policy development. Presentations will include current applications used to understand microbial community structure and diversity, as well as the use of these tools to enhance the understanding of ecosystem functions, source-tracking, and improving predictive models in the Great Lakes basin.

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Tom Edge, Environment and Climate Change Canada, Burlington, ON; 905-319-6932; thomas.edge@canada.ca

Governance, Education, and Outreach: Sessions 17-28

#17. Great Lakes Outreach and Education

Chaired by Kristin TePas, Rochelle Sturtevant, and Helen Domske

The session will focus on innovative and exemplar education and outreach efforts being conducted around the Great Lakes Basin, including in both urban and rural areas. Papers are welcome from universities, Sea Grant programs, NGOs, agencies and others interested in sharing how these successful science-based programs were conducted and evaluated.

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Rochelle Sturtevant, GLERL/NOAA, Sea Grant Extension, Ann Arbor, MI; 734-741-2287; rochelle.sturtevant@noaa.gov

Helen Domske, SUNY @ Buffalo, NY Sea Grant - GL Program, Buffalo, NY; 716-645-3610; hmd4@cornell.edu

#18. Research-Driven Educational Initiatives to Improve Watershed Health

Chaired by Erin Argyilan, Laurie Eberhardt, and Julie Peller

A watershed perspective and implementation of effective local research projects can be essential approaches for protecting water quality of the Great Lakes. Research-driven projects or curricula designed for K-12, university, and



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informal science education can help participants develop an attachment to place and can be critical to obtaining data and conducting research on emerging issues in their watershed. Still, major criticisms and perceptions of watershed monitoring in the form of citizen science are that the methods and data lack quality control, lack scientific rigor, and only provide point data available to participants. The persistence of these perceptions is a major obstacle to obtaining funding for needed local water quality monitoring efforts. This session invites participants to share strategies and projects that challenge and overturn these perceptions. Researchers, educators, and community partners are encouraged to share best practices and discuss strategies for developing impactful watershed-scale research projects.

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Laurie Eberhardt, Valparaiso University; laurie.eberhardt@valpo.edu

Julie Peller, Valparaiso University; julie.peller@valpo.edu

#19. Natural Capital Accounting

Chaired by Sarah Herbst

All living organism including human dominated ecosystems depend on the energy and natural resource stocks and flows. Accounting of natural and social capital can offer a number of benefits including but not limited to strengthening decision making and business resilience through the use of a broader information set; enhanced risk management and reduced costs; along with identification of business opportunities, revenues and comparative advantage with customer base. Responsible Sourcing is a tool within business to support sustainability (i.e. environmental stewardship, green chemistry, product stewardship, etc.), let's share examples and make a difference.

Sarah Herbst, Perrigo, Colden, NY; Sarah.Herbst@Perrigo.com

#20. An International Decade of Great Lakes Exploration and Research

Chaired by J. Val Klump, Robert Sterner, Michael Twiss, and Nancy Langston

The Laurentian Great Lakes are valuable, fascinating systems that are undergoing significant change, but challenges to scientific progress are significant. Recent publications argue that support for scientific research on the Great Lakes has not kept pace with the current and future need for fundamental, process-oriented investigation and exploration. Consequently, we too often lack basic information and the understanding required to document and forecast change, mitigate impacts, and restore and preserve the Laurentian Great Lakes ecosystem. New and ongoing pressures are affecting the region, including climate change, novel chemical pollutants, urbanization, rapidly evolving agricultural practices and land uses, eutrophication, HABs, and invasive species. Enhancement of Great Lakes science is needed but what are the highest scientific and social priorities? This town hall session is directed at formulating a coordinated, binational decadal scale program of fundamental and strategic science under the concept of an "International Decade of Great Lakes Research and Exploration" to generate new knowledge and understanding to match our commitment to Great Lakes restoration and ensure the greatest return on investment for lasting social and ecological impact.



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Nancy Langston, Michigan Tech University, Houghton, MI; nelangs3@mtu.edu

#21. The Science-Policy Interface in Great Lakes research

Chaired by Nicole Klenk, Maria Lemos, Katie Browne, and Brian Pentz

In this session, we explore how Great Lakes (GL) research becomes ‘useable’ and “policy-relevant”. Proponents argue that evidence-based policy-making (EBPM) holds the promise of demystifying decision-making and making the public-policy process systematic by adopting clear protocols based on the most relevant and rigorous knowledge base with the hope of reducing the number of policy failures. However, critical policy scholars have questioned the linear, rationalistic assumptions underlying EBPM, pointing to the messy, and often political pathways, for research to inform policy. We ask: How does the scale of decision-making (e.g., local, regional, international), the types of decisions (e.g., operational day-to-day decision, long-term programs), and the types of uncertainties associated with decision-making affect how GL research is translated into “policy-relevant” evidence? How is the science-policy interface understood by researchers, decision-makers, and stakeholders involved in GL governance? How does the science-policy interface take shape in different research contexts (e.g. research on water quality, biodiversity, agriculture, cities)?

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Katie Browne, University of Michigan, Ann Arbor, MI; kebr@umich.edu

Brian Pentz, University of Toronto Scarborough, Toronto, ON; brian.pentz@mail.utoronto.ca

#22. How to Talk Science so Policy will Listen, and Listen so Science will Talk?

Chaired by Rachel Melzer and Jennifer Winter

Have you ever wondered why Great Lakes policies and programs seem to latch on to some scientific findings, but are slow to incorporate others? Have you ever wanted to communicate your research findings to better inform and influence policy decisions? This session will offer Great Lakes researchers some “insider” views into policy processes, along with ideas about how to contribute their science into those processes.

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#23. The IJC's Science Advisory Board – Review of Current Priorities and Projects

Chaired by Carol Miller, Jeff Ridal, Deborah Lee, and Gavin Christie

The Great Lakes Water Quality Agreement requires that the International Joint Commission establish and support a Great Lakes Science Advisory Board (SAB) to provide advice on research and scientific matters to the Commission and the Great Lakes Water Quality Board. Since 1978 the SAB has been advancing its responsibilities in part through completion of projects that the Board identifies, or issues referred to it by the Commission. This session will highlight the structure and functioning of the Board and review several of its recent and ongoing projects related to (i) nutrients (including influences and transport pathways of fertilizer application, declining lake productivity, and how models can be used in an adaptive management framework), (ii) the potential impacts of unrefined hydrocarbon transport on water quality and ecological processes, (iii) assessing platforms that deliver and use information, and the flow of information to decision-makers, (iv) development of an early warning system for emerging stressors and threats, (v) development of a platform to integrate surface and groundwater models.

