

To make it easier to find an appropriate session, we’ve grouped them below by themes. We encourage authors to submit abstracts for specific sessions, but also will consider those submitted to session #46. General Contributions under Other Topics.

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## Biology and Human Dimensions (1–5)

### **#1. Coregonine Ecology, Trends, and Management**

Coregonines are a diverse taxon of fishes that inhabit freshwater systems throughout the northern hemisphere, including several of the world’s large lakes. In the Laurentian Great Lakes, coregonines support valuable commercial fisheries, are of cultural and economic significance to Indigenous communities, and play important ecological roles in lake food webs. A number of stressors have threatened populations of coregonines, resulting in species extinctions, population declines, and losses in commercial fishery yields. This session brings together researchers investigating various aspects of coregonine ecology and population dynamics, with the aim of providing information needed to support management and restoration of these important fishes. Specific topics covered include drivers of recruitment declines, spatial and evolutionary ecology, and restoration initiatives.

*Chaired by Erin Dunlop, [Erin.Dunlop@ontario.ca](mailto:Erin.Dunlop@ontario.ca), Ontario MNR, Trent University; Andrew Muir, Great Lakes Fishery Commission*

### **#2. Environmental DNA and RNA for Monitoring Great Lakes Ecosystem**

The Great Lakes ecosystem is undergoing rapid changes due to anthropogenic inputs and the spread of aquatic invasive species. An understanding of the early stages of change in biodiversity is crucial to the improvement of biodiversity management practices and the prevention of biodiversity loss. With rapid advancements in monitoring aquatic species through environmental samples, eDNA and eRNA are coming into the spotlight as techniques used to monitor a wide

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variety of species. This session mainly focuses on the application of eDNA/eRNA methods for monitoring changes in ecosystem health, invasive species occurrence, rare species, native species, species distribution, species quantification, and their interactions with the environment. Further, we also invite you to submit topics focuses on diet analysis, and predator-prey interactions.

*Chaired by Subba Rao Chaganti, [chaganti@umich.edu](mailto:chaganti@umich.edu)*

### **#3. Human Dimensions of Recreational Use of the Laurentian Great Lakes: Insights about Behaviours, Value, and Impacts**

The Laurentian Great Lakes are an important setting for water-based recreation activities including recreational fishing. These activities can impact aquatic ecosystems through harvest of fish (exploitation) and the purposeful and accidental movement of invasive species. These same activities, however, are valued by recreationists who in turn spend money on their activities that supports local economies. Here, we highlight cases that illustrate the behaviours of recreationists along with impacts and/or values associated with the activities.

*Chaired by Len Hunt, [len.hunt@ontario.ca](mailto:len.hunt@ontario.ca)*

### **#4. Maximizing Results, Minimizing Disturbance: Non-Invasive, Low Impact Monitoring of Aquatic Ecosystems**

Session highlighting techniques and technologies that are being used to monitor and study aquatic ecosystems while minimizing impacts to wildlife and habitats.

*Chaired by Matthew Windle, [mwindle@riverinstitute.ca](mailto:mwindle@riverinstitute.ca)*

### **#5. Revitalization and Resilience of Great Lakes Communities and Ecosystems**

There is growing research and institutional interest in community revitalization and resilience, as well as adaptation to climate change in the Great Lakes region. While the region has made progress in addressing one stressor (i.e., legacy contamination), another (i.e., climate change) emerges. Agencies, communities, and individuals are taking actions to adapt to these stressors and those actions are shaping both ecosystems and communities in different ways throughout the region, in part, because revitalization, resilience, and adaptation are embedded in biophysical and social contexts that vary across space. Indeed, vulnerability to legacy pollutants and climate change is disproportionately distributed and the capacity to respond to environmental stressors in ways that support resilience and revitalization differs. Thus, place can be an integrating concept where the biophysical and social environments interact and where stressors are experienced. Moreover, place-based examinations can be important to understanding context-specific responses to environmental stressors that align with the needs and values of the community. Consequently, understanding these community dimensions of revitalization and resilience will benefit both ecosystems and society. Thus, this session will welcome presentations that explore community responses to environmental pressures, including implementing revitalization, enhancing resilience, or planning climate change adaptation. Topics can include, but are not limited to, community capacity and vulnerability, participation and collaboration, and environmental and climate justice.

*Chaired by Kathleen Williams, [williams.kathleen@epa.gov](mailto:williams.kathleen@epa.gov); Rebecca Nixon; Stuart Carlton*

## Climate Change and Adaptation (6–10)

### **#6. Building Resilience in the Great Lakes Basin**

Extreme weather events is affecting thousands of people each year in the Great Lakes basin as floods, extreme temperatures and storms are becoming more and more frequent. This session will explore the relationship between climate change adaptation and disaster risk reduction and will offer an opportunity for practitioners to share about progresses made by municipalities and higher level of governments towards climate change adaptation.

*Chaired by Jerome Marty, [jmarty@iaqlr.org](mailto:jmarty@iaqlr.org)*

### **#7. Expected Impacts of Climate Change on Fisheries Production and Potential Anticipatorily Adaptation Strategies**

To assess the impacts of climate change on the fisheries sector, and the need to formulate potential adaptation strategies.

*Chaired by Geoffrey Chavula, [gchavula@gmail.com](mailto:gchavula@gmail.com)*

### **#8. From Climate Data to Climate Action: Towards Ecosystem-Based Adaptation in the Great Lakes**

Climate change continues to alter communities, ecosystems, and the biodiversity of the Great Lakes, amplifying existing stressors and putting people, the environment, and the economy at increasing risk. Already at more than 1°C of global warming compared to the pre-industrial period, Great Lakes communities have faced more extreme weather events, flooding, erosion, variable lake levels, warmer winters, extreme heat, and less snow and ice cover. With every degree of additional warming from anthropogenic, heat-trapping greenhouse gases, Great Lakes communities risk even more devastating climate impacts to the freshwater ecosystem on which they depend. As climate science and knowledge continues to improve globally, we seek to share the latest advancements in climate science and knowledge in the Great Lakes region to improve understanding of possible climate futures, and the associated impacts that communities need to prepare for. This may include improvements in climate modelling to better understand extremes, the influence of the Great Lakes on regional climate (e.g. lake-effect precipitation), what the IPCC's new illustrative emissions scenarios mean for the Great Lakes region, and the integration of community-based climate knowledge. This session also seeks to share innovative applications of how climate data and information have been used to inform ecosystem-based adaptation and locally-specific strategies that benefit the health and resilience of the Great Lakes freshwater ecosystem and surrounding communities.

*Chaired by Sharon Lam, [sharon.lam@trca.ca](mailto:sharon.lam@trca.ca); Yuestas David; Claire Sanders; Jenessa Doherty*

### **#9. Nature-based solutions as a Key Driver to Climate Adaptation in the Great Lakes Basin**

Nature-based solutions (NBSs) have the potential to contribute to many ecosystems services including climate change mitigation via the capture of carbon. This session will evaluate the importance of NBSs as a driver to reduce the impacts of climate change on critical ecosystems of the Great Lakes.

*Chaired by Jerome Marty, [jmarty@iaqlr.org](mailto:jmarty@iaqlr.org)*

### **#10. The Impacts of Climate Change on the Great Lakes-St. Lawrence Basin and Potential Policy Responses**

At the intersection of Science, Policy, and Management, the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement (Agreement) and corresponding Compact call for providing leadership in developing science that would improve management of the Great Lakes-St. Lawrence River system. To that end, the Agreement's Regional Body

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and Compact’s Council in 2019 adopted a Science Strategy to engage the scientific community regarding what would be of greatest assistance to decision makers. As stated in the Science Strategy “...the integration of information about the impacts of climate change on the Great Lakes Basin water balance is a key challenge.” As required by the Compact and Agreement, the Regional Body and Compact Council released the third iteration of its Cumulative Impact Assessment, covering the years 2016-2020. In addition to looking at the impacts of the Cumulative Impacts of Withdrawals, Diversions and Consumptive Uses, new and existing models are used to identify what the impacts of Climate Change have been to the water budget and what the impacts will likely be in the future. This session will focus on describing the outcomes of that study, other studies examining basin wide Great Lakes climate impacts and any policy changes that may be taken in response.

*Chaired by Peter Johnson, [pjohnson@gsqp.org](mailto:pjohnson@gsqp.org)*

## Communicating Great Lakes Science (11–15)

### **#11. Approaches for Horizon Scanning: Assessing Threats to the Great Lakes to Establish Early Warnings**

Great Lakes water quality is under threat from a variety of sources. Risk is a social construct that varies as greatly as the social diversity across the Great Lakes basin and the communication of this risk is dependent upon the voices heard. This session will be led by a working group of the International Joint Commission’s Great Lakes Science Advisory Board. The session seeks to provide a platform for scientists and public advocates alike to bring to the fore their warnings of threats known, suspected, or unknown to the Great Lakes community. Presentations may consider various ranges of threats that may present themselves across spatial, temporal scales, as well as a variety of methods of understanding (Western/positivist science to Traditional Ecological Knowledge) used to address the range of understanding known, suspected, and unknown threats.

*Chaired by Michael Twiss, [michael.twiss@alqomau.ca](mailto:michael.twiss@alqomau.ca); Lucinda Johnson; Matthew Child; Lizhu Wang*

### **#12. Communicating about Great Lakes Invasive Species**

Invasive species have significant environmental and socioeconomic impacts on the Great Lakes region, and communicating those impacts to stakeholders presents unique challenges – and unique opportunities. With nearly 200 introduced aquatic species reported throughout the basin and dozens of new species at risk of introduction, effective science communication is more important than ever to protect the health of the Great Lakes. This session welcomes presentations on any topics related to communication, education, and outreach about Great Lakes invasive species, from proposed changes to species names/technical terminology, effective framing in outreach material, communication challenges in invasive species management, or other intersections of rhetoric and ecology in the region. Talks can focus on specific species, issues, geographic regions, but should discuss broader implications/transferability.

*Chaired by El Lower, [elower@umich.edu](mailto:elower@umich.edu)*

### **#13. Inspiring Stewardship for the Great Lakes through Education**

Empowering youth to take action for our environment is key to sustaining the Great Lakes and local ecosystems for generations to come. Inspiring young people to take an interest in the natural world sets up the path for future leaders who understand and appreciate the importance of caring for ecosystems. Presentations in this session will help to answer the following questions: How are we educating youth about the current state of the Great Lakes? What are the characteristics of successful initiatives to improve Great Lakes literacy with K-12 students, and formal and nonformal

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educators? How can we ensure future education efforts reach traditionally underserved and underrepresented populations? How is climate literacy being incorporated into educational efforts?

*Chaired by Kristin TePas, [ktepas@illinois.edu](mailto:ktepas@illinois.edu); Emilie DeRochie; Megan Gunn*

#### **#14. Mobilization of Science through Outreach and Communities of Practice**

Across the globe, impacts of climate change on water resources are increasing. Effective responses require interdisciplinary scientific (biophysical and social) information that meets the needs of the general public, community leaders, decision-makers, and stakeholders. While all audiences have a vital role in mobilization of knowledge into effective policies, regulations, management practices and water use, each audience has different information needs. Outreach experts who immerse themselves within the community can build trust and authentically support communities' information priorities. Networks of organizations and communities of practice support mobilization of knowledge gained through experiential learning, transferring complex social-ecological knowledge to pertinent stakeholders. These networks can create inter-disciplinary understanding and connect wider geographies to evoke ecosystem change to scale. This session focuses on science mobilization and the role of scientists in policy and other community-based initiatives to ensure the successful communication of scientific findings and to co-produce knowledge to inform effective policies that meet community needs. Presentations would ideally focus on: methods and implementation of outreach, education, and science communication to reach a variety of audiences; the role of scientists in participatory co-production of knowledge and co-management of changing ecosystems; effective methods for network weaving to advance interdisciplinary understanding of coupled human-natural systems; engagement and authentic support of socio-economically disadvantaged and environmental justice communities; case studies of any of these aspects.