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Gavin Christie, Great Lakes Lab for Fisheries & Aquatic Sci, Fisheries and Oceans Canada, Burlington, ON; 905-336-4876; gavin.christie@dfo-mpo.gc.ca

#24. Managing Water Use in the Great Lakes-St. Lawrence River Basin

Chaired by John Dungavell and Mike Piskur

In 2005, the Great Lakes States, Ontario and Québec signed the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement. The Agreement details how the States and Provinces manage and protect the water resources of the Basin through an innovative structure of shared governance. This collaborative approach enables the states and provinces to achieve shared environmental goals while retaining needed flexibility that reflects the region's diverse history, geography, and political landscape. In recent years, the States and Provinces have made major improvements in the areas of water use information, cumulative impact analysis, and demand forecasting. This session will focus on data and scientific priorities for managing water use in the Basin and implementing actions taking place across various scales.

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Mike Piskur, Council of Great Lakes Governors, Chicago, IL; 3124070177; mpiskur@cglg.org



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#25. Applying the OECD's Water Governance Indicators in the Great Lakes Region

Chaired by Carolyn Johns

The Organization for Economic Cooperation and Development (OECD) Water Governance Initiative has been developing water governance principles and indicators since 2015. At the World Water Forum in March 2018, the OECD will release its 36 Water Governance Indicators (WGIs) which have been organized around 12 Principles, three dimensions: effectiveness, efficiency and trust and engagement, and will “apply to all levels of government, all water management functions, all water users, and regardless of ownership models” and be used as a “tool for dialogue to diagnose what works well at national, subnational, basin and local levels, as well as to identify gaps” (OECD 2017). This session will feature a panel of scholars and practitioners who will provide an overview of the OECD's WGIs and discuss the value and challenges of adapting and applying these WGIs in complex transboundary systems like the Great Lakes. After contributions from the panelists, attendees at this session will be engaged to discuss and critique the application of these WGIs in the Great Lakes region in terms of improving outcomes under the Great Lakes Water Quality Agreement and other efforts to improve water governance in the region.

Carolyn Johns, Ryerson University, Toronto, ON; 416-979-5000; cjohns@ryerson.ca

#26. Valuing Great Lakes Coastal Sand Dunes: New Science and Approaches

Chaired by Bradley Garmon

Great Lakes coastal sand dunes, though common along parts of Michigan's shoreline, play a vital role in building and supporting the cultural, economic and recreational aspects of the state's Great Lakes identity and heritage. A team of Michigan-based researchers and NGO partners developed a cross-disciplinary approach to understanding the role and importance of this unique landscape. This collected body of work includes efforts to: improve our understanding of the age and dynamism of the system and lake level and climactic factors influencing the periodic reactivation of dune development; update existing subjective maps of the coastal dune areas with a comprehensive new delineation made possible with recent improvements in GIS spatial imaging data and tools; engage and educate community stakeholders; and develop, deploy and analyze results from an innovative online survey protocol designed to capture, map and characterize the uses and values of residents and visitors related to the coastal sand dunes of Michigan.

Bradley Garmon, Michigan Environmental Council, Lansing, MI; 517-487-9539; brad@environmentalcouncil.org

#27. Emerging Partnerships, Research, and Capacity in the African Great Lakes

Chaired by Theodore Lawrence, Robert Hecky, and Jessica Ives

The African Great Lakes are hydrologically and ecologically diverse, species rich, and directly support millions of people. These lakes, like those of all freshwater systems globally, face a set of challenges that have been studied over many decades. Among these challenges are a lack of coordinated research, a dearth of future freshwater experts, and inadequate resources to facilitate effective management. This session will focus both on results of research that has been conducted on the African Great Lakes, and also the benefits and challenges of conducting research in Africa. The



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African Center for Aquatic Research and Education (ACARE), a newly created non-profit, intends to facilitate a long-term, perpetual process of collaboration between freshwater experts globally for the purpose of enhancing and harmonizing research, growing a global network of partners, training the next generation of African freshwater experts, and positively influencing freshwater management and policy on the African Great Lakes. Submissions are welcome from all aspects of African Great Lakes, with particular attention to those that stimulate ideas that describe processes and systems that enable this to happen. This session will conclude with a 40 minute facilitated discussion among key participants focusing on how ACARE can facilitate international research and collaborations on the African Great Lakes. Interested parties are strongly encouraged to attend and provide insight. More information on ACARE can be found at www.agl-acare.org.

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Robert Hecky, formerly of Large Lakes Observatory, Duluth, MN; 204-582-0288; rehecky@gmail.com

Jessica Ives, University of Windsor, Windsor, ON; 2262462732; jives@uwindsor.ca

#28. Pilot Projects and Future Visions: Transdisciplinary Collaboration for Applied Research

Chaired by Justine Holzman and Sandra Cook

Great Lakes are challenging yet critical sites to apply the recent scientific research that addresses interdependent ecological and anthropogenic issues. The shorelines of the world's Great Lakes are extremely productive landscapes both ecologically and economically. Conventional industrial shorelines of ports, factories and farmland that employ ubiquitous technologies and practices need to be challenged. New approaches to the management of the world's Great Lake resources which are supportive of both human habitat and ecological viability need to be implemented. Taking action to amend harmful practices and restore ecological health requires policy capable of ensuring action in complex landscapes with competing environmental and economic goals. Productive collaboration for designing and implementing adaptive and resilient landscape infrastructure requires flexible organizational structure, diverse teams, and the time and budget for pilot projects to refine and further develop research and design methods. We are asking for submissions from scientists, engineers, and designers working collaboratively on pilot projects and future visions for the Great Lakes. Asking, how can we apply scientific research for broad scale impacts? What projects do we need to make important regulatory changes? How do we assemble and create pilot projects and applied research that support our vision for the Great Lakes of the future? What opportunities do we have to tie restoration with industry? What have been successful moments of collaboration and practice that have facilitated transdisciplinary research?