*Chaired by Wendy Kellogg, [w.kellogg@csuohio.edu](mailto:w.kellogg@csuohio.edu); Navjot Dhaliwal; Samantha Pickering*

#### **#15. Valuing Indigenous Ways of Knowing, Being, Doing, and Connecting in an Era of Climate Change, Crisis, and Uncertainty**

The need for and value of Indigenous-led conservation is being increasingly recognized by the research community and public alike. This is apparent across Canada and around the world where policymakers and various actors in dominant society have failed to control human activities driving climate change and habitat loss, while Indigenous lands and waters have been relied on and cared for across millennia. Far from the colonial idea of separating people from nature in order to preserve nature and the concept of the "pristine" or "wilderness" free from human influence, Indigenous approaches to conservation regularly place reciprocal people–place relationships at the center of cultural and care practices. This session will focus on Indigenous-led conservation and care efforts that support and embrace Indigenous knowledge systems, sovereignty, and governance structures. We welcome contributions that are responsive to the United Nations Declaration on the Rights of Indigenous Peoples, the Truth and Reconciliation Commission of Canada's Calls to Action, and the National Inquiry into Missing and Murdered Indigenous Women and Girls Calls for Justice. We plan to centre ceremony, practice, legal systems, languages, stories, and science that work towards engaging in and restoring just and healthy relations between fish, people, and place. We endeavour to deliver a hybrid event to encourage widespread, low-barrier access to our session, and we welcome contributions from all geographies while committing to working closely with those whose territories we will be on during this conference.

*Chaired by Andrea Reid, [a.reid@oceans.ubc.ca](mailto:a.reid@oceans.ubc.ca); Alexander Duncan & Elizabeth Nyboer; Catherine Febria; Clint Jacobs*

## Great Lakes Habitats (16–20)

### **#16. Great Lakes Shoreline Dynamics**

Recent high water levels in the Laurentian Great Lakes have been associated with large shoreline changes for the Great Lakes. Shoreline effects have included beach erosion, bluff and dune recession, breakwater and seawall damage, residential and industrial property damage, persistent coastal flooding, and more. The economic and social cost of these changes has been large and continues to mount. This session focuses on the assessment and documentation of recent Great Lakes shoreline changes, efforts to mitigate these changes, shoreline change modeling, and discussion of these changes in the context of long-term processes and management policies. Contributions are welcomed from a wide range of perspectives and approaches, including observations, numerical modeling, socio-economic assessments, and case studies.

*Chaired by Cary Troy, [troy@purdue.edu](mailto:troy@purdue.edu); Pengfei Xue; Chin Wu*

### **#17. Protected Areas, Natural Solutions to Climate Change**

Protected and conserved areas are recognized as one of the most effective tools to address biodiversity loss and climate change. However, despite the protection these areas afford, species and ecosystems remain vulnerable to impact and change. It's a complex and uncertain context for conservation, and one that challenges traditional planning and management efforts and seeks new and integrated approaches. How coastal and freshwater protected areas respond, and continue to be a frontline defence to these twin crises, will be the focus of this session. The session will examine how protected and conserved areas are, or are projected to be, affected by climate change and how managers in these sites are preparing and adapting. As well, the session will explore how these areas contribute to a "nature-positive world" and serve as a "natural solution" to climate change, including examples of maintaining or building ecological resilience, conserving and restoring biodiversity and ecosystem services, advancing good governance and management effectiveness, supporting human wellbeing and sustainability, and in carbon stabilization. Finally, in the context of equitable and effective area-based conservation, the session will invite discussion on efforts to expand or create new protected or conserved areas and establish ecological corridors and networks.

*Chaired by Scott Parker, [scott.parker@pc.gc.ca](mailto:scott.parker@pc.gc.ca)*

### **#18. Restoring and Monitoring Habitat in the Toronto and Region Area of Concern**

The Toronto and Region Area of Concern (AOC) is one of 43 within Canada and the United States where local environmental degradation may be causing harm to the larger Great Lakes system. Historically, the Toronto waterfront was a rich mosaic of natural assets including aquatic and terrestrial habitats and diverse communities of fish and wildlife. Over the past 200 years, pressures of urbanization, port expansion, industrial activity, transport, and recreation have resulted in the destruction of wetlands and riparian habitats, thereby compromising the natural capital that provided various ecosystem functions and services for a resilient future. In the last three decades however, extensive efforts have been made along Toronto's waterfront and within its watersheds to implement various nature-based solutions, restore habitats, and track success over time. This session will focus on the various mechanisms helping to protect, enhance, and restore natural assets as well as the monitoring techniques used to inform adaptive management. The presentations will highlight, through various case examples, the successes and lessons learned through the implementation of nature-based solutions in Canada's largest urban centre that bring us closer to delisting Toronto and region as an AOC.

*Chaired by Don Little, [don.little@trca.ca](mailto:don.little@trca.ca); Andrew Ramesbottom*

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## **#19 Small but Mighty: Wetlands As Keystone Ecosystems in the Great Lakes Basin in an Era of Climate Change**

Inland and coastal wetlands in the Laurentian Great Lakes basin (GLB) play a critical role in mediating watershed hydrology and water quality, in addition to serving as biodiversity hotspots for plants and wildlife. Similar to “keystone species”, wetlands have been considered “keystone ecosystems” because they exert a disproportionately positive impact on the ecological diversity and function of their surrounding watersheds relative to their small size. Since European settlement, well over 60% of wetlands within the GLB have been destroyed by human activities. In southern Ontario alone this vast wetland loss is thought to have eliminated 2 billion tonnes of carbon storage. Remaining inland and coastal wetlands in the GLB continue to be threatened with increasing land-use pressures, just as anthropogenic climate-change impacts intensify. As such, there is an urgency to better understand and manage these remaining wetlands through an integrated lens that accounts for their hydrological, ecological, socio-economic, and Indigenous value. This session aims to bring together presentations on any aspect of wetland science, including geophysical and biological research, Indigenous knowledge frameworks, and management in the GLB, within the thematic context of climate change. Focal topics include climate change impacts to wetlands, as well as their role in climate change adaptation and mitigation. It is anticipated that presentations in this session will reflect a diverse range of insights on GLB wetlands, in order to provide a holistic perspective on their current status and future potential for ecosystem services.

*Chaired by Andrea Kirkwood, [andrea.kirkwood@ontariotechu.ca](mailto:andrea.kirkwood@ontariotechu.ca); Rebecca Rooney*

## **#20. The Leslie Street Spit - Tommy Thompson Park: Exploring the Creation of a Biodiversity Hotspot**

The Leslie Street Spit, home to Tommy Thompson Park, is a 471-ha constructed landform near downtown Toronto, Canada. It was not intended to be a public urban park, but land use needs shifted during construction, and through natural succession and strategic habitat enhancement and creation projects it has turned into the most significant natural area on Toronto’s central waterfront. It is recognized as a global Key Biodiversity Area and Environmentally Significant Area. Toronto and Region Conservation Authority developed a Master Plan to guide park development and management and set out to restore some of the habitats that were historically lost from the Toronto waterfront. Fish, wildlife, and people benefit from over 70 hectares of created and restored wetland and terrestrial habitat, two kilometres of shoreline, as well as deep water enhancements. Restoration and management are not without challenges, which include invasive species, colonial waterbirds, fisheries, and people. With over 250,000 visits annually, human management is essential to ensure the ecological integrity of the site is maintained. Well planned infrastructure, 18-km of trails and nature-driven special events help the public understand, appreciate, and steward Toronto’s urban wilderness. This session invites speakers to discuss all aspects of Tommy Thompson Park including habitat enhancement and creation efforts, assessment of these features, and habitat and wildlife monitoring and research.

*Chaired by Karen McDonald, [karen.mcdonald@trca.ca](mailto:karen.mcdonald@trca.ca)*

## **Great Lakes Processes (21–25)**

### **#21. Ecological Modeling and Physical-Biological Interactions in Large Lakes and Their Watersheds**

This session will highlight ecological modeling and empirical studies of biological-physical interactions and biogeochemistry in the pelagic and benthic zones of large 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 using process-based numerical models, data-driven models, experimental, and observational approaches.

*Chaired by Reza Valipour, [reza.valipour@ec.gc.ca](mailto:reza.valipour@ec.gc.ca); Mark Rowe; Josef Ackerman*

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## #22. Groundwater Influences on Lakes, Wetlands, Springs, and Tributaries

Groundwater discharge to lakes, wetlands, and tributaries, as well as other groundwater – surface water interactions, can affect surface water quality and quantity (flow or level). These effects can be potentially harmful, for example by supplying excess nutrients or toxic contaminants to surface waters. They may also be beneficial, such as maintaining base flows, providing thermal refugia, or diluting/attenuating contaminants. These groundwater-related effects in turn can have direct implications for aquatic and nearby terrestrial ecosystems and for human use of these surface waters. In this session, we invite research that: i) demonstrates the influences of groundwater on lakes, wetlands, springs, and tributaries; ii) assesses the resulting potential impacts on related ecosystem or human services; iii) explores groundwater – surface water interaction mechanisms; iv) investigates the factors that may affect groundwater – surface water interactions and their impacts, including changes to climate, land use, and groundwater resource use; and v) develops new methods of investigation or modeling of all of the above. Studies that combine holistic, multi-disciplinary approaches are particularly sought.

Chaired by James Roy, [jim.roy@ec.gc.ca](mailto:jim.roy@ec.gc.ca); Jana Levison; Sabina Rakhimbekova; Clare Robinson

## #23. Physical Processes in Lakes

This session's focus is on the physical limnology of the Great Lakes and other lakes of the world. Papers are solicited dealing with field, modeling, experimental and laboratory studies of physical processes in lakes (waves, currents, turbulence, stratification, sediment transport, etc.) ranging in sizes from small, to medium and large.

Chaired by Mathew Wells, [m.wells@utoronto.ca](mailto:m.wells@utoronto.ca); Jason Olsthoorn; Reza Valipour; Leon Boegman

## #24. The Climate Systems of Large Lakes at Seasons to Millennia

Variability and changes in climate drive complex interactions between air, land, water, and ice in the Great Lakes region, with links to both the global atmosphere-ocean- surface system and local ecosystem processes. Global and hemispheric climatic phenomena, in turn, are reflected in the Great Lakes regional climate through teleconnections, which span the seasonal to multi-decadal time scales, and greenhouse gasses, which work on the multi-decadal scale. We welcome contributions that address how lakes and their ecosystems, in any lake-influenced region in the world, interact with the many aspects of the climate system over this wide range of time scales. This includes research covering topics in observation, diagnosis, theory, and/or modeling of the climate systems of large lakes (e.g., interactions between water, ice, land, and atmosphere, or the ecosystems embedded within).

Chaired by Jia Wang, [jia.wang@noaa.gov](mailto:jia.wang@noaa.gov); David Cannon; Abby Hutson

## #25. The Paleolimnological Record of Large Lakes and Their Catchments: Insights for Adapting to Future Climates

Just as the present is the key to the past, the past can provide important insights for the future. Lake sediments are important archives of past climatic and limnological conditions. Biological and physicochemical proxies record past conditions that can be dated using radiometric techniques such as radiocarbon or lead-210 age models and in exceptional cases, annual chronological precision can be obtained from varved sediments, allowing correlation with historic and instrumental records of climate. Geoarchaeological records also provide insight into prehistoric settlement and the relationship between humans and the lakes during different climate regimes. This session will explore the paleolimnological record of large lakes and smaller lakes within their catchments, with emphasis on information that will assist in adapting to future climates.