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Monitoring, Modeling, and Analysis: Sessions 29-36

#29. Preliminary Results from the 2017 CSMI Intensive Field Year on Lake Huron.

Chaired by Paris Collingsworth and David Bunnell

The Cooperative Science and Monitoring Initiative (CSMI) is a binational program that coordinates monitoring and research efforts on each Great Lake over a five-year cycle. Research and monitoring efforts are guided by priorities identified in Lakewide Action and Management Plans (LaMPs) and the results generated from CSMI field efforts inform the development of future management programs. In 2017, CSMI research and monitoring efforts were focused on Lake Huron and presenters will share results from the intensive field year and knowledge gained during the CSMI effort during this session.

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David Bunnell, USGS Great Lakes Science Center, Ann Arbor, MI; 7342149324; dbunnell@usgs.gov

#30. Ecosystem Impacts of the Lake Ontario-St Lawrence River Flood of 2017

Chaired by Michael Twiss and Jeff Ridal

The spring and summer of 2017 brought extreme water levels to Lake Ontario and the Saint Lawrence River. Adverse impacts of the extreme water levels included economic disruption to recreation and property damage. Ecosystem impacts varied from potentially beneficial (disturbance of wetland marshes to increase fish spawning) to adverse (pollutant mobilization through erosion and debris dispersal). Presentations will illustrate the impacts that high water levels had on the nearshore ecosystem.

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Jeff Ridal, St. Lawrence River Institute, of Environmental Sciences, Cornwall, ON; 613-936-6620; jridal@riverinstitute.ca

#31. Evaluation of the Current State of Ecological Modeling and Future Perspectives

Chaired by Alex Neumann, Dong-Kyun Kim, Yuko Shimoda, and George Arhonditsis

In the Great Lakes area, the emergence of the ecosystem approach has pervaded the contemporary mathematical modeling practice, increasing the demand for more complex ecosystem models. The current challenges make compelling the development of more realistic modeling platforms (i) to elucidate causal mechanisms, complex interrelationships, direct and indirect ecological paths of the Great Lakes basin ecosystem; (ii) to examine the interactions among the various stressors (e.g., climate change, urbanization/land-use changes, alternative management practices, invasion of exotic organisms); and (iii) to assess their potential consequences on the lake ecosystem



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functioning (e.g., food web dynamics, benthic-pelagic coupling, fish communities). The proposed session aims to provide insights into the current state of the field, and also highlight the major challenges and future directions of research. Special emphasis will be placed on studies that address topics, such as novel uncertainty analysis techniques, Bayesian inference methods (including Bayesian networks), development of new model formulations and proper representation of plankton functional types, emerging techniques of data assimilation and model optimization, effective integration of physics with biology, accommodation of the interplay between inshore and offshore areas, and strategies to improve the contribution of complex models to ecological theories. The proposed session encourages contributions from both mathematical and statistical ecosystem modelers.

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George Arhonditsis, University of Toronto Scarborough, Toronto, ON; 416-208-4858; georgea@utsc.utoronto.ca

#32. Long-Term Monitoring: Achievements, Challenges, and Solutions

Chaired by Alexander Karatayev, Lyubov Burlakova, James Watkins, and Elizabeth Hinchey Malloy

Freshwater ecosystems harbor a rich diversity of species and habitats and also provide critical resources to people. The condition of these ecosystems can be degraded by numerous environmental stressors, such as increases in pollution, habitat alteration, introduction of invasive species and other factors that impact, and in some cases, profoundly alter biotic and abiotic processes in these ecosystems. Long-term monitoring is essential for understanding the effects of these activities and the effectiveness of restoration and protection activities, especially in large lakes with long turn-over time. Long-term monitoring provides information on water quality and other ecosystem services, enabling discrimination between interannual variability and longer-term trends. We invite talks on the topics of monitoring methods, analysis of long-term data series, and consideration of new perspectives or solutions to recognized and emerging research and management issues related to the Great Lakes and other large lakes worldwide.

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James Watkins, Cornell University, Bridgeport, NY; 315-378-8115; jmw237@cornell.edu

Elizabeth Hinchey Malloy, U.S. EPA GLNPO, Chicago, IL; 312-886-3451; hinchey.elizabeth@epa.gov



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#33. Toward a Great Lakes Early Warning System

Chaired by Michael Donahue and Kathryn Friedman

The International Joint Commission (IJC) has embarked on a timely and much-needed initiative to identify emerging ecosystem issues and recommend strategies for preventing and resolving them through the development and operation of a “Great Lakes Early Warning System”. Such a system will allow resource managers basin-wide to take a coordinated, structured approach to anticipate, avoid or otherwise respond to complex threats (e.g., chemical substance impacts, Harmful Algal Blooms, invasive species) facing the binational Great Lakes-St. Lawrence System. This session features speakers who will share “lessons learned” and “best practices” gleaned from various applications of early warning systems, drawn from various geographies (i.e., within Canada and the United States) and topical areas. The session will also provide an opportunity for attendees to share thoughts on critical features of a prospective Great Lakes Early Warning System. Information gleaned from the presentations and subsequent attendee dialogue will be carefully considered as the IJC develops the framework for a Great Lakes Early Warning System.

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Kathryn Friedman, U Buffalo - SUNY Friedman, U Buffalo - SUNY, Buffalo, NY; 716-878-2431; kbf@buffalo.edu

#34. Aquatic Habitat Evaluation and Assessment

Chaired by Susan Doka and Jeff Buckley

We invite a broad range of presentations on Great Lakes aquatic habitat research, management and policy. Topics of interest range from mapping and measuring key habitat variables, the valuation of habitats (e.g. suitability or other metrics), to establishing species-specific, community or ecosystem linkages with habitat quality or supply. Both monitoring and modeling applications are encouraged and could include habitat condition assessments, effectiveness measures of habitat actions, and the validation of habitat associations or niche based approaches. Tools and systems development as well as landscape approaches for habitat evaluation and assessment are needed for managers and should be highlighted here; no matter the scale, as long as there may be broad applicability to the Great Lakes’ community. Effects on biodiversity and productivity from multiple stressors or cumulative impacts research on water regulation, pollution, invasive species, climate change and development are especially relevant. Natural variability in habitats and their usage by biota is also important for context in habitat evaluations and assessments. Novel management and policy initiatives like habitat banking or offsetting in the Great Lakes and management- stakeholder partnership programs are welcome.