Chaired by Francine McCarthy, [fmccarthy@brocku.ca](mailto:fmccarthy@brocku.ca); Soren Brothers; Paul Hamilton; R. Timothy Patterson



## Restoration and Management for the Future (26–29)

### **#26. Advances in Hydroclimate Modeling and Data to Support Great Lakes Adaptive Management**

Flooding caused by high lake levels during 2017-2020 and a recognition of uncertain future impacts of climate change on water level variability and predictability have resulted in increased demand for improved adaptive management of the Great Lakes – St. Lawrence River system (for example, the IJC’s request for an expedited review of Lake Ontario regulation Plan 2014 following flooding in 2017 and 2019). Approaches to data analysis and modeling in support of water management in the Great Lakes have traditionally incorporated an assumption of stationarity, as well as a limited number of deterministic model and data products. These approaches limit water managers’ ability to (1) test regulation plans under the full range of hydroclimate conditions that may be expected in the future over a decadal timeframe, and (2) make decisions based on predicted hydroclimate conditions over a seasonal to interannual timeframe. We seek presentations that describe advancements in Great Lakes hydroclimate data and models for use in representing variability over climatological timescale and enhancing predictability of water supply and water levels at a seasonal to interannual timeframe. Examples of integration of recent hydroclimate advancements into decision support tools for water management are also welcome. This session will build on a recent workshop convened by the Great Lakes – St. Lawrence River Adaptive Management Committee (GLAM) that was aimed at identifying hydroclimate research priorities to advance adaptive management in the Great Lakes.

*Chaired by Lauren Fry, [lauren.fry@noaa.gov](mailto:lauren.fry@noaa.gov); Frank Seglenieks; Deanna Fielder*

### **27. Lake Simcoe: Progress, Trends, and Future Directions**

Lake Simcoe, the largest inland lake in south-central Ontario, is being affected by many of the same environmental stressors as the Great Lakes: nutrient inputs, invasive species, fishing pressure, increasing urban land cover, and climate change. Over the past 40 years, lake restoration and management strategies have shown some positive trends, while synergistic impacts from stressors has complicated progress in other areas. This session will provide updates on progress toward lake management goals, trends in environmental variables, possible future trends and challenges including climate change mitigation and adaptation, and how trends in Lake Simcoe may foreshadow or mirror environmental change in the Laurentian Great Lakes.

*Chaired by Brian Ginn, [b.ginn@lsrca.on.ca](mailto:b.ginn@lsrca.on.ca); Justin Trumpickas; Joelle Young*

### **28. Land-to-Lake Connections for a Resilient Future**

Western Lake Ontario receives waters from the Greater Toronto Area, which is one of the most urbanized regions in Canada. The land use and land cover in this region have direct and indirect impacts on its watersheds and Lake Ontario. Among others, this region has persistent concerns associated with ecosystems and water quality including concerns around pollutant and nutrient loadings from the land significantly impacting the lake. As land use and climate continues to change, these concerns are expected to exacerbate, unless appropriate mitigation actions are implemented. Building a resilient future for both land and lake ecosystems and communities require a strategic and integrated planning process that incorporates information from science, policy, planning, and practice to understand the features, functions, and interactions between watersheds, watercourses, and ultimately the receiving lake. Improved understanding of components such as hydrology, water quality, natural cover, biodiversity within the broader context of land use and climate change are pertinent to this approach. Integrated watershed, waterfront, and nearshore management approaches provide systematic and comprehensive ways identify synergies and can inform management actions that benefit both land and lake health and overall community well-being. This session will present the multi-faceted aspects of integrated management for land and lake health. Presentation include advances made in scientific methods and

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models to improve understanding of land and lake water quality and ecosystems, innovations in planning processes for co-development of integrated plans, and meaningful partnerships that help facilitate implementation on the ground.

*Chaired by Namrata Shrestha, [namrata.shrestha@trca.ca](mailto:namrata.shrestha@trca.ca); Krista Chomicki*

### **#29. Restoring Great Lakes Areas of Concern: Innovative Approaches to Assessment, Improvement and Restoration**

Great Lakes Areas of Concern (AOCs) are sites in Canada and the US where human activities have impaired some beneficial uses of the lakes and connected ecosystems. An AOC site designation is determined by the number and extent of the Beneficial Use Impairments (BUIs), which are indicators of ecological impact and functioning. These BUIs encompass a range of environmental impairments such as water quality, degradation of benthos, and restrictions on wildlife and fish consumption due to contaminants. Each AOC has a unique set of identified BUIs, and thus requires unique methods to properly assess, monitor, and restore beneficial uses and ecological function to impaired areas. This session will highlight innovative and effective approaches for evaluating ecological restoration efforts and scientific methods to assess the status of AOCs, improve ecological function, remove BUIs, and ultimately delist AOCs. Potential approaches include comparative techniques to assess benthic community health, molecular approaches for evaluating microbial community shifts, innovative measures of contaminant uptake into organisms and food webs, alternative applications of established indices of biotic health or habitat quality, analysis of recovery trends from long-term monitoring programs, and case studies for assessing the effectiveness of ecological restoration projects. The session is expected to benefit project managers working within AOCs, remediation or restoration experts, research scientists focused on characterizing the recovery of impaired ecosystems, and the broader regulatory community.

*Chaired by Brittany Perrotta, [perrotb@mcmaster.ca](mailto:perrotb@mcmaster.ca); Freya Rowland; Karen Kidd*

## **Technology, Innovation, and Data Management (30–33)**

### **30. Advances in Clean Energy Technologies and Climate Smart Solutions for Sustainable Fisheries Production**

Global fisheries are in danger of multiple stressors from within their aquatic environments, external anthropogenic activities, and climate change, with the resulting impacts cascaded along the entire value chain of production, handling, processing, and marketing. These stressors have largely contributed to the decline in stocks of exploited species, particularly the large-bodied species. Besides, issues of bycatch, discards, and post-harvest loss have remained the other challenges that have negatively impacted fisheries production, leading to loss of livelihoods, income, and employment opportunities for the beneficiary populations. The rapidly changing climate and fast degrading environment calls for practical innovative climate smart and clean energy solutions to enhance sustainable fisheries production and productivity. Therefore, the session on “*Advances in Clean Energy Technologies and Climate Smart Solutions for sustainable fisheries production*” is intended to provide a platform that brings together fisheries professionals and stakeholders to share knowledge on the recent advances in innovative clean energy technologies and climate smart solutions for increased fisheries production. The session targets scientists, innovators, academia, entrepreneurs, and private actors including investors.

*Chaired by Nakiyende Herbert, [nakiyende@yahoo.ie](mailto:nakiyende@yahoo.ie)*

### **Community Science: Local Action for Resilience and Management**

Contemporary problems in Great Lakes Basins are difficult to solve without participation from people that live around the lakes, especially as anthropogenic water quality impacts are worsened by climate change. Unfortunately, limited resources result in water quality data gaps that serve as barriers to the investments needed to ensure community

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resilience and ecosystem management across the region. Fortunately, Great Lakes residents feel a powerful sense of connection to their water resources. Local communities and organizations have been harnessing this energy to power “Citizen” or “Community” science groups across the Basin for years. Community science allows local residents to collect critical water data in a cost-effective manner, increase residents’ awareness, and expand the spatiotemporal reach of traditional research approaches. Historically, lack of standardized sampling methods and limited visibility have often meant that community science data is not considered in water governance, research, and advocacy conversations. Despite these challenges, local groups and institutional stakeholders are finding ways to use data to greater collective impact. We invite talks that highlight the return on investments in community-based water monitoring and approaches to elevating these activities. We particularly want to center success stories where researchers, managers, and residents work together to address problems in community resilience and aquatic ecosystem management.

*Chaired by Lindsay Day, [lindsay@datastream.org](mailto:lindsay@datastream.org); Max Herzog; Gabrielle Parent-Doliner; Alana Tedeschi; Jacqueline Vinden; Pat Chow-Fraser*

### **#32. Open Data Resources of the Laurentian Great Lakes**

This session will familiarize listeners with major open access data resources in the Laurentian Great Lakes and how to search for and use shared data. In this session, we will learn best practices for checking the quality of open access data and ensuring data are compatible with your project. We will hear about repositories of publicly accessible data from major monitoring, research, and restoration efforts in the Great Lakes. Long-term data are critical to establish historic trends for climate change research. We will learn about catalogs to search for shared data to supplement your dataset when time or resources for extensive new studies are limited. Leveraging data from previous studies at your restoration site has potential to reduce uncertainty when analyzing restoration effectiveness. Existing datasets can offer fresh insights if interrogated with new research questions or new data exploration methods. Open data resources allow everyone to participate in Great Lakes research from anywhere, at any time, without the time-commitment, travel, and expense of field research. So come find out how to take advantage of the abundance of Laurentian Great Lakes open data available for re-use. GDIT chairs are independent contractors funded by EPA contract in support of the Great Lakes Restoration Initiative.

*Chaired by Cynthia Collier, [Cynthia.Collier@gdit.com](mailto:Cynthia.Collier@gdit.com); Tim Lewis; Craig Palmer; Louis Blume*

### **#33. Smarter Lakes Are Better Lakes: Innovation, Collaboration, and Entrepreneurship**

Over the last decade, the rapid pace of technological innovation has enabled radical shifts in environmental monitoring. Newly affordable solutions for distributed in-situ monitoring, remote sensing, community science, and data fusion offer immense opportunities to build the research, management, and community capacity needed to understand, protect, and restore our water resources across the Lake Erie Basin. New technology is enabling a broader movement of water monitoring by community groups, municipal actors, cross-sector partnerships and industry leaders across the states and provinces that form Lake Erie's shores. This session will highlight case studies and innovative tech to explore the next generation of lake data collection and analysis systems. By bringing together perspectives from research, nonprofit, and industry, this session will not only showcase technologies and research methods, it will also highlight the collaborations and partnerships that enable development, piloting, and field operation. Consider this session a water tech symposium, with submissions including experiential components such as on-stage demonstrations of wireless sensor networking or navigating real-time data with VR technology along with conventional research presentations. Users of the newly created testbed program will also be featured that help companies rapidly test and deploy technology on the Great Lakes.

*Chaired by Edward Verhamme, [everhamme@limno.com](mailto:everhamme@limno.com); Emily Hamilton; Calvin Hitch*

## Threats to the Great Lakes (34–39)

### **#34. Aquatic Invasive Species Research**

Invasive species are a leading threat to native species and biodiversity, are an important driver of global ecological and evolutionary change, restructure food webs, and have caused significant economic damage to ecosystems. This session welcomes presentations reflecting a broad array of aquatic invasive species research in large lakes of the world. We encourage presenters to connect their research to recent international, national, regional or local management-driven research prioritization lists and gap analyses such as the Aquatic Nuisance Species Task Force’s National Priorities List.

*Chaired by Rochelle Sturtevant, [rochelle.sturtevant@noaa.gov](mailto:rochelle.sturtevant@noaa.gov)*

### **#35. Chloride Sources, Transport, Impacts, and Management - Implications for Mitigating Freshwater Salinization**

Chloride concentrations are increasing in streams, lakes, soil water, and groundwater in the Great Lakes basin. These trends are mainly due to the overapplication of chloride-based de-icers; however, other anthropogenic chloride sources may play a role in the issue of freshwater salinization in some regions. The negative impacts of chloride pollution are significant for both terrestrial and aquatic ecosystems, and extend to direct economic and human health consequences. This session is for researchers and practitioners to share recent advances related to the study of chloride sources, transport, impacts, i.e., physical, biological, adaptive, interactive, and management. We welcome a wide range of studies, including (but not limited to) monitoring-, modelling-, ecological-, and policy-based. We are particularly interested in studies that make explicit links to how we can move toward mitigating freshwater salinization.