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Jeff Buckley, Ontario Ministry of Natural Resources & Forestry, Picton, ON; 613-476-1619; jeff.buckley@ontario.ca



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#35. Watershed Modeling across all Scales from Small to Large

Chaired by Agnes Richards, Dale Robertson, Glenn Benoy, and George Arhonditsis

Watershed models (e.g., SPARROW, SWAT) have been applied across a wide range of scales to quantify nutrient loadings, sources, and sinks. There is a wide range of applications in the literature which include single-model and multi-model approaches. Modelers make critical decisions about the spatio-temporal data resolution, data sources, sub-routines, management operations, calibration, parametrization, and uncertainty quantification. We invite contributions from all watershed modeling studies that address some of these critical decision points.

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George Arhonditsis, University of Toronto Scarborough, Toronto, ON; 416-208-4858; georgea@utsc.utoronto.ca

#36. Improving Model Predictions through Coupled System and Data Assimilation

Chaired by Pengfei Xue, Philip Chu, Matthew Hoffman, and Vincent Fortin

Numerical models have proved to be a useful tool for understanding, simulating and predicting physical, biological and ecological processes. However, most models were developed and implemented in a standalone mode or loosely linked fashion to simulate a single process. With advances in high performance computing and software coupling, multiple models now have the capability to run in an integrated coupled mode, exchanging information dynamically. Model coupling has great potential to increase the accuracy of models in the Great Lakes, but it is not widely used. With regards to data, the Great Lakes region has a fairly dense and long-term observational record of meteorological and physical parameters, especially compared to other coastal areas and deep oceans. These in-situ measurements and remotely sensed data have been widely used for model initialization and verification, but rarely get blended into model simulations to improve short-term forecasts or create reanalyses through data assimilation--which is one of the most effective approaches for statistically combining observational data and model dynamics to provide the best estimate of system state. This session invites contributions focusing on model improvement through model coupling (atmospheric, hydrologic, hydrodynamics, wave, ice, water quality and ecological models) and data assimilation.

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Matthew Hoffman, Rochester Inst. of Technology, School of Mathematical Sci., Rochester, NY; 585-420-6288; mjhsma@rit.edu

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Nutrients, HABs, and Emerging Contaminant Stressors in the Great Lakes: Sessions 37-46

#37. Harmful Algal Blooms (HABs) and their Toxicity: Remote Sensing and Modeling Approaches

Chaired by Homa Kheyrollah Pour, Serghei Bocaniov, and Philippe Van Cappellen

Harmful Algal Blooms (HABs) are a worldwide problem that has been widely recognized over the past several decades. While freshwater HABs can occur naturally, human activities leading to increased eutrophication as well as climate change have been linked to the increased occurrence and intensity of HABs. HABs can be both non-toxic or toxic. While non-toxic HABs can negatively impact water quality, fisheries and recreational facilities, toxic blooms may additionally cause illness and death in humans and wildlife. Therefore, it is vital to be able to understand and predict the toxicity of HABs. Though a variety of physical, chemical and biological variables have been suggested as factors triggering HAB toxicity, much remains to be done to improve our predictive and response capabilities, including the early detection and tracking of blooms, monitoring of HAB toxicity, and the development of scale-adaptive modeling tools. The primary goal of this session is to create a valuable opportunity for the interdisciplinary exchange of ideas and experiences between the lake modeling, remote sensing, and Earth System Modeling communities. The session will facilitate in-depth discussions of emerging concepts, field and satellite observations, as well as statistical and mechanistic modeling approaches. We particularly welcome presentations on field observations of HABs, predictive modeling studies, statistical analyses of the environmental factors that control algal and nutrient dynamics in lakes, and recent advances in estimating Chl-a and other relevant variables using field and remotely-sensed observations for seasonal and inter-annual forecasting of HABs.

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Serghei Bocaniov, University of Waterloo, Ann Arbor, MI; 734-763-2646; bocaniov@umich.edu

Philippe Van Cappellen, University of Waterloo, Waterloo, ON; 519-888-4567; pvc@uwaterloo.ca

#38. Nutrient Sources, Transport & Retention in Great Lakes Watersheds: Field Measurements, Modeling and Management implications

Chaired by Chris Parsons, Maria Dittrich, Kimberly Van Meter, and Agnes Richards

Despite numerous ongoing field and modeling studies there are still considerable knowledge gaps surrounding nutrient non-point sources, transport pathways, and sink dynamics across the Great Lakes Basin. Surprisingly little is known about the effects of seasonality, storm events, land use, and management practices on particulate and aqueous speciation and the bioavailability of key nutrients such as carbon, nitrogen, phosphorus, silicon, iron and sulfur. We invite contributions from field studies, laboratory experiments, and modeling investigations to examine key processes driving nutrient dynamics between source and sink areas. We are particularly interested in work related to coupled nutrient cycles, nutrient speciation, different nutrient source signatures, nutrient legacies, the effects of seasonality and high flow events.



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Agnes Richards, Environment Canada, Burlington, ON; 905-336-4838; Agnes.Richards@canada.ca

#39. Managing Agriculture Water and Nutrients - Science Solutions for Tomorrows BMP's

Chaired by Donna Speranzini and Pamela Joosse

There are many ways that agricultural production systems impact water quality. Some of these are well understood and have clear management practices that can be precisely implemented where needed. Other sources and pathways are less understood and practices are still being developed and tested for their ability to improve tributary and lake water quality. This session will provide a forum to discuss some of the latest understanding and innovations for managing water and nutrient losses from agricultural sources at the farm scale including research related to: livestock; muck soils; biosolids, water conservation, treatment and reuse; wastewater and stormwater treatment; on-farm processing; greenhouse; and on-farm energy production. We would solicit expertise from both within and outside the basin to bring forward relevant solutions. The session will also aim to explore agricultural sources and management opportunities that may not be well understood or incorporated in current landscape models or programs.

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Pamela Joosse, Agriculture and Agri-Food Canada, Guelph, ON; pamela.joosse@agr.gc.ca

#40. Connecting Knowledge Gaps: Physiology, Ecology, Food-Web Transfer to Forecasting HABS

Chaired by Yuko Shimoda, Satyendra Bhavsar, and Dong-Kyun Kim

There is a great deal of research on cyanobacteria and mechanisms triggering Harmful Algal Blooms (HABs), but there are still many complex questions that remain unclear. For example, what are the causal factors that drive blooms and toxin production? What are the impacts of toxins on food-web dynamics? When and where cyanobacteria blooms are most likely expected? Predictive models (both empirical and mathematical) developed for HABs often fail to capture the occurrence and magnitude of algal blooms. In his "Horizon" article, Flynn (2005) pointed out that the problem in aquatic sciences is rooted in the inadequate dialogue between the biologists and modelers; modelers are often not supported by sound conceptual understanding of biological processes and adequate empirical knowledge on the patterns of sentinel plankton organisms under environmentally relevant conditions. By contrast, biologists often lack sufficient guidance on how data collection and experimentation could be optimized for the development of predictive models. In the context of water quality management, prediction and forecasting of HABs should evolve more rationally and congruent with the technological constraints and data availability, modelers should embrace methodological advances, and more critically consider the future directions. This session aims to bring researchers, field practitioners, and others



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to share the latest advancements on HABs research and synthesize our collective knowledge in order to guide more effectively future management actions.

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Dong-Kyun Kim, University of Toronto Scarborough, Toronto, ON; dkkim1004@gmail.com

#41. Great Lakes Harmful Algal Blooms Research from Watershed Influence to Ecosystem Effects

Chaired by Kenneth Gibbons, Christopher Winslow, Michelle Selzer, and Michael Murray

The increased presence of CHABs (Cyanobacterial Harmful Algal Blooms) across the Great Lakes has resulted in substantial research efforts and technological innovations to (1) predict bloom dynamics (e.g., movement both vertically and horizontally, forecast bloom size, timing, and toxicity, understand bloom species composition, etc.), (2) assess the health risks associated with cyanobacterial toxin exposure to human and ecological health, increase our ability to detect toxins in both aquatic ecosystems and within the human body, and increase our ability to remove toxins during water treatment, (3) assess patterns and trends in fertilizer application, nutrient dynamics, and transport pathways within soils and receiving waterbodies, (4) model how effective land use management might be at reducing nutrient inputs, optimizing implementation of these practices, and use edge-of-field and demonstration farms to identify approaches to both reduce and remediate nutrient inputs (e.g., nutrient management, wetlands, two-stage ditches, cover crops, etc.), and (5) connect scientists with producers and partners of agriculture through community-engaged research aimed at maximizing the impact of investments and accelerating the implementation of conservation programs. In this session, presenters from across the Great Lakes will detail the progress that has been made within the aforementioned themes.

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Christopher Winslow, Ohio Sea Grant College Program, Columbus, OH; winslow.33@osu.edu

Michelle Selzer, Michigan Office of the Great Lakes, Lansing, MI; 517-284-5050; selzerm@michigan.gov

Michael Murray, National Wildlife Federation, Great Lakes Regional Center; 706-504-3825; murray@nwf.org

#42. Multi-Watershed Nutrient Study: Establishing a Monitoring Network in Agricultural Regions

Chaired by Ryan Sorichetti, Mohamed Mohamed, Grace Arabian, and Laura Benakoun

This session highlights the Multi-Watershed Nutrient Study (MWNS); a provincial network to assess agricultural non-point source nutrient loading to inform key bi-national and provincial commitments. This collaborative initiative focuses on the relationship between agricultural land use, land management and nutrient export, emphasizing high flow events across seasons. Presentations in this session will detail the goals, design, implementation, and preliminary results of this work including aspects of monitoring station construction, telemetry, and data management and analysis.



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*Laura Benakoun, Ministry of the Environment and Climate Change, Etobicoke, ON; 4162356850;
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#43. Climate Change Impacts on Ecohydrology of Urbanized Watersheds Draining into Large Lakes

Chaired by Mahyar Shafii, Mohamed Mohamed, Stephen Braun, and Philippe Van Cappellen

Urban watersheds are unique environments containing engineered waterways and buried streams that not only alter hydrological and biogeochemical functioning of the watershed, but also affect ecosystem functions that are critical for enhancing water quality in receiving waters including large lakes. Climate change-induced extreme weather intensifies the negative impacts of urbanization on ecosystems health. To adopt mitigation options for infrastructure retrofits that are necessary for water quality control under extreme weather, decision makers need an improved understanding of the sources, pathways, retention mechanisms, and seasonal timing of contaminant and nutrient export in urbanized watersheds. The goal of the proposed session is to bring together a broad range of studies that provide improved understanding of the hydrochemical dynamics in urban watersheds and implications for receiving waters, especially under climate change. We invite observational, theoretical, and modeling contributions to urban ecohydrology including, but not limited to, impacts of extreme climatic events on hydro-biogeochemical fluxes and urban non-point source pollution, targeted ecosystem-based conservation/restoration activities with the potential to adaptation to climate change, green approaches to nutrient control at the watershed scale, effects of policy and capacity building on the climate change resilience of large lakes receiving water from urbanized watersheds.

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Stephen Braun, Matrix Solutions Inc., Guelph, ON; sbraun@matrix-solutions.com

Philippe Van Cappellen, University of Waterloo, Waterloo, ON; 519-888-4567; pvc@uwaterloo.ca



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#44. Unrefined Hydrocarbon Transport in the Great Lakes Basin

Chaired by Rochelle Sturtevant, Matthew Child, Michele Leduc-Lapierre, and Katherine Bunting-Howarth

Crude oil travels through the Great Lakes basin in unprecedented quantities and domestic crude production has been increasing over the last decade. Crude oil production from several formations west of the Great Lakes has strained pipeline capacity, increasing the importance of other modes of transportation, particularly rail. Infrastructure and operation of multiple modes of crude oil transportation pose a risk to the Great Lakes and other watersheds in the U.S. and Canada, and has been accompanied by increased safety concerns. This session will explore the complexity of crude oil movement and potential risk in the Great Lakes, St. Lawrence River and other northern basins, including regional transportation, spill response, and hazards and environmental sensitivity.