*Chaired by Jenn Drake, [jennifer.drake@carleton.ca](mailto:jennifer.drake@carleton.ca); Shelley Arnott; Clair Oswald; Krista Chomicki; Lyndsay Cartwright; Stephanie Melles*

### **#36. Contaminants in a Future Climate: Legacy and Emerging Contaminants Under Global Change**

The pollution of freshwaters by legacy and emerging contaminants affects the health of ecosystems and impairs water for human and ecological uses. Climate change impacts, such as changes to precipitation patterns, water quality, water levels, temperature, and extent of hypoxia, can affect contaminant bioavailability. For example, the 2021 Great Lakes Binational Strategy for Mercury Risk Management identifies climate change effects on the mercury cycle as an important knowledge gap. Factors such as changing water levels and increasing hypoxia are expected to alter methylmercury bioavailability. Such work is urgently needed to help clarify recent non-decreasing or increasing fish mercury trends in the Laurentian Great Lakes and predict possible future changes in mercury cycling in freshwaters globally. Another example includes changes to precipitation patterns and subsequent alterations to terrestrial dissolved organic matter transport that have the potential to affect contaminant bioavailability in complex ways. These are important determinants of bioavailability for both legacy and emerging contaminants, such as the per- and polyfluoroalkyl substances. There is a need to understand how climate change impacts may change legacy and emerging contaminant bioavailability and uptake into the food web. We welcome all contributions that place contaminant research in a climate change lens.

*Chaired by Roxanne Razavi, [razavi@esf.edu](mailto:razavi@esf.edu); Evie Brahmstedt*

### **#37. Great Lakes Oil Spill Science: Planning and Response in a Changing Climate**

The environmental inputs, fate, and effects of petroleum products in freshwater systems is notoriously understudied in comparison to the body of research from marine systems. The Great Lakes - St. Lawrence River region is particularly dependent upon petroleum products because of their use in power generation, manufacturing, and chemical industries.

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As climate change causes more frequent, intense weather events, extreme fluctuations in lake levels, and flooding, the energy sector's infrastructure and Great Lakes habitats are increasingly at risk. How will future climate conditions affect the risk of and response to oil spills in the Great Lakes? This session will explore spill planning and response adaptations under circumstances in which the increasing probability of erosion could compromise already aging infrastructure in the Great Lakes basin, reducing ice coverage could increase Great Lakes vessel traffic, and growing ecosystem stress may prolong spill recovery time in vulnerable habitats. Attendees of this session will learn from researchers and scientists about: (1) How petroleum products impact and persist in freshwater ecosystems; (2) How climate change might impact these characteristics and/or other risks; and (3) How we might need to adapt to provide the best future response. This session is being coordinated by the Hazardous Materials Transport Outreach Network (HazMaTON), a collaborative focused on reducing the risks associated with multiple transportation modes of oil and other hazardous materials.

*Chaired by Kelsey Prihoda, [priho011@d.umn.edu](mailto:priho011@d.umn.edu); Mark Burrows; Natalie Chin; Rachel Pryor*

### **#38. Join the Great Lakes Harmful Algal Bloom Collaborative for Updates on HABs Management and Research**

This session will convene researchers and outreach professionals working to understand and communicate the science surrounding harmful algal blooms, including potential solutions from watershed to lake. The Great Lakes HABs Collaborative stands as a forum to link the region's science and management communities. Thus, presentations will include the latest research on HABs formation, toxicity, and persistence as well as management actions that may help reduce HAB occurrences through control of both watershed and in-stream/lake sources. For IAGLR 2023, the Collaborative is particularly interested in convening presentations examining HAB science through the lens of a changing climate, spurring discussion of questions such as: How may changes in lake levels and temperature affect species composition and abundance? Are existing models adequate to evaluate nutrient loading from surface/tile runoff and internal lake or streambed loading? Where have on-the-ground efforts with the agricultural community been successful and which messages resonate? How do climate and climate change complicate nutrient reduction efforts and messaging? Will nutrient reduction alone be sufficient to curtail HABs in Lake Erie and other lakes in the Great Lakes basin?

*Chaired by Katie Stammler, [kstammler@erca.org](mailto:kstammler@erca.org); Mary Anne Evans; Nicole Zacharda*

### **#39. Recent Advances in Plastic Pollution in the Great Lakes to Inform Monitoring and Ecological Risk Assessment**

Plastic debris is accumulating in freshwater systems and threatening ecosystems of vital importance, including the Laurentian Great Lakes. As concern rises about the risks of plastics in aquatic ecosystems, more studies have documented the presence of macro- and microplastics – including in sediments, water and aquatic species - across the Great Lakes and their catchments. The ubiquity of plastics in these ecosystems raises concerns for the health of biota as macroplastics can entangle wildlife and cause tissue damage, false satiation and mortality when ingested. Microplastics can be toxic to freshwater organisms as a result of their chemical components and because they can physically displace food and translocate into tissues. There is currently considerable momentum on understanding the sources, fate, exposure levels, effects and risks of plastic debris in the Great Lakes, and a need to develop a standardized monitoring program and risk assessment framework for the basin. This session will bring together researchers to showcase recent advances and research endeavours in plastics science. We invite talks on the presence and fate of macro- and microplastics in water, sediment and aquatic and riparian biota of the Great Lakes and their catchments. Presenters are also welcome to share laboratory and field toxicity studies, modeling results, risk assessment frameworks, methods development, analytical approaches or new initiatives that tackle issues related to plastic pollution in the Great Lakes.

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Participants will benefit from the latest knowledge on and approaches for plastic pollution research, and contribute to a better understanding of the environmental fate and impacts of macro- and microplastics in the Great Lakes basin.

*Chaired by Karen Kidd, [karenkidd@mcmaster.ca](mailto:karenkidd@mcmaster.ca); Rebecca Rooney; Chelsea Rochman; Eden Hataley*

## Water Quality and Healthy Ecosystems (40–45)

### **#40. Agricultural Best Management Practices to Restore Farm Soil Health and Water Quality**

This section invites research investigating the role of agricultural best management practices (BMPs) on soil health and nutrient (e.g., phosphorus and nitrogen) and organic contaminants (e.g., pesticides and herbicides) export into waterways. In-field and edge-of-field BMPs can include the 4R Nutrient Stewardship, precision agriculture, cover crops, crop rotation, conservation tillage, drainage water management structures, two-stage ditches, woodchip bioreactors, phosphorus removal structures, and wetlands, among others. The application of green compost, manure, biosolids, and dredged sediments can influence the physical, chemical, and biological farm soil properties. Multiscale approaches (catchment to field to soil pedon) including empirical and modeling are solicited in this section.