Rochelle Sturtevant, GLERL/NOAA, Sea Grant Extension, Ann Arbor, MI; 734-741-2287; rochelle.sturtevant@noaa.gov

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Michele Leduc-Lapierre, Great Lakes Commission, Ann Arbor, MI; 7349719135; michelel@glc.org

Katherine Bunting-Howarth, NY Sea Grant, Ithaca, NY; (607) 255-2832; keb264@cornell.edu

#45. Hypoxia: Causes, Impacts, and Management

Chaired by Mark Rowe, Hongyan Zhang, J. Val Klump, and Reza Valipour

Contributions are invited on hypoxia, including physical, ecological, and human dimensions perspectives. Hypoxia occurs in freshwater and coastal marine systems when dissolved oxygen decreases to levels that have ecological impacts (e.g., <2 mg/L). Hypoxia is a result of both physical and ecological mechanisms. Eutrophication causes excessive production of organic matter, resulting in elevated biochemical oxygen demand, while stratification of the water column prevents replenishment of oxygen from the epilimnion. Hypoxia impacts aquatic ecosystems by limiting the distribution of benthic organisms, by limiting access of fish to preferred habitat, and by interrupting (e.g., enhancing or decoupling) predator-prey interactions. In addition, hypoxia alters biogeochemistry by releasing phosphorus from the sediment, and by releasing reduced iron and manganese that affect drinking water treatment. We also welcome contributions describing hypoxia management approaches including monitoring, modeling on multiple scales, and consideration of human dimensions.

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J. Val Klump, School of Freshwater Sciences, Milwaukee, WI; 414-382-1700; vklump@uwm.edu

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#46. Plastics in the Great Lakes: Characterizing the Problem and Finding Solutions

Chaired by Paul Helm and Sara Belontz

Plastic (nano-, micro- and beyond) in the Great Lakes basin is receiving considerable public and scientific attention as an emerging contaminant. The research effort is growing, documenting the extent of plastic and microplastic pollution across the region, and investigating the potential impacts of such debris. A high level of awareness, interest and engagement is also fostering initiatives and innovations to help reduce plastic contamination. This session will highlight new findings on the occurrence, sources, and fate of plastic debris and microplastic particles in aquatic and terrestrial environments, the potential impacts and harm associated with this emerging contaminant, as well as identifying solutions to begin reducing the release of plastic into the environment.

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Sara Belontz, Western University, London, ON; sbelontz@uwo.ca

Physical Processes and Limnology: Sessions 47-53

#47. Physical Processes in Lakes

Chaired by Leon Boegman, Mathew Wells, Reza Valipour, and Marek Stastna

This session will focus on physical limnology of the Great Lakes and other lakes of the world. Papers are welcome that apply theoretical, computational modeling, laboratory and/or observational methods to investigate physical hydrodynamic processes (e.g., waves, currents, turbulence, stratification, sediment transport, etc.).

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Reza Valipour, Environment and Climate Change Canada, Burlington, ON; 905 319 7204; valipour.r@gmail.com

Marek Stastna, University of Waterloo, Waterloo, ON; 519-888-4567; mmstastn@uwaterloo.ca

#48. Physical Ecology in Large Lakes and their Watersheds

Chaired by Josef Ackerman, Shaylah Tuttle-Raycraft, and Lakshika Giriagama

This session will highlight biological-physical interactions in the benthic and pelagic zones of lakes as well as streams and rivers in their watersheds. We encourage contributions that address important ecological functions as well organismal responses to abiotic stress.



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Shaylah Tuttle-Raycraft, University of Guelph, Guelph, ON; stuttle@uoguelph.ca

Lakshika Giriagama, University of Toronto, Toronto, ON; 647-673-7473; lakshika.rwrh@utoronto.ca

#49. Big Lakes – Small World: IAGLR Teams with the European Large Lakes Symposium in 2018

Chaired by John Lenters, Lars Rudstam, Robert McKay, and Orlane Anneville

Large lakes around the world provide many important ecosystem goods and services to society. Despite the significant diversity among the world's great lakes, these important ecosystems are impacted by many common stressors such as climate change, eutrophication, and invasive species. Motivated by discussions at the 2015 European Large Lakes Symposium (ELLS), as well as IAGLR meetings in 2016 and 2017, this session is devoted to "great lakes of the world," in anticipation of the first joint ELLS / IAGLR conference in Evian-les-Bains, France (Lake Geneva; September 23-28, 2018). Submissions are welcome from all aspects of global, large-lake limnology, particularly those that highlight the diversity and commonalities among the world's great lakes and that stimulate interest and participation in the 2018 international meeting in France.

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#50. Fate and Transport of Suspended Particles

Chaired by Rajat Chakraborti and Jagjit Kaur

The origin of particles, whether organic or inorganic, along with the flow in the system are the governing factors of shape and size of suspended particles. In the natural systems or in the treatment plant operations, most of the particles flocculate and develop complex aggregate structure. Due to the development of variable porosity, size, and shape and uncertainty in the estimation of floc density, it makes difficult to predict the fate and transport of particles which are often non-compact and non-spherical aggregates. This has implications on how sediment transport and deposit, as well as how sorption and desorption processes are represented within a modeling framework. The analysis of number and distribution of primary particles in an aggregate structure is important to design particle-mediated processes for engineered and natural aquatic systems. For example, it is important to improve our understanding of how to analyze



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settling of suspended particles as a means of improving model capabilities and decision making for remediation and the best management practices. As the flocs grow, Brownian motion becomes slow and insignificant, and other forces make the flocs stick together, for example, by convection currents caused by the temperature gradient. It is important to understand particle behavior from the practical point of view. Processes like aggregation and disaggregation are important in terms of predicting fate and transfer of particles which control many important environmental processes like, coagulation, flocculation, advection, adsorption, desorption and particle settling. This session will focus on presentations from academics, researchers and professionals.

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Jagjit Kaur, CH2M HILL, Los Angeles, CA; 213-228-8229; jkaur@ch2m.com

#51. Coastal Resilience

Chaired by Ali Farhadzadeh, Joseph Atkinson, Henry Bokuniewicz, and Sean Burkholder

The session will focus on resilience of built and natural environments in coastal areas. The session will accept abstracts on topics ranging from coastal hydrodynamics and morphology, coastal structures and shore protection measures (traditional and newly emerged techniques, e.g., living shorelines), environmental hydrodynamics, and coastal zone management and planning.

Ali Farhadzadeh, Stony Brook University, Stony Brook, NY; 631-632-9513; ali.farhadzadeh@stonybrook.edu

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Henry Bokuniewicz, Stony Brook University, Stony Brook University, NY; 631-632-8674; henry.bokuniewicz@stonybrook.edu

Sean Burkholder, University at Buffalo, The State University of NY; seanburk@buffalo.edu

#52. Climate Interactions with Large Lakes' Physical Systems

Chaired by Brent Lofgren and Jia Wang

Variability and changes in climate are interactive among the air, land, water, and ice of the Great Lakes region and other locations with large lakes, and link into the global atmosphere-ocean-surface system, as well as ecosystems regionally and globally. Hemispheric and global climatic phenomena can have different characteristics according to time scale— from teleconnections lasting for seasons, to greenhouse gases in this century and going forward, to ice age cycles. The last two decades have had particularly wide variance in lake level regimes. We welcome contributions that address how lakes and their ecosystems interact with all aspects of the climate system at this wide range of time scales and in any lake-influenced region of the world.



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#53. Great Lakes Water Level Fluctuations and Water Management

Chaired by Vincent Cheng, Aisha Javed, Agnes Richards, and Dong-Kyun Kim

The Laurentian Great Lakes are home to more than 30 million people and consist of over 10,000 miles of shoreline. Fluctuations of water levels on the Great Lakes are an on-going concern and have received considerable attention from many different sectors that depend on the various services provided by these freshwater bodies such as: hydroelectric power, transportation for shipping, shoreline recreation, and a source of drinking water for many Canadian and U.S. citizens. Understanding the processes that drive the Great Lakes water level fluctuations and the ability to forecast is therefore an issue of great societal importance. This session aims to identify recent research developments that advance our understanding of the water level fluctuations and/or the water budget in the Great Lakes, and make an impact to the water resources and/or shoreline management. This can include improvement of existing modeling tools, coupling of climate and hydrological models, different novel empirical methods, and/or utilization of new type of observations to predict/project water level fluctuations from the short-term to the future decades.

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Aisha Javed, University of Toronto Scarborough, Toronto, ON; aisha.javed@mail.utoronto.ca

Agnes Richards, Environment Canada, Burlington, ON; 905-336-4838; Agnes.Richards@canada.ca

Dong-Kyun Kim, University of Toronto Scarborough, Toronto, ON; dkkim1004@gmail.com

Linkages between Nearshore and Offshore Zones: Sessions 54-58

#54. Food Web Ecology and Dynamics of Lake Ontario: Nearshore – Pelagic Linkages

Chaired by Mohiuddin Munawar, James Watkins, and Mark Fitzpatrick

Lake Ontario underwent significant ecological and trophic alterations due to exposure to multiple stressors over the past four decades that have impacted the whole food web including: eutrophication and phosphorus abatement, contaminants, invasive species and climate change. Research into these and other stressors has benefitted from programs like CSMI and continued monitoring of coastal Areas of Concern under Remedial Action Plans. Few studies can be broad enough to capture the diversity of habitats found within the lake; these include coastal zones that range from oligotrophic to hyper-eutrophic as well as pelagic waters that are ultra-oligotrophic. The goal of this session is to bring together diverse studies from all types of habitats within the lake including all trophic levels from phytoplankton to fish to provide a holistic understanding of Lake Ontario. Linkages between nearshore and offshore habitats are particularly important for sustainable food webs. Studies with a geographic or food web focus are welcome as are studies which



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attempt to bridge our understanding of the whole lake. We also welcome papers that address the potential impacts of delisting AoCs on the main lake and emerging/novel monitoring techniques for the future.

Mohiuddin Munawar, Great Lakes Lab for Fisheries, and Aquatic Sciences, Burlington, ON; 905-336-4867; mohi.munawar@dfo-mpo.gc.ca

James Watkins, Cornell University, Bridgeport, NY; 315-378-8115; jmw237@cornell.edu

Mark Fitzpatrick, Fisheries & Oceans Canada, Burlington, ON; 905-336-6402; mark.fitzpatrick@dfo-mpo.gc.ca

#55. Solutions for Lake Ontario: Addressing the Human Footprint on Regional Water Quality

Chaired by Shari Dahmer, Todd Howell, Nadine Benoit, and Gary Bowen

Lake Ontario has a long history of water quality and ecosystem health concerns, with pollutant and nutrient loadings from the land significantly impacting the lake. This session will highlight research and management activities in Lake Ontario – with an emphasis on Western Lake Ontario – making connections between actions on land and the health of the lake. The session will conclude with a discussion on collective actions that can be implemented to restore, preserve and protect Lake Ontario.

Shari Dahmer, Toronto and Region Conservation Authority, Toronto, ON; sdahmer@trca.on.ca

Todd Howell, Ontario Ministry of the Environment, Env. Monitoring & Reporting Br, Toronto, ON; 416-235-6225; todd.howell@ontario.ca

Nadine Benoit, Ontario Ministry of the Environment, Toronto, ON; 416-235-6229; nadine.benoit@ontario.ca

Gary Bowen, Toronto and Region Conservation Authority, Downsview, ON; 416-271-8944; gbowen@trca.on.ca

#56. Science for a Healthy Lake Simcoe

Chaired by Erin Dunlop and Justin Trumpickas

Lake Simcoe, a large lake in southern Ontario close to many population centres, has been greatly affected by human activities, with subsequent alterations occurring in many aspects of the lake's ecosystem, from water quality to fish communities. Ongoing efforts to improve the lake's health have included long-term monitoring, targeted research, and management actions. This session highlights the multitude of approaches used to better understand the lake ecosystem and the science required to support the management of the lake's valuable resources. Lake Simcoe offers a great study system for understanding the impact of key stressors on the Laurentian Great Lakes, where many of the same pressures exist.