*Chaired by Angelica Vazquez Ortega, [avazque@bgsu.edu](mailto:avazque@bgsu.edu)*

### **#41. Characterizing Climate Change Impacts with Integrated Large Lake/Coastal Ocean-Watershed Modelling**

Climate-change induced impacts on large lakes and coastal waters are complex and not easily identified because climate affects these ecosystems in two ways, directly and indirectly. The latter can result from possible synergies or trade-offs with human activities such as land use, thermal and chemical pollution, carbon sequestration, and water usage. Models can help to account for a full spectrum of interactions and couplings but they need to rely on realistic boundary conditions and external forcings. This requires dynamic and/or statistical approaches to link the outputs of watershed and climate models with water quality and ecosystem models of the receiving lakes and coastal ecosystems. We invite contributions that address water quality modelling in this context. Contributions that target the full aquatic continuum or specific sub-components are welcome.

*Chaired by Serghei Bocaniov, [sbocaniov@uwaterloo.ca](mailto:sbocaniov@uwaterloo.ca); Kevin Lamb; Yerubandi Ram Rao; David Hamilton; Philippe Van Cappellen*

### **#42. Quantifying Nutrient Loading and the Changes in Loading to the Great Lakes**

Documenting nutrient loading and determining if there are trends in the loading to the Great Lakes is important to determine whether actions being taken in their watersheds are having beneficial effects. In this session, we would like to discuss methods being used to estimate nutrient loading (direct measurement and modeling approaches), describe approaches to quantify and display trends in water quality and loading, and describe methods to extrapolate the measured loads to unmonitored areas of the watershed.

*Chaired by Dale Robertson, [dzrobert@usgs.gov](mailto:dzrobert@usgs.gov); Matthew Diebel*

### **#43. Remote Sensing of Lake Water Quality in a Changing Climate**

Climate change is having significant and widespread impacts on large lake systems and their surrounding watersheds, exerting a direct influence on lake biogeochemistry and water quality. Modifications to runoff, erosion, and thermal regimes, for example, are impacting light quality and quantity, primary production, and proliferation of algal blooms. Comprehensive lake monitoring is essential in order to document and further understand the response of water quality

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to these shifts in climate and watershed processes. Several key water quality variables can be observed using Earth Observation satellites, including water colour and clarity, phytoplankton biomass (chlorophyll-a), harmful or nuisance algal blooms (HNABs), suspended sediments, dissolved organic matter, and temperature. Remote sensing data can therefore inform on water quality over a range of spatio-temporal scales, from short episodic events, to diurnal and seasonal cycles, and long-term trends, over local, regional and global scales. This session seeks contributions that use satellite and/or airborne remote sensing data to advance water quality monitoring capabilities in large freshwater systems as well as remote sensing applications for detecting both event-driven and long-term change. Contributions highlighting the role of remote sensing in interdisciplinary studies are also encouraged, as well as presentations describing novel algorithm and application development for lake biogeochemistry and water quality, particularly as related to future satellite missions such as NASA's PACE.

*Chaired by Caren Binding, [caren.binding@ec.gc.ca](mailto:caren.binding@ec.gc.ca); Michael Sayers; Andrea Vander Woude*

#### **#44. Urban Phosphorus Speciation, Retention, and Export: From Science to Management**

Phosphorus (P) loss from terrestrial ecosystems is widely recognized as the main driver of eutrophication, hence, calling for P management strategies to protect sensitive aquatic environments, such as ponds, lakes, and coastal waters. In urban landscapes, surface imperviousness and greater hydraulic connectivity due to stormwater management infrastructure result in P dynamics that are different from those in forested and agricultural watersheds. Mitigation of algal blooms in lakes and reservoirs downstream of urban regions will benefit from a predictive understanding of the watershed-scale export of different forms of P – because P speciation is closely related to P bioavailability – specific to urban areas. Increased availability of data and process knowledge of urban P export and speciation should be incorporated in real-world P management solutions at different scales – from small residential neighborhoods to large urban metropolitan areas. In this session, we invite submissions presenting results from observational studies, and data-driven and process-based modeling studies, as well as presentations on stormwater management solutions that enhance the retention of the more reactive P fractions exported from urban areas. We also welcome research on the watershed scale role of low-impact development (LID) practices on P cycling and export.

*Chaired by Mahyar Shafii, [mshafii@uwaterloo.ca](mailto:mshafii@uwaterloo.ca); Krista Chomicki; Chris Parsons; Philippe Van Cappellen*

#### **#45. Watershed-Scale Collaboration to Understand and Address Water Quality Challenges in Saginaw Bay**

The Saginaw Bay Watershed is the largest watershed in Michigan, spanning 2.4 million hectares, and one of the three largest agricultural watersheds in the US Great Lakes basin. The Bay and its tributaries support substantial commercial and recreational fishing, boating, and coastal recreation, diverse native wildlife and vegetation, as well as one of the largest concentrations of coastal wetlands in the Great Lakes. Excess sediment and nutrients from crop lands and other sources have contributed to eutrophication of the inner bay and related symptoms including excessive algal growth, decaying organic matter (aka muck) on beaches, degradation of spawning reefs, fish and invertebrate communities in streams, and exacerbation of invasive species in coastal wetlands. Nutrient and sediment loads are predicted to increase with increasing frequency and intensity of spring storms. The Saginaw Bay Monitoring Consortium is addressing water quality data needs in tributaries and the Bay to answer key questions and inform management decisions. Our goal with this session is to convene those working within or outside Saginaw Bay who can contribute knowledge, data and ideas related to addressing nutrient loading, ecosystem health, or climate adaptation. We welcome abstracts focused on monitoring, modeling, restoration, research, and outreach and engagement from a watershed-scale perspective. We will start with a series of presentations followed by an interactive discussion to highlight challenges, ideas and opportunities for collaboration.

*Chaired by Douglas Pearsall, [dpearsall@tnc.org](mailto:dpearsall@tnc.org); David Karpovich; Sherry Martin*

### Other Topics (46)

#### **#46. General Contributions**

Please include any abstract submission in which you are unsure of what Theme to submit to.

*Chaired by Timothy Johnson, [tim.johnson@ontario.ca](mailto:tim.johnson@ontario.ca)*