Erin Dunlop, ON Ministry of Natural Resources, Trent University, Peterborough, ON; 705-755-2296; erin.dunlop@ontario.ca



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*Justin Trumpickas, ON Ministry of Natural Resources & Forestry, Peterborough, ON; 519-583-3025;
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#57. Advances in Understanding Nearshore Ecosystems in Great Lakes and Connecting Channels

Chaired by Elizabeth Hinchey Malloy, Janette Anderson, Mari Nord, and Pete Zuzek

Although nearshore waters are the most highly used and visible parts of the lakes, regular monitoring has primarily concentrated on the offshore regions and the connections between the condition of the nearshore waters and their adjacent shorelines remain largely unknown. Nearshore environments are dynamic habitats, and understanding the nearshore environment and impacts to it requires a holistic approach that reflects their complexity. This session seeks submissions from ecologists, biologists, geologists, chemists, and physical oceanographers which directly address advances in nearshore monitoring approaches, the role of land-based and offshore forcing factors on nearshore dynamics, and assessment of condition and function of nearshore environments at multiple scales.

Elizabeth Hinchey Malloy, U.S. EPA GLNPO, Chicago, IL; 312-886-3451; hinchey.elizabeth@epa.gov

Janette Anderson, Environment and Climate Change Canada, Burlington, ON; janette.anderson@canada.ca

Mari Nord, U.S. EPA Region 5, Chicago, IL; nord.mari@epa.gov

Pete Zuzek, Zuzek, Inc., Waterdown, ON; pzuzek@zuzekinc.com

#58. Cities on the Shore: Urbanization as a Growing Threat to Nearshore Ecosystem Health

Chaired by Andrea Kirkwood and Claire Oswald

Over 40 million people live in the Laurentian Great Lakes Basin (GLB), and most are concentrated in urban centers. With urban expansion in the GLB, watersheds are experiencing major changes in hydrological response and increased sediment and contaminant loads. This session will focus on the impacts of urbanization to water quality and biotic integrity in GLB watersheds, as well as the downstream impacts of urban tributaries to nearshore ecosystem health in the Great Lakes.

Andrea Kirkwood, University of Ontario Institute of Technology, Oshawa, ON; 905-721-8668; andrea.kirkwood@uoit.ca

Claire Oswald, Ryerson University, Toronto, ON; 416-979-5000; coswald@ryerson.ca



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Remote Sensing and Detection Techniques: Sessions 59-61

#59. Innovative Monitoring Across the Great Lakes

Chaired by Ed Verhamme and Bryan Stubbs

This session will focus on innovative monitoring methods that aid scientists and managers in collecting unique datasets to address the major issues facing the Great Lakes. Presentations are welcomed that use new technology, methods, or data analysis techniques to collect in-situ or remote sensing data from the Great Lakes, its tributaries, or watersheds. Advances in technology, telemetry, cheap sensors, the Internet of Things, custom applications, and other devices allow a new generation of data to be collected to help monitor at medium to large scales across the Great Lakes. Recent examples include the Great Lakes Acoustic Telemetry network, the nearshore buoy network, drifters, wet chemistry nutrient monitoring, arduino based data loggers and others. Authors are encouraged to present on conceptual build out of new and emerging technology and networking.

Ed Verhamme, LimnoTech, Ann Arbor, MI; 734-332-1200; everhamme@limno.com

Bryan Stubbs, Cleveland Water Alliance, Cleveland, OH; bstubbs@clewa.org

#60. Seeing Below the Surface: Quantifying the Underwater Environment with Image Analysis

Chaired by Knut Mehler, Peter Esselman, Molly Wick and Ted Angradi

The recent proliferation of increasingly cost-effective technologies to gather and analyze underwater still and video imagery creates new opportunities to address ongoing challenges of sampling and assessing benthic ecosystems. These advances also present new challenges to be overcome for data acquisition, processing, and analysis. The purpose of this symposium is to expose the IAGLR membership to the exciting advances made possible by underwater image analysis, and to identify key challenges to their successful application. A range of image acquisition strategies will be explored from vessel-based sampling to towed camera sleds to autonomous underwater vehicles, and use of stereographic and monocular imagery. Case studies highlighting the use of underwater images for benthic habitat characterization, species identification, abundance estimation, species sizing, species behavior, and mapping of underwater cultural features will be shared with emphasis on data acquisition, image interpretation, and technical challenges. Solutions to the central challenge of “feature extraction” from thousands or tens of thousands of image frames using crowd sourcing and model-based approaches will be explored, and their promise for the future elaborated.

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Ted Angradi, U.S. EPA MED, Duluth, MN; 218-529-5243; angradi.theodore@epa.gov



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#61. Remote Sensing, Visualization, and Spatial Data Applications for the Great Lakes

Chaired by Robert Shuchman and George Leshkevich

Contributions are invited on all aspects of remote sensing (including data collection, data analysis/interpretation, data applications, etc.) in the Great Lakes or other large lakes from satellite, airborne, ship, or other platforms. Presentations highlighting the role of remote sensing in interdisciplinary studies are encouraged, as are presentations describing the utilization of new or innovative sensors (such as scatterometer, hyperspectral, or acoustic) or techniques (such as data fusion and data visualization) for research or operational use.

Robert Shuchman, Michigan Tech Research Inst., Ann Arbor, MI; 734-913-6841; robert.shuchman@mtu.edu

George Leshkevich, Great Lakes Env. Research Lab, NOAA, Ann Arbor, MI; 734-741-2265; george.leshkevich@noaa.gov

General: Sessions 62-63

#62. Distilling A Career: A Tribute to Doug Haffner's Contributions to Environmental Research on Large Lakes

Chaired by Aaron Fisk and Craig Hebert

After more than 30 years, Professor and Canada Research Chair G. Douglas Haffner retired from the University of Windsor in September 2017. Doug has published more than 150 papers and three book chapters that have advanced aquatic research in the areas of ecotoxicology, food web trophodynamics, limnology of ancient lakes and non-point source eutrophication of lakes and rivers. His career has focused on the Laurentian Great Lakes, with important research in ancient and threatened lakes in Indonesia and China. This session will focus on Doug's research areas and his contributions.

Aaron Fisk, University of Windsor, Windsor, ON; 519-253-3000; afisk@uwindsor.ca

Craig Hebert, Environment Canada, Ottawa, ON; 613-998-6693; craig.hebert@ec.gc.ca

#63. General Contributions

Chaired by Mathew Wells and George Arhonditsis

This general session is designed for presentations that fit within the broad scope of IAGLR but that do not align with any other specific session.

